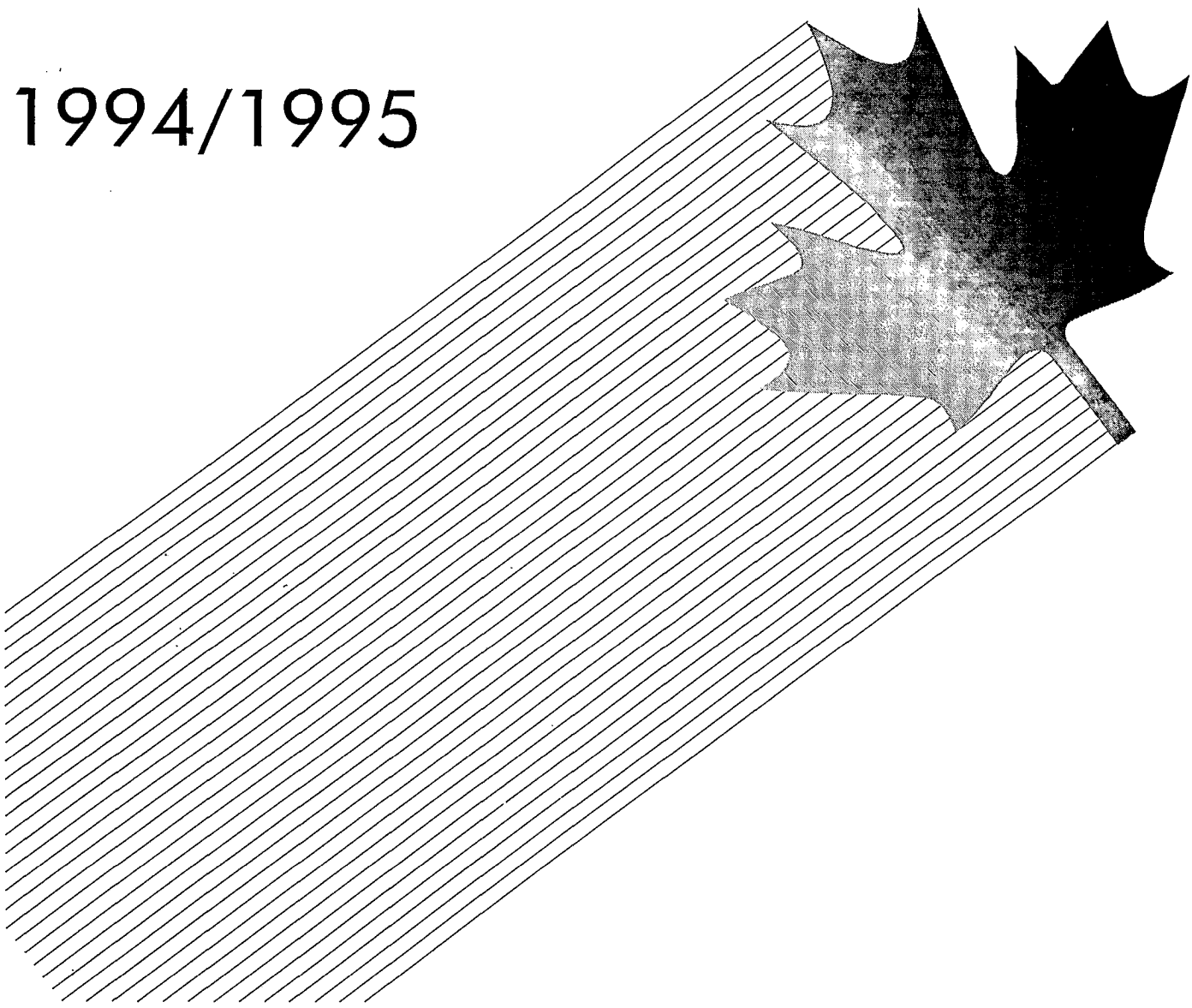
Canadian Robotics & Knowledge-Based Systems Industries Capability Guide

1994/1995



CANADIAN ROBOTICS

&

KNOWLEDGE-BASED SYSTEMS

INDUSTRIES

CAPABILITY GUIDE

Mr. Richard A. Krajweski
Director
Marine & Defence
Manufacturing,
Industry Canada
235 Queen Street
Ottawa, Ontario
K1A 0H5

Tel: (613) 954-3388
Fax: (613) 991-9469

Mr. Kevin B. Murray
Sectoral Liaison Secretariat
Trade Planning &
Operations Bureau
International Business
Development Branch
Foreign Affairs &
International Trade
125 Sussex Drive (TOST)
Ottawa, Ontario
K1A 0G2

Tel: (613) 996-8086
Fax: (613) 944-0050

Mr. Sultan Akhtar
Marine & Defence
Manufacturing
Industry Canada
235 Queen Street
Ottawa, Ontario
K1A 0H5

Tel: (613) 954-2866
Fax: (613) 957-8912

February 25, 1994

FOREWORD

This Canadian Robotics and Knowledge-Based Systems Industries' Capability Guide is a joint effort among the companies themselves, and with the Federal Government Departments of Industry Canada; Foreign Affairs and International Trade Canada; and the Department of National Defence. We wish to acknowledge the contributions made by Precarn Associates Inc., a Canadian industrial research consortium in artificial intelligence and robotics.

Canada has an established and well earned reputation in robotics and has attained world leadership in space robotics and manipulators and many other demonstrable applications in such diverse fields as aerospace, high technology manufacturing, nuclear energy, mining, transportation, forestry, food production, biotechnology and environmental clean up.

Canada has a vibrant cluster of institutional and private company research as well as educational facilities working with many of the leading edge tools such as micro and telerobotics, robotics, simulation, vision, skin fingerprinting, muscle manipulation, intelligent computing, machine translation, software development, sensing, optics/photonics and decision support software. Canada's National Research Council and Defence Research Establishments have worked with industry over the years to bring industrial research and development and advanced applied research into the reality of outstanding solutions and world renowned products.

While many Canadian companies have developed specialties and niches, they have also worked in effective teams to produce automated manufacturing solutions, underground mining systems, airborne surveillance devices, mobile surface and marine robots, fully integrated low cost portable ground to air video trackers and solutions for hazardous waste, nuclear energy, forest fire and detection systems to name a few.

Many of these Canadian companies have significant experience in applying advanced software techniques derived from their origins and capabilities in the geomatics, sensing and signal and image processing fields. They have produced systems ranging from ice related remote sensing to low cost/ high performance pattern recognition systems. These companies have also worked as system integrators in such applications as applying proximity sensors into robots.

To assist prospective customers, or joint venture partners this directory outlines the profile of some 120 Canadian companies. It also includes a quick reference matrix of their capabilities and where each of the companies listed fits into the regime of your potential applications and solutions.

You can express your interests directly to the companies or to the Canadian Embassy, Consulate or Trade Office in your country where these data are available to them electronically. You may also wish to communicate with the Federal Departments of Industry and/or Foreign Affairs and International Trade. These contacts are displayed on the previous page.

August 15th 1994

CANADIAN ROBOTICS & KNOWLEDGE-BASED SYSTEMS INDUSTRIES

TABLE OF CONTENTS

COMPANY PROFILES

A.T. SCHINDLER COMMUNICATION INC.

21 Antares Drive
Suite 101
Ottawa, Ontario
K2E 7T8

Contact: Mr. Andy Schindler
President
Tel: (613) 723-1103
Fax: (613) 722-3689

Background: A.T. Schindler Communications Inc., established in 1985, specializes in wireless LAN communications products. FiRLAN, its product line delivers full Ethernet and Token Ring bandwidth using a low power optical infrared signal in place of cabling. FiRLAN is designed for standards compatibility and can co-exist with today's wired LANs.

Capability/Products: FiRLAN can provide a wireless connection between the control and the robot. The wireless connection not only can provide a flexible communication link which allow teleoperation and full mobility of the robot.

It is also immune to EMI (electromagnetic interferences) and ground loop problems because it is a photonic link. The high throughout of FiRLAN products enable quality digital video transmission over the wireless link.

Niches/Achievements: For large manufacturing plant such as in the aviation industries, FiRLAN is the preferred choice because of its immunity to EMI and ground loop problems, and its ease of recognition. In harsh environment such as in chemical plants where cable corrosion is common, FiRLAN is the obvious solution. Where security is major concern, such as in the government and military applications. FiRLAN's line of sight capabilities can meet the most stringent security requirements.

Marketing Activities: Our current marketing activities include a massive direct mail and advertising campaign, participation in 12 to 15 trade shows in 1994. Our major objective is to recruit and support resellers globally.

Total Employees: 10 - 15

R&D Staff: 5
Plant Size: 150 square metres.

AASTRA CORPORATION

1685 Flint Road
North York, Ontario
M3J 2W8

Contact: Mr. Hugh Scholaert
VP, Business Development
Tel: (416) 736-7070
Fax: (416) 736-7178

Background: Design, build and install automated manufacturing systems, including vision guided robots and dedicated assembly and material handling equipment.

Capability/Products: Design and build dedicated or robotic assembly systems utilizing third party servo robots such as adept technologies or ATS standard pick and place robots with standard end effectors and custom designed tooling.

Niches/Achievements: In the industries indicated we assist our customers in simultaneous engineering studies to help design their products for assembly automation. Then conceptualize and build the automated manufacturing solution followed by documentation, and training service. All this designed to help our customers become globally competitive.

Marketing Activities: We currently advertise (limited) in trade magazines. Direct mail, trade shows, open houses.

Total Employees: 300
Plant Size: 30 square metres.

ACDS GRAPHIC SYSTEM INC.

80 Jean Proulx
Hull, Quebec
J8Z 1W2

Contact: Mr. Jean Guy Laplante
President
Tel: (819) 770-9631
Fax: (819) 770-9267

Background: ACDS develops "G.I.S." software and markets (sells) at the international level.

Capability/Products: Knowledge discovery in large databases, logic programming expert systems.

Niches/Achievements: Computer/Software.

Marketing Activities: We sell our GIS software and its tool kit to distributors (system integrators) at the national and international level.

Total Employees: 15
R&D Staff: 5

AGRA INDUSTRIES LIMITED

335 - 8th Avenue S.W.
Royal Bank Tower
Suite 1900
Calgary, Alberta
T2P 1C9

Contact: Mr. Bob Speed
Director, Corporate Development
Tel: (403) 263-9606
Fax: (403) 263-9676

Background: The company markets robotic technologies through its subsidiary, Vadeko AGRA Technologies Inc. A range of software technologies are marketed through its subsidiary, Monenco AGRA Inc. Robotics technologies have been developed for large applications like rail car painting and rocket preparation and lining. Smaller applications have been common. Software technologies relate to applications like radio frequency monitoring, materials scheduling and the digitization of drawings.

Capability/Products:
Robotics capabilities include: actuators, manipulators, end effectors, flexible joints/links, teleoperation, control systems, visual displays, interpretation of sensory data.

Software capabilities include: logic programming, visual displays.

Niches/Achievements: Robotics niches include: Aerospace and aviation, Chemical, Cleaning, Factory Automation, Space.

Software niches include: Computer software, Engineering, Energy, Government, Mining and Oil Extraction.

Marketing Activities: Robotics: The company is redirecting its efforts from large military type projects to smaller industrial applications where defence related technologies can be applied.

Software: The company markets to governments and industry. Industrial markets include mining, oil and gas, engineering firms, and manufacturers.

Total Employees: 5,500
R&D Staff: 100
Plant Size: 1,000 square metres.

ALGO DESIGN

3090, boul. Le Carrefour
Bureau 502
Laval, Quebec
H7T 2J7

Contact: Mr. Marcel Boridy
Director, Business Development
Tel: (514) 681-2584
Fax: (514) 681-2589

Background: Financial workflow re-engineering, Financial Products Development, Artificial Intelligence.

Capability/Products: All our activities are related to intelligent computation.

Niches/Achievements: Aerospace and Aviation, Defense/Military, Education, Energy, Environmental, Finance/Accounting, Government, Medical, Pharmaceutical Industries, Space, Utilities.

Marketing Activities: Increase penetration in Canada especially outside Quebec. Export US/Mexico.

Total Employees: 30
R&D Staff: 4

AMERICAN BUSINESS COMPUTER LTD.

4000 Steeles Avenue West
Suite 205
Woodbridge, Ontario
L4L 4V9

Contact: Mr. Dietmar Simanowski
General Manager
Tel: (416) 798-4999
Fax: (905) 856-5954

Background: Canadian Corporation started in 1987. Computer Software Development, specializing in Electronic Data Interchange, Shop Floor and Artificial Intelligence applications. The Canadian Corporation evolved from its U.S. namesake, which was founded in 1976.

Capability/Products: Control systems, logic programming, expert systems, knowledge representation, knowledge discovery, visual display.

Niches/Achievements: Automotive and other process and manufacturing industries, computer software, computer hardware, services, security.

Total Employees: 10
R&D Staff: 8

APPLIED AI SYSTEMS INC.

340 March Road
Suite 500
Kanata, Ontario
K2K 2E4

Contact: Mr. Takashi Gomi
President
Tel: (613) 592-3030
Fax: (613) 592-2333

Background: We provide intelligent robotics and autonomous systems, including the programming, testing and marketing of Subsumption Architecture Behaviour-based intelligent robots; and development of real world systems using fuzzy logic, neural networks and the real time AI approaches, including research, design, implementation and training. We are also a Canadian distributor of many leading AI system development tools.

Capability/Products: AAI develops and markets a line of Subsumption Architecture (SA) and other Behaviour-Based Artificial Intelligence robots to R&D organizations world-wide. It also conducts joint intelligent robot development projects with government departments and private corporations. Currently involved in R&D activities in the keyworded areas marked above.

Niches/Achievements: Over 40 intelligent prototypes have been sold during the last three years to major corporations, universities, research organizations, and individuals who are involved in developing robots to work in the areas marked.

Marketing Activities: The largest percentage of our business has been with Japan. We are increasing our marketing efforts in other parts of south east Asia (visits to Taiwan and Hong Kong) and Europe (attending CeBIT Trade Fair).

Total Employees: 15

APPLIED ROBOTICS INC.

112 Research Drive
Suite 212
Saskatoon, Saskatchewan
S7K 3L7

Contact: Mr. Terry Nelson
President
Tel: (306) 242-2776
Fax: (306) 242-9767

Background: Applied Robotics specializes in machine vision and robotic guidance systems. The company has been involved in the development of military unmanned vehicles such as the ANCAEUS system, the ROMMIDS system and the TRAPS system.

Capability/Products: We are involved in teleoperated control systems for autonomous systems, using visual sensing, motion sensing, range sensing and sensor integration. The systems utilize expert systems, neural networks, pattern recognition and fuzzy logic.

Niches/Achievements: Applied Robotics is applying robotic technology from the Defence/Military and Aerospace industries to the Agriculture and Mining industries.

Marketing Activities: We are currently marketing object recognition systems into Agriculture and robotic guidance solutions into mining.

Total Employees: 9
R&D Staff: 5
Plant Size: 200 square metres

ARRAY SYSTEMS COMPUTING INC.

401 Magnetic Drive
Suite 27
Downsview, Ontario
M3J 3H9

Contact: Mr. Robert Bruce
Manager, Business Development
Tel: (416) 736-0900
Fax: (416) 736-4715

Background: Array Systems Computing Inc. (ASC) is a privately owned firm, located in Toronto and Halifax. Array is a leader in advanced software development and systems integration for signal and image processing applications.

Capability/Products: Array is experienced in the processing and interpretation of various sensors including Radar, Infra- Red and X-ray. These applications are used in the teleoperation of autonomous control systems. ASC has also implemented pattern recognition algorithms using neural networks to classify various targets.

Niches/Achievements:
Security: X-ray image analysis system (carry-on luggage).
Aerospace: Airborne Synthetic Aperture Radar (SAR) system (Trisar).
Space: Ground-based Synthetic Aperture Radar (SAR) processor for satellites (Foot Scan).

Marketing Activities: ASC is focussing on international opportunities for its Trisar, Foot Scan and X-ray applications.

Total Employees: 50
R&D Staff: 35

ASSOCIATION OF CANADIAN COMMUNITY COLLEGES

1223 Michael Street N.
Suite 200
Ottawa, Ontario
K1J 7T2

Contact: Ms. Terry Anne Boyles
Vice President, National
Tel: (613) 746-2222
Fax: (613) 746-6721

Background: Custom designs and delivers training in 40 countries in technology including robotics, CAD/CAM and general knowledge based systems. Our 170 Colleges/ Cegeps/ Technical Institutes are Canada's largest training systems.

Capability/Products: Training in the development and maintenance.

Niches/Achievements: We access over 30,000 professional training staff in our member institutions. We support export sales of Canadian industry by providing training and technology transfer in the market environment.

Marketing Activities: We actively market our training services to IBRD, Inter America Bank, Asia Development Bank, CIDA and in 30 countries. We are Canada's largest national and international trainer.

Total Employees: 71/30,000
Plant Size: Head Office: 3,000 square metres.

ATLANTIC NUCLEAR SERVICES LTD.

P.O. Box 1268
Fredericton, New Brunswick
E3B 5C8

Contact: Mr. Keith Scott
President
Tel: (506) 458-9552

Fax: (506) 451-0525

Background: Atlantic Nuclear specializes in the engineering safety and mission critical systems. Through an active R&D program the latest computer technologies in parallel processing and intelligent computing are incorporated into commercial applications.

Capability/Products:
Robotics: Control Systems, teleoperation.
Machine Sensing: Sensor integration and interpretation of sensor data.
Human Machine Interface: Visual displays.
Intelligent Computation: Expert systems, neural networks, pattern recognition, machine learning, fuzzy logic.

Niches/Achievements: Atlantic Nuclear develops software for applications in nuclear engineering, aerospace, defense, medical and process industries.

Marketing Activities: Current priorities are the commercialization of three products that have been developed.

AVAT, a CASE tool for software quality engineering:
IRMAD - an integrated remote monitoring and diagnostic system ; and
PAW - a plant analysis workbench.

Total Employees: 27
R&D Staff: 4
Plant Size: 450 square metres.

ATOMIC ENERGY OF CANADA LIMITED (AECL)

Chalk River Laboratories
Chalk River, Ontario
K0J 1J0

Contact: Marc Robillard
Account Manager
Nuclear Products & Services
Tel: (613) 584-3311
Fax: (613) 584-4010

Background: AECL develops, designs and markets the CANDU nuclear power reactor worldwide, and manages contracts for both construction and servicing of these reactors. As part of the servicing expertise, AECL develops remote handling and automated inspection systems, including robotics and machine vision systems.

Capability/Products: AECL supplies autonomous mobile robots for remote handling, inspection, security and sampling. AECL provides specialty manipulators and end effector tooling for use in hazardous environments. Other technology areas include system modeling for robot diagnostics, automated fuel fabrication processes, visual displays for control room design, pattern recognition for machinery diagnostics, expert systems for process diagnostics, and neural networks for process modeling.

Achievements: AECL has several machine vision systems in the lighting industry to automatically inspect fluorescent lamps. AECL is currently under contract to develop an autonomous robot for use in hazardous environments.

Marketing Activities: The primary markets for AECL robotic systems and services are the nuclear power industry and nuclear waste handling. Secondary markets for these technologies are manufacturing and security.

Total Employees: 4,500
R&D Staff: 2,500

ATS AUTOMATION TOOLING SYSTEMS INC.

250 Royal Oak Road
Box 32100, Preston Centre
Cambridge, Ontario
N3H 5M2

Contact: Mr. Roger Awad
Director, Sales & Marketing, North America
Tel: (519) 653-6500
Fax: (519) 653-6533

Background: Design, build and install automated manufacturing systems, including vision guided robots and dedicated assembly and material handling equipment.

Capability/Products: Design and build dedicated or robotic assembly systems utilizing third party servo robots such as

adept technologies or ATS standard pick and place robots with standard end effectors and custom designed tooling.

Niches/Achievements: In the industries indicated we assist our customers in simultaneous engineering studies to help design their products for assembly automation. Then conceptualize and build the automated manufacturing solution followed by documentation, training service. All this designed to help our customers become globally competitive.

Marketing Activities: We currently advertise (limited) in trade magazines. Direct mail, trade shows, open houses.

Total Employees: 300
Plant Size: 30 square metres.

AUTODYNE INC.

992 Dillingham Road
Pickering, Ontario
L1W 1Z6

Contact: Mr. John Schneider
Sales Engineer
Tel: (905) 839-7121
Fax: (905) 420-6419

Background: Autodyne Inc. are designers and builders of custom manufacturing equipment, supplying the automotive, sheet metal and specialty industries through welding and assembly automation, robotics, material handling/loading/unloading and special purpose machinery. Our equipment varies between single station operations through multi-station/cell process equipment. Our proposals include conceptional layouts, production output, required operators and firm pricing.

Capability/Products: As custom manufacturers Autodyne integrate many items which are dependant on the application and our customers' specifications.

Robotics: actuators, manipulators/end effectors - Mig and resistance welding and adhesive applications.
Machine Sensing: vision systems, motion sensing, range, remote and sensor integration and interpretation.
Human Machine Interfaces: visual and tactile.

Intelligent Computations: logic programming, pattern recognition.

Niches/Achievements:
Automotive and Sheet Metal Industries: our scope includes - welding and assembly automation, non-synchronous/synchronous component assembly and tresting, integration of specialty process equipment. Our solutions include project management, engineering, system equipment, controls design, hardware build, programming, debug documentation and total post sale customer support.

Marketing Activities: In house sales team.

Total Employees: 24
R&D Staff: 3-4
Plant Size: 1,858 square metres.

AUTOMATED MINING SYSTEMS INC.

120 Bermondsey Road
Toronto, Ontario
M4A 1X6

Contact: Mr. Jack Purchase
Acting General Manager
Tel: (416) 750-6534
Fax: (416) 757-9221

Background: A joint venture between INCO and Ainsworth Technologies, AMS supplies robotic systems for underground mining.

Capability/Products: Teleoperation and Semi - Autonomous mining vehicles incorporating visual sensing, range sensing with sensor integration and providing operator feedback using 3D visual displays.

Niches/Achievements: Mining robotics and underground, communication systems based on our patented technology.

Marketing Activities: Active in Canada, Chile, Australia and Russia.

Total Employees: 80
R&D Staff: 20
Plant Size: 24,000 square feet.

AUTONETICS RESEARCH ASSOC. INC.

5317 Sooke Road
R.R. #1
Sooke, British Columbia
V0S 1N0

Contact: Dr. Kathleen Booth
CEO
Tel: (604) 642-5352

Background: Founded 1978. Pure research and techniques for oceanographic data analysis. Applications of neural nets to character and sound recognition, other applications to economic prediction and image analysis.

Capability/Products: We have worked in all of the above areas and have supplied output to government research and defence labs.

Niches/Achievements: We have offered courses to Universities and to government institutes. We produced (for NRC) a domestic energy controlling device which achieved 25% savings. We have developed a complete software package for medical and veterinary practices. We also produce software packages for marine mammal classification and identification.

Marketing Activities: We do not seek markets directly. Our reputation generates an adequate volume of work.

Total Employees: 6
R&D Staff: 4
Plant Size: 300

B.C. ADVANCED SYSTEMS INSTITUTE

1122 Mainland Street
Suite 450
Vancouver, British Columbia
V6B 5L1

Contact: Mr. Brent Sauder
Executive Director
Tel: (604) 689-0551
Fax: (604) 689-4198

Background: To foster the growth of the advanced technology industry in British Columbia through collaboration and interaction between industry and post secondary institutions including universities, colleges and institutes.

Capability/Products: ASI through its industrial affiliates and university fellows, are involved in Computer/Software, Electronic, Engineering, Information and Media, Photonics/Optics, Telecommunication/Telepresence.

Total Employees: 3

BEHAVIOURAL TEAM

21 Vaughan Road
Suite 202
Toronto, Ontario
M6G 2N2

Contact: Dr. Ben Barkow
President
Tel: (416) 656-6676
Fax: (416) 658-6878

Background: Applied Psychology, Human Factors and Ergonomics.

Capability/Products: Visual displays, virtual reality, natural language interfaces, speech interpretation, tactile interfaces, knowledge discovery in large databases, knowledge representation.

Niches/Achievements: Computer/Software, Computer/Hardware, Construction, Consumer/Home Use, Defense/Military, Devices for the Disabled, Education, Leisure and Hospitality, Medical, Office Automation, Telecommunication/Telepresence, Transportation, Utilities.

Marketing Activities: Human Computer Interaction, Ergonomics, Applied Psychology.

Total Employees: 6
R&D Staff: 5
Plant Size:500 square metres

BERCLAIN GROUP INC.

3175 Quatre-Bourgeois
Suite 100
Ste-Foy, Quebec
G1W 2K7

Contact: Mr. Louis Tetu
Vice President, Marketing
Tel: (418) 654-1454
Fax: (418) 654-0645

Background: Manufacturing synchronization software based on rule-based and simulation technologies; Manufacturing decision support systems. Scheduling and resource assignment systems; 6 offices worldwide, head-office in Canada.

Capability/Products: Decision support software, resource assignment and scheduling.

Niches/Achievements:
Current large customers: Motorola, John Deere, Alcan, Reynolds. Factory Automation.

Marketing Activities: Currently, marketing in manufacturing discrete and batch process industries.

Total Employees: 43
R&D Staff: 13

BOMBARDIER INC., CANADAIR, DEFENCE SYSTEMS DIVISION

10,000 Cargo A-4 Street
Montreal International Airport
Mirabel, Quebec
J7N 1H3

Contact: Mr. Gary T. Bingham
Director, Marketing & Sales
Tel: (514) 855-2013
Fax: (514) 855-2166

Background: The Defence Systems Division (DSD) of Bombardier Inc., Canadair provides total aircraft systems support services and related activities and is a world leader in the development, integration and production or unmanned airborne surveillance systems. Complementing DSD's strong engineering team are specialists in production, quality assurance, integrated logistics and logistics management.

Capability/Products:
Robotics: Control systems/Teleoperation
Machine Sensing: Remote sensing/ Sensor Integration

Human Machine Interfaces: Visual displays
Intelligent Computation: Logic programming (real time)
Systems Integration: Systems engineering, interface control management.

Niches/Achievements: Aerospace and Aviation; Defense/Military; Government; Services.

Marketing Activities: Current programs: Supporting DND aircraft in Canada (CF-18 SES), special mission versions of Bombardier aircraft (Challenger EST), CL-289 AND CL-227 surveillance systems, pilot training.
Other initiatives: Training systems, civil aviation support, aerial target towing, STEAR program participation.

Total Employees: 910
Plant Size: 29,000 square metres

BRANDT MANUFACTURING INC.

1040 Hargrieve Road
London, Ontario
N6E 1P5

Contact: Mr. Bryan Brandt
Plant Manager
Tel: (519) 681-6083
Fax: (519) 681-6083

Background: 15 years established at building automated equipment for assembly and testing, tooling, jigs, fixturing, fabrication and CNC work.

Capability/Products: actuators, manipulators, end effectors, logic programming.

Niches/Achievements: Building of Automated Machinery for: Siemens Automotive Ltd., Northern Telecom Ltd.

Marketing Activities: Increase our customer

base in the United States.

Total Employees: 12
R&D Staff: 2
Plant Size: 830

BRITISH COLUMBIA RESEARCH INC.

3650 Wesbrook Mall
Vancouver, British Columbia
V6S 2L2

Contact: Mr. James M. Dodds
Vice President, Operations
Tel: (604) 222-5527
Fax: (604) 224-4331

Capability/Products: British Columbia Research has in-house expertise in the specific application areas indicated beside each key word.

ROBOTICS:
actuators: hydraulics, pneumatics, electronics, stepper motors, solenoid valves; flexible links/joints: belts, rod ends, bearings; control systems: ADC, DAC, circuit boards, computers, feedback/feedforward elements.

MACHINE SENSING:
motion sensing: accelerometry; remote sensing: combustion, gas mixtures, temperature, humidity, pressure, velocity; sensor integration: control systems/algorithms, computers, software, hardware; interpretation of sensory data: software, computers.

HUMAN MACHINE INTERFACES:
visual displays: GUI's, oscilloscope, software, display consoles, control panels, signage conventions; tactile interfaces: switches, levers, buttons, strength requirements, reach, layout; knowledge discovery in large databases: data analysis, statistics, filtering.

INTELLIGENT COMPUTATION:
logic programming: custom software/control systems; expert systems; knowledge representation; pattern recognition: peak detection algorithms, electrocardiographic analysis, electromyographic analysis, waveform recognition.

Marketing Activities: Focused activities in three areas:
1. Environmental Science and Engineering.
2. Biotechnology.
3. Advanced Systems Engineering including Ergonomics and Human Factors.

Total Employees: 90
R&D Staff: 60
Plant Size:180,000 square metres.

BROCK UNIVERSITY

St. Catharines, Ontario
L2S 3A1

Contact: Dr. Jim Bradford
Chair
Tel: (905) 688-5550
Fax: (905) 688-3255

Background: University; undergraduate degree in computer science.

Capability/Products: Robotics course; Speech interpretation course and research; Logic programming; Neural networks; Machine learning; Expert systems.

Niches/Achievements:
Computer/Software (Research/Education).
Scientific/Technical (Research/Education).

Marketing Activities:
Teach undergraduate students (and a few MS's).
Faculty do individual research programs.

Total Employees: 10
R&D Staff: 7

CAE ELECTRONICS LIMITED

8585 Cote de Liesse
St. Laurent, Quebec
H4T 1G6

Contact: Mr. Terry Williams
Marketing Manager
Tel: (514) 341-6780
Fax: (514) 734-5617

Background: Flight Simulation for Commercial airlines and Military applications.

Real Time Computer Generated Imaging, Telerobotics and telepresence display equipment and the integrated control systems for autonomous and semi-autonomous operation of robotic devices, Supervisory Control and Data Acquisition (SCADA) Systems, Integrated Platform Management System (IPMS), and nuclear and fossil fuel power plant simulators.

Capability/Products: actuators, manipulators, teleoperation, control systems, autonomous systems, motion sensing, tactile sensing, active sensing, remote sensing, sensor integration, interpretation of sensory data, visual display, virtual reality, tactile interface, logic programming, expert systems, knowledge representation, pattern recognition.

Niches/Achievements: Aerospace and Aviation, Computer/Software, Computer/Hardware, Defense/Military, Education, Electrical, Electronic, Engineering, Energy, Information and Media, Marine Engineering, Medical, Mining and Oil Extraction, Natural Resource Industries, Photonics/ Optics, Space, Scientific/Technical, Telecommunication/Telepresence, Transportation, Utilities, Waste Handling.

Marketing Activities: In addition to our core product flight simulators, we are actively pursuing the sale of the telerobotic and telepresence equipment and the integrated control system designed to support multiple platforms. The direct application of this technology includes nuclear and hazardous waste handling, automated mining, maintenance of high voltage power distribution lines and unmanned vehicles for military use.

Total Employees: 3,400
R&D Staff: 1,700
Plant Size: 60,000 square metres.

CANADIAN INDUSTRIAL INNOVATION CENTRE

156 Columbia Street W.
Waterloo, Ontario
N2L 3L3

Contact: Mr. Gary K. Svoboda
Manager, Marketing Services
Tel: (519) 885-5870
Fax: (519) 885-5729

Background: We help to commercialize technological innovation. We provide technical assistance (engineering and product evaluation) market research; workshops, technology transfer database and books, tapes and software.

Capability/Products: Knowledge discovery in large databases.

Niches/Achievements: Have conducted consulting activities in Aerospace and Aviation, Agriculture, Computer/Software, Consumer/Home Use, Devices for the Disabled, Electronic, Energy, Environmental, Forestry, Government, Scientific/Technical, Services, Utilities.

Total Employees: 25
R&D Staff: 15

CANADIAN SPACE AGENCY

6767 route de l'Aeroport
St-Hubert, Quebec
J3Y 8Y9

Contact: Mr. Raymond Hui
Research Scientist
Tel: (514) 926-4679
Fax: (514) 926-4695

Background: The Canadian Space Agency is a government agency established in 1989 to conduct and promote peaceful use of space, research and development and programs and activities related to remote sensing communications and science.

Total Employees: 400
R&D Staff: 70

CANPOLAR INC.

1450 Lodestar Road
Unit 2
Toronto, Ontario
M3J 3C1

Contact: Mr. James R. Rossiter
President
Tel: (416) 635-5484
Fax: (416) 635-5353

Background: Research and development consulting, especially in the field of intelligent sensing systems for environmental and engineering applications. Particular expertise in ground penetrating reader and ice-related remote sensing.

Marketing Activities:
Commercialization (through spin-off companies) of Road Reader System and Ice Probe. Interest in new R&D venture, especially in information technologies.

Total Employees: 1
R&D Staff: 1

CARLETON UNIVERSITY

C.J. MacKenzie Bldg.
Room 235
Ottawa, Ontario
K1S 5B6

Contact: Prof. Jerry Z. Sasiadek
Professor/DSC
Tel: (613) 788-5698
Fax: (613) 788-5715

Background:
Research in Robotics.
Teaching Robotics Courses - Introduction to Robotics, Robotics.
Consulting on Robotics.

Capability/Products: All aspects listed under Robotics, Manipulator and Mobile Robots, sensor integration for robotic systems.

Niches/Achievements: Space, Aerospace and Aviation, Natural Resource Industries, Education.

Total Employees: 6000
R&D Staff: 600

CDL SYSTEMS

100 Discovery Place One
3553-31 Street N.W.
Calgary, Alberta
T2L 2K7

Contact: Mr. David Weiler
Real-Time Systems Manager
Tel: (403) 289-1733
Fax: (403) 282-1238

Background: CDL Systems, the real-time systems division of Combustion Dynamics Ltd., specializes in the monitoring and control of remotely operated vehicles and systems, and data acquisition and analysis consulting. CDL has developed vehicle control software for the Hewlett-Packard UNIX environment capable of controlling unmanned reconnaissance and target vehicles. The Vehicle Control Station consists of several operator interface panels providing vehicle status and position information, and allowing easy operator control of the vehicle. The primary features of the station are the scrolling map, which provides vehicle position information on a familiar map background, and the video imagery, which provides remote video camera images and controls.

Capability/Products: CDL Systems delivers software control systems to real-time systems requiring operator interaction, such as teleoperation of vehicles or sensor systems. The Vehicle Control Station integrates sensor information (infrared, video, ultraviolet, and others) to map information (terrain, forest cover, sea currents, etc.) in real time. CDL has experience in human-machine interfaces, integrating video images with status and position information, and system controls.

Niches/Achievements: Past achievements include the remote operation and real-time monitoring of military unmanned target vehicles, and remote operation of video sensor systems (camera control) aboard a Defence Research Establishment aircraft from the ground.

CDL Systems is currently developing a forest fire detection and monitoring system, based on its proven Vehicles Control Station technology, integrating real-time sensor interpretation, Geographical Information

Systems, and fire prediction capability based on real-time sensor data.

Industries worked in and hoping to enter: Aerospace and Aviation, Computer/Software, Computer/Hardware, Defence/Military, Environmental, Forestry, Government, Transportation and Telecommunication/Telepresence.

Potential applications of products/expertise: Defence/Reconnaissance, Environmental applications (remote sensing), Geographical Information Systems (GIS interface), Guidance Systems (autonomous operation/mission planning), Information Gathering (remote sensing, GIS interface), Mission Planning, Rescue Missions (mission planning, remote sensing).

Marketing Activities: Current marketing activities involve finding new applications for our Vehicle Control Station, which integrates vehicle position/map information/sensor information into usable forms for the operator. Areas of interest: forest fire mapping/modelling, environmental images (oil spills, hazardous material spill mapping) and Search and Rescue.

Total Employees: 18
R&D Staff: 12
Plant Size:
600 square feet (55 square metres)
2400 square feet (220 square metres)
2800 square feet (260 square metres)

CEMTECH

19 Fairmont Avenue
Ottawa, Ontario
K1Y 1X4

Contact: Dr. John de Mercado
Chairman & CEO
Tel: (613) 722-2222
Fax: (613) 722-6305

Background: CEMTECH, incorporated in January 1984, is wholly owned and managed. The Company consists of four Groups:

The CEMTECH Computer Group
The CEMTECH System Integration and Networks Group
The CEMTECH Secure Systems Group, and
The CEMTECH International Group

The corporate office is located in Ottawa with production and support facilities in Markham, Ontario.

Capability/Products: Our products have a well earned reputation for extremely high quality, reliability and the best price/performance in the industry.

The capacity and features of all CEMTECH's computer products are continuously being enhanced and updated with special emphasis on networking compatibility for systems integration.

CEMTECH is committed to the production of microcomputer, work station, file server and networking products which offer the highest level quality and reliability. Our highest priority remains to ensure customer satisfaction through the provision of timely service, and state of the art products at competitive prices. We will continue to achieve this by strict quality control procedures at the level of ISO9002.

We bring the same level of commitment to excellence to our system integration and network services.

Niches/Achievements: Our products are in use in numerous industries.

CENTRE DE RECHERCHE INFORMATIQUE DE MONTREAL (CRIM)

1801, avenue McGill College
Bureau 800
Montreal, Quebec
H3A 2N4

Contact: Ms. Monique Lefebvre
President & CEO
Tel: (514) 398-1234
Fax: (514) 398-1244

Background: CRIM is committed to high-level research and development in the field of advanced computer science technology. The Centro transfers this knowledge to users,

enabling them to increase their competitive advantage and improve their contribution to economic development.

Capability/Products: Teleoperation, control systems, autonomous systems, interpretation of sensory data, visual displays, virtual reality, natural language interfaces, speech interpretation, expert systems, knowledge representation, neural networks, fuzzy logic.

Niches/Achievements: CRIM is a technology transfer centre working to promote precompetitive and industrial research in applied computer science and software engineering by bringing together university expertise, industrial players, and CRIM's own scientific interpretation, software engineering, parallel architectures, computerized control of industrial processes and computer vision, teleinformatics and computer networking, and computer assisted training environments and user interfaces.

Marketing Activities: Helping industry and university, especially in Quebec, work together for the economic benefit of Quebec and Canada. Assist universities with graduate student funding and research opportunities.

Total Employees: 102
R&D Staff: 56

CENTRE FOR INFORMATION TECHNOLOGY INNOVATION (CITI)

1575 boul. Chomedey
Laval, Quebec
H7V 2X2

Contact: Ms. Helene Hains
Public Relations Officer

Tel: (514) 973-5733
Fax: (514) 973-5757

Background: CITI conducts advanced applied research in information technology. The research focuses on improving the performance of individuals and the competitiveness of organizations that work together across time and distance, through the digitization of their collaborative processes.

Capability/Products:
Our core competencies: Language Technologies, Anthropology of Technology, Content Technologies and Multimedia-Multimodal Person-Machine Interfaces.

Language Technologies: Used to solve cooperation problems by developing translation tools that help eliminate language barriers.

Content Technologies: Directed toward increasing the productivity of those who manipulate complex, widely distributed informational materials (neural networks).

MMPMI: CITI is in the position to find optimal ergonomics solution to problems faced by users requiring access to customized knowledge across time and distance.

Antheopology of technology.

Niches/Achievements: Our fields of activity: Electronic Advanced Manufacturing Commerce, Language Industry, Training Industry, Cultural Industry, Governmental Services.

We also conduct some projects in the environmental field in diverse applications such as a performance support systems which combines knowledge-based systems and hypermedia systems to develop a computerized decision support tools to help emergency response teams from the federal and provincial environment department cope with chemical or oil spills in St. Lawrence River.

Marketing Activities:
Organization of special events: open house, partners' day, etc.
Development of CITI's information documents: activity report, leaflet etc.
Presentation of CITI research results.
Development of new partnerships.

Total Employees: 160
R&D Staff: 135

CLC LIMITED

239 Champlain St.
Hull, Quebec
J8X 3R7

Contact: Mr. Victor Loewen
Computational Linguist
Tel: (819) 777-5779
Fax: (819) 777-0239

Background:
Focus: Computational Linguistics, Machine-translation of natural languages.
Experience: Development of automated terminology retrieval software, machine translation.
Capabilities & Services: Terminological database development, database research interface.

Capability/Products:
Product Name: Term Cruncher(TM), uses logic programming, based on a terminological expert system, accesses database.
New Project: Le Robot Pesant, logic programming, machine learning from text, knowledge retrieval and representation and inferencing, automated machine translation.

Niches/Achievements: Several industries may benefit from our technology, insofar as they have printed materials for human consumption that require translation into one or more languages.

Marketing Activities: Marketing Term Cruncher(TM) software to large-volume translation departments; R&D in machine translation; ongoing linguistic consultation; development of terminological databases upon request.

Total Employees: 2
R&D Staff: 2

COGENTEX INC.

5871 Dolbeau
Montreal, Quebec
H3S 2G1

Contact: Mr. Richard Kittredge
President
Tel: (514) 344-1774
Fax: (514) 344-1721

Background: CoGenTex was founded in Montreal in 1989 by Dr. Richard Kittredge, a professor of linguistics with more than twenty years' experience in machine translation, text generation and the linguistic description of technical sublanguages. The company soon demonstrated that its advanced language models enable computers to simultaneously generate English and French documents from on-line data, thus avoiding the need for either human or machine translation. Simultaneous generation requires only a few seconds and no human intervention to deliver bilingual text output summarizing the content of databases or knowledge bases. Our research and development staff has pioneered the computer implementation of Igor Mel'chuk's Meaning-Text language model in three languages (English, French and Russian).

CoGenTex is the world leader in the automatic synthesis of texts using artificial intelligence techniques. We have developed leading-edge technology enabling business and government organizations to produce accurate, maintainable and readable documents in one or more languages in the most cost-effective manner possible.

In 1990 CoGenTex founded an affiliate company in New York State, which has won contract with the U.S. government and industrial leaders. The companies are developing complementary technologies and working together to market a package of document generation products.

Niches/Achievements:
CoGenTex is a world leader in the automatic synthesis of texts using artificial intelligence techniques.

Developed the world's first commercial software for building text generators in a variety of application domains.

Developed the FoG weather forecast generator that is used daily at several forecasting centres.

Research: CoGenTex is carrying out software research and development in all aspects of text generation, including text planning, bilingual knowledge representation and computational models of English, French and

other natural languages. We are also actively developing related technologies used to link text generation to application areas, including expert systems, graphical user interfaces and speech synthesis.

With regards to the technology tree our research is as follows:

Software Development
- application tools for systems
- text generation
- development of computational models of natural languages.

Other
- expert systems work
- speech synthesis work

Total Employees: 6 (plus an equal number in U.S. office)
R&D Staff: 5
Plant Size: 100 square metres

COGNISYS CONSULTANTS INC.

3431 Drummond
Suite 400
Montreal, Quebec
H3G 1X6

Contact: Mr. Pierre Mychaltchouk
President
Tel: (514) 842-4443
Fax: (514) 842-1788

Background: COGNISYS is a firm specialized in software and expert systems development, and specifically in productivity software tools in knowledge acquisition and knowledge based transfer.

Capability/Products: Our company offers a wide range of products and services, including the following; visual display systems, expert systems and knowledge representation.

Total Employees: 7
R&D Staff: 4

COMDALE TECHNOLOGIES (CANADA) INC.

833 The Queensway
Toronto, Ontario
M8Z 5Z1

Contact: Mr. Wayne Thompson
Marketing Manager
Tel: (416) 252-2424]
Fax: (416) 252-9794

Background: Development of advanced software such as expert systems and neural networks for the industrial marketplace.

Capability/Products: Expert systems, fuzzy logic, neural networks for pattern classification.

Niches/Achievements: Factory Automation, Mining and Oil Extraction, Natural Resource Industries, Pharmaceutical Industries, Other Process and Manufacturing Industries, Utilities.

Total Employees: 25
R&D Staff: 10

COMPENGSERV LIMITED

19 Fairmont Avenue
Suite 300
Ottawa, Ontario
K1Y 1X4

Contact: Mr. James Bowen
Vice President
Tel: (613) 722-3008
Fax: (613) 722-5660

Background: Experience in software engineering, artificial intelligence and machine learning. Design and development of such systems for a wide variety of clients worldwide using proven methodologies to high quality standards.

Capability/Products: A wide variety of applications. Most note worthy being services in military, government, aerospace, aviation and space.

Total Employees: 20
R&D Staff: 10

Plant Size: 2,500 square metres

COMPUTING DEVICES CANADA LIMITED

3785 Richmond Road
Ottawa, Ontario
K1G 3M9

Contact: Ms. Ruth McMahon
Publicity Manager
Tel: (613) 596-7059
Fax: (613) 596-7396

Background: Computing Devices is one of Canada's most successful defence electronics companies. A key to this success is our focus on core technologies. We have unique expertise in: digital signal processing; C3 systems design and integration; secure, tactical communications; ballistics; high resolution digital displays and flat panel displays. In addition to extensive hardware and software development experience, Computing Devices Canada has proven expertise managing and integrating complex military electronics systems. We've developed sophisticated management tools to ensure our programs are delivered on time and on budget. And our world-class manufacturing facilities are particularly well-suited to producing systems that meet military specifications. We have the latest in through-hole and surface mount assembly, conformal coating, extensive environmental stress screening and TEMPEST test facilities. At Computing Devices we pride ourselves in being a Canadian leader in total quality management practices. We are continually scrutinizing all the company's procedures in an effort to improve the way we do business. Our proven performance gives customers peace of mind and value for money. Computing Devices is a Ceridian company.

Capability/Products: Direct and indirect fire control systems, vehicle electronics, reconnaissance vehicle surveillance systems, computerized laser sight for anti-tank weapons, tactical communications systems, headquarters information distribution systems, tactical voice and data distribution systems, acoustic signal processing, ASW mission systems, sonobuoy processors, active sonar systems, towed array sonar systems, tactical acoustic trainer, mil-spec electroluminescent displays, large multi-sensor displays, coastal intrusion detection systems, fibre-optic distribution systems, contract manufacturing.

Marketing Activities: Communications systems; ground systems for military vehicles; anti-submarine warfare systems; display systems.

Total Employees: 1,000
Plant Size:
425,000 square feet - Ottawa
110,000 square feet - Calgary.

CONTROL DIGITAL INC.

7240 Woodbine Avenue
Suite 208
Markham, Ontario
L3R 1A4

Contact: Mr. Brian Henson
President
Tel: (416) 756-2012
Fax: (416) 493-7523

Background: Industrial control and automation systems based on vision inspection technology. 11 years experience in automotive, food and drug industries. Also provide maintenance and trouble shooting service for robotics system at a major Toronto food manufacturer.

Capability/Products: Provide on line inspection of manufactured goods and verification of date and lot codes for drug manufacturers. Additionally, reject control systems, turnkey PLC based industrial control systems, diagnostics, maintenance and upgrade of existing control systems including robotic systems.

Niches/Achievements: Specialized knowledge of vision inspection and control systems for food processing and drug manufacturing.

Marketing Activities:
Specializing in drug label (font) verification and reject control systems using vision systems.
Industrial Automation and control, food manufacturing.

Robotic service and maintenance.

Total Employees: 3

CORTEX ENGINEERING INC.

342 Dewitt Road
Stoney Creek, Ontario
L8E 2T2

Contact: Mr. Charles Gower
P.Eng.
Tel: (905) 664-6680
Fax: (905) 664-1166

Background: Cortex Engineering Inc. is a Systems Integrator company with years of Electrical/Electronic, Automation experience in all major industry groups. Cortex has designed and built Industrial Control Systems for over 10 years.

Capability/Products: Cortex Engineering original strength is Electrical/Electronic Control Systems for all major industries. Specializing in Motion Control and Drives Applications, Cortex is an authorized Systems Integrator for Robot Manufacture, Drives Manufacture, logic controller companies. Extensive experience in Human Machine Interfaces.

Niches/Achievements: Designed and built custom Automation Control systems for factory floor automation. Included are Automotive industries, Paper and paper converting industries, Steel and Fabrication industries.

Marketing Activities: Promotion. Brochures and literature, joint sales efforts, target accounts presentations (domestic and international).

Total Employees: 6
R&D Staff: 2
Plant Size: 10,000 square metres.

CRIQ AUTOMATISATION

8475 ave. Christophe-Colomb
B.P. 2000, succursale Youville
Montreal, Quebec
H2P 2X1

Contact: Mr. André Bissonnette
Conseiller spécialisé
Tel: (514) 383-3215
Fax: (514) 383-3260

Background: Industrial research and development center; over 200 scientists, technicians and engineers. Automatic machinery developers, robotic cell integrators, technical trouble shooting, technical and economical feasibility studies in view of automation.

Capability/Products: Integrators of robotic cells plus: development of automatic machinery prototypes; brainstorming specialists; feasibility studies; machinery retrofitting and upgrading; manufacturing system developers.

Marketing Activities: We are actively prospecting Quebec based businesses.

Total Employees: 420
R&D Staff: 230
Plant Size: 60,000 square metres

CRS PLUS INC.

830 Harrington Court
Burlington, Ontario
L7N 3N4

Contact: Mr. Raymond Simmons
President
Tel: (905) 639-0086
Fax: (905) 639-4248

Capability/Products:
Robotics: manipulators, end effectors, control systems, autonomous systems.
Machine Sensing: visual sensing, motion sensing, sensor integration, interpretation of sensory data.
Human Machine Interfaces: visual displays, natural language interface, tactile interfaces.

Niches/Achievements: Aerospace and Aviation, Automotive, Biotechnology, Chemical, Defense/Military, Education, Energy, Environmental, Factory Automation, Food and Beverage, Fisheries, Government, Medical, Mining and Oil Extraction, Natural

Resource Industries, Pharmaceutical Industries, Space, Scientific/Technical, Waste Handling, Human Scale Robotics.

Marketing Activities: Exporting to 22 countries worldwide.

Total Employees: 35
R&D Staff: 7
Plant Size: 1200 square metres.

CYBERWORKS

31 Ontario Street
Orillia, Ontario
L3V 6H1

Contact: Mr. V. Burhanpurkar
President
Tel: (705) 325-6110
Fax: (705) 325-8566

Background: Cyberworks develops a wide range of intelligent systems including autonomous mobile robots, sensors, controls, custom robots and vision systems.

Capability/Products: Cyberworks' products and engineering capabilities include the fields of mobile robots, teleoperation, control systems, autonomous systems, visual sensing, motion sensing, range sensing, active sensing, sensor integration, interpretation of sensor data, virtual reality, logic programming, expert systems, pattern recognition, machine learning, and fuzzy logic.

Niches/Achievements: Cyberworks' technology has been applied to fields as diverse as cleaning, embedded computer design, consumer home products, defense/military products, devices for the disabled, custom engineering, environmental remediation, factory automation, forestry, mining, security, service industry, telecommunications, telepresence, and waste handling.

Marketing Activities: Cyberworks seeks strategic alliances, licenses, distributors, and marketing alliances in the above technologies and market sectors.

Total Employees: 10
R&D Staff: 8
Plant Size: 800 square metres

DERLAN AEROSPACE CANADA LTD.

180 Market Drive
Milton, Ontario
L9T 3H5

Contact: Mr. Bill Moffatt
Sales Representative
Tel: (519) 875-4000
Fax: (519) 875-4082

Background: Derland Aerospace is a subsidiary of Derlan Industries Limited, a Canadian public company with 22 operating subsidiaries in North America and Mexico. The company is a fully integrated end-to-end designer, engineer and manufacturer of high technology metal based products with a diversified customer, market and product base.

Derlan Aerospace Canada Limited is one of Canada's largest subcontractors of aerospace, defense and transportation components. In addition to Derlan's aerospace involvement, Derlan has utilized aerospace technology in the commercial market place to become a premier supplier of proprietary severe service process industry products.

Products include flight critical gears, rotor heads and dynamic flight components for helicopters, gearboxes for gas-turbine engines, ultra-precise components for space manipulators and satellite assemblies, complex ground support structures for spacecraft integration and structural airframe components for fixed wing aircraft.

Organized into 3 focused factories in Southern Ontario, Derlan Aerospace brings together specialized manufacturing capabilities to create a unique single business source for the design, engineering, manufacturing and testing of high precision metal products. Core competencies include state of the art program management services and systems, ISO 9000 quality standards and a experienced supplier management group. Manufacturing processes incorporate heat treatment, gear grinding, precision machining,

fabrication, special metal processing, non destructive testing, assembly and clean room facilities.

Derlan Aerospace Limited recognizes the importance of on-time delivery in the aerospace business due to the aggressive delivery schedules our customers must use to win business. Derlan Aerospace employees are strongly committed to completing all programs on time.

As a result of Derlan's new diversified capabilities, in August 1993, the company secured a contract with the world's most successful helicopter manufacturing company, Westland Helicopter. The contract with Westland is for the worldwide retrofit of the Lynx helicopter and has the potential for up to 380 rotor heads with a total value of approximately $90 million Canadian dollars.

Derlan Aerospace is under contract for the qualification pieces of the Boeing Dynamic Upgrade program for the CH46 helicopter which will be retrofitted into over 400 helicopters. In addition, Derlan Aerospace is successfully processing pyroware material for the Kaman SK26 Helicopters.

Capability/Products: Robotics: manipulators, end effectors, actuators, joints.

Niches/Achievements: Space, Aerospace and Aviation.

Marketing Activities: Develop business in the space market. Focus on new customers.

Total Employees: 300
Plant Size: 7500 square metres, 12,500 square metres.

DEWEY McMILLIN & ASSOCIATES LTD.

1741 Feltham Road
Suite 100
Victoria, British Columbia
V8N 2A4

Contact: Dr. J.M. Dewey
President
Tel: (604) 477-5849
Fax: (604) 477-7808

Background: The company was founded to facilitate the transfer of technology from the University of Victoria Shock Studies Laboratory. The Principals, J.M. Dewey and D.J. McMillin, respectively have 38 and 22 years experience in blast wave diagnostics and the development of expert systems for explosion hazard evaluation. The company and its principals have many years of experience in collaboration with agencies in Canada, U.S.A. and Europe.

Capability/Products: The company specializes in the use of high speed photogrammetres for visual sensing of shock and blast waves detailed analysis and interpretation of this sensory data, and uses this for the development of large databases. The databases are integrated into expert systems and knowledge representation networks, together with fuzzy logic for explosion hazard evaluation.

Niches/Achievements: Collaboration with defence/military and other government agencies in several countries for the development and application of photonics and optical methods for shock and blast wave diagnostics.

Development of computer software for the presentation of scientific and technical information about the properties of blast waves and explosion hazard evaluation.

Marketing Activities: We currently market and sell an expert system and intelligent database, called AirBlast, to provide detailed information about the physical properties of blast waves via a user-friendly interface. We undertake contracts with agencies in North America and Europe for high-speed photogrammetres blast wave diagnostics. We develop customized networked systems for explosion hazard evaluation.

Total Employees: 7
R&D Staff: 6
Plant Size: 100 square metres

DIFFRACTO

2835 Kew Drive
Windsor, Ontario
N8T 3B7

Contact: Dr. Omer Hageniers
President
Tel: (519) 945-6373
Fax: (519) 945-1467

Background: Design and build laser based and electro-optical sensors for measurement. Part location and surface quality inspection. 22 years of experience.

Capability/Products: Control systems, range sensing, visual sensing.

Niches/Achievements:
Non Destructive Inspection - Aerospace
Dimensional Measurement - Aerospace
Car Body Gauging - Automotive
Surface Quality Inspection - Automotive

Marketing Activities:
North American Automotive and Aerospace via direct sales people.
European Automotive via distribution.
Japan via partner and distribution
Korean Automotive via distribution

Total Employees: 27
R&D Staff: 6
Plant Size: 2000 square metres

DIPIX TECHNOLOGIES INC.

1051 Baxter Road
Ottawa, Ontario
K2C 3P1

Contact: Mr. R.G. Dixon
Sales Manager
Tel: (613) 596-4942
Fax: (613) 596-4914

Background: Since its inception in 1978, DIPIX's sound management, innovative products and continuing profitability have gained respect in the international marketplace. From its head office and manufacturing facilities in Ottawa, Canada, the company has established an international network for selling, servicing and supporting its customer base in over 25 countries.

Building on its expertise in applying digital image technology, DIPIX has concentrated on several product areas serving the vision market through its three division: Vision Products, Vision Instruments, Vision Systems.

Capability/Products: DIPIX Technologies Inc. is a leading supplier of digital imaging technology. The company designs and manufactures an innovative line of vision products, ranging from frame grabber and image-processing boards for PCs to large end-user systems solutions servicing various industries.

Niches/Achievements: The Vision Products Division sells high-performance imaging boards to OEMs and VARs in the fields of industrial inspection, machine vision, non-standard sensor interface and scientific imaging; the Vision Instruments Division sells its products to industries as diverse as flour milling and pharmaceutical; and the Vision Systems Division develops turnkey vision systems for selected industries such as security printing and baked goods industries.

Marketing Activities: DIPIX is focussing its efforts in the following areas:

1. Vision Products Division - OEM Accounts, non-standard camera suppliers, Machine vision equipment suppliers;

2. Vision Instruments Division - Scientific & Research labs for food and microbiological work, Flour Milling;

3. Vision Systems Division - machine vision systems for the baked goods industry.

Total Employees: 36
R&D Staff: 21
Plant Size: 15,000 square feet.

DYNAMIC CONTROL SYSTEMS

7088 Venture Street
Suite 205
Delta, British Columbia
V4G 1H5

Contact: Mr. Gordon Porter
Tel: (604) 940-0141
Fax: (604) 940-0793

Background: Design, manufacture and support long range, non-contact laser vision

sensors, single laser, multiple laser, variety of ranges available.

Capability/Products: Visual sensing, range sensing.

Niches/Achievements: Designed and patented multi point laser heads in conjunction with NRC for use in sawmill machinery.

Marketing Activities: Expanding our long range sensors line. Building a worldwide network of dealers and agents.

Total Employees: 14
R&D Staff: 4
Plant Size: 400 square metres

ESCHER-GRAD TECHNOLOGIES INC.

3172 Joseph Dubreuil
Lachine, Quebec
H8T 3H5

Contact: Mr. Najeeb Khalid
President
Tel: (514) 636-3195
Fax: (514) 636-5664

Background: Escher-Grad Technologies Inc. has been designing, manufacturing and distributing high quality, high resolution laser imaging systems since 1986. Technological leadership and a unique design approach have given Escher-Grad an important advantage in enabling them to secure several critical patents for such developments as their single beam red laser diode technology, which incorporates such advancements as glass encoders, DC servo motors and high speed air-bearing mirror motors, and light-proof film cartridges for automatic daylight operations.

Escher-Grad has a proven line including Laser Plotters and Image Setters ranging in format from 12" x 18" to 44" x 50". With a worldwide installed base covering more than 10 countries, Escher-Grad continues to serve both the printed circuit board and printing industries with state-of-the-art laser imaging devices.

Capability/Products: Escher-Grad's product line includes laser plotters and imagesetters ranging in format from 12" x 18" to 44" x 50". Escher-Grad has automated the handling of the photo sensitive materials used in these machines. These materials which include film, polyner plate material and laser speed metal plate, are extremely sensitive and require delicate handling. Once the media has been loaded into a cartridge there is no further manual intervention required until it is deposited in the outbin. The media is automatically removed from its cartridge and inserted into the imager. Once exposed, it is automatically removed and transported to either an in-line processor or holding cartridge. Additionally all machines are equipped with electronic sensors which monitor various internal components and activities and report on their status.

Niches/Achievements: Major industries serviced by Escher-Grad equipment are the Printed circuit board industry (PCB) and the printing industry. Industries which participate in the creation and manufacturing of Escher-Grad equipment are computer/software, computer/hardware, electronic, engineering materials, photonics/optics, other process and manufacturing industries, scientific/technical.

Marketing Activities: Trade Show participation; Press relations; Strengthen OEM relations; Sales training; Establish and strengthen strategic alliance partnerships; Develop and improve marketing collaterals.

Total Employees: 40
R&D Staff: 12
Plant Size: 1840 square metres

ENGINEERING SERVICES INC. (ESI)

5 Kings College Road
Toronto, Ontario
M5S 1A4

Contact: Dr. Ananth Seshan
Executive Vice-President
Tel: (416) 595-5519
Fax: (416) 595-9994

Background: The company conducts contractual research, development and consulting in the areas of robotics, automation and control systems. The

company is specialized in the development of low-cost customized robotic turnkey systems. The industrial sectors that have been served by the company thus far include aerospace, food processing, computer, defense, electrical, energy, environmental, medical, transportation, space, gas, tire etc. As a by-product of the contractual work performed in the past, the company has acquired intellectual property rights on several novel and advanced robotic technologies that have immense potential for commercialization. Currently, the company is seeking venture capital to exploit these opportunities.

Capability/Products: The company has an enormous range of products that include: ROBOTWINS: a dual-arm modular reconfigurable robotic system; ROBOJOINT: a self-contained modular robot joint with an actuator, transmission, torque sensor and interface electronics & software; ROBOTORQUE: a novel robotic joint torque sensor; ROBOCONTROL: a real time control software for robotic control, with simple-to-use graphic user interfaces; ANTI-G VALVE: a computer controlled valve for pressurizing Anti-G suits used by high speed aircraft pilots; WOOD-PECKER: a tree trimming robotic system; ROBOMASTER: a bilateral position/force hand controller for advanced teleoperation; ROBOWRIST: a three-degree-of-freedom spherical wrist; ROBOGRIP: a proportionally controlled robotic gripper; ROBOINTERFACE: a universal electronic and software interface between a robot and a computer.

Further, the company has acquired new technologies that are currently being developed into the following products: ROBOPORK: a robotic pork grading system; ROBOGAS: a robotic system for automatic sealing joints of gas pipes; ROBOTIRE: a robotic system for automatic inspection of tire casings; EHA: a novel Electro-Hydraulic Actuator with high torque/mass ratio; EMA: a novel Electro-Magnetic Actuator with superior performance characteristics; ROBOSECURITY: a robotic system for neutralizing bombs; ROBOVACUUMER: a miniature mobile robotic vacuuming system; ROBOWASTE: a robotic waste handling system.

Niches/Achievements: The company is focussed at special niches in the various target industries for low-cost, application oriented and highly flexible automated and robotic systems. By developing modular designs of hardware and software, the company has achieved the capability to provide industry-specific robotic systems (to any target industry) with practically no need for system adaptation. This has provided the company with a competitive edge over the currently available commercial robotic systems which are more or less general purpose and are quite costly to adapt to a specific industry's needs.

Some specific outstanding achievements of the company include the development of compact and high performance robot joints, highly dexerous end-effectors with integrated sensors, and high performance computational architectures. The company's claims to fame has been mainly due to its ability to relate to very different applications and industrial sectors using innovative and modular approaches.

The target industries that are served by the company are aerospace, automobile, food processing, waste management, telecommunication, defense, computer, tire, forestry, energy, nuclear, space, etc.

Marketing Activities: The company is aggressively promoting all the products developed by the company. The company's market entry strategy is product specific. In general, the company plans to enter the various target markets either by contracting out manufacturing or by means of licensing. At present, the company's top marketing priorities are RoboTwins, RoboJoints, Anti-G Valve, RoboPork, RoboTire, and Robogas.

Total Employees: 6
R&D Staff: 5
Plant Size: 120 square metres

EXPERT SOLUTIONS

8 Olympus Avenue
Toronto, Ontario
M6S 1K9

Contact: Dr. Peter Davies
Principal
Tel: (416) 769-5695
Fax: (416) 761-1805

Background: Expert Solutions has been developing AI applications and providing consulting services since February 1986. Focus has been on Expert Systems and Neural Networks. We have also developed and delivered seminars in both disciplines.

Capability/Products: Capabilities include neural networks, expert systems, pattern recognition, natural language interfaces and knowledge discovery in large databases.

Niches/Achievements: Developed neural networks in Finance, Process Control and Medical areas.
Developed seminar entitled "Applicants of Neural Networks in Finance and Investing.
Developed Expert Systems in Finance, Security, Accounting.

Marketing Activities: We are currently marketing our seminar "Applicants of Neural Networks in Finance and Investing . Our current priorities are further refinement of the seminar and the development of more and better financial applicants, in particular in the investment area.

Total Employees: 1
R&D Staff: 1

FERGUSON SIMEK CLARK

Box 1777
Yellowknife, N.W.T.
X1A 2P4

Contact: Mr. Garry Karst, P.Eng.
Partner
Tel: (403) 920-2882
Fax: (403) 920-4319

Background: GIS, Facility Planning/Mapping - Our Subsidiary company - GINN Systems Inc. #200, 11133 - 124 Street, Edmonton, Alberta, T5M 0J2 - does our software development.

Capability/Products:
Civil Engineering Software Programs
COGO - coordinate geometry
DTM - digital terrain modelling
GIS - geographic information systems
UMS - utility mapping AM/FM
ROAd - highway design

Niches/Achievements: Utilizing CADD in doing engineering; Cold weather engineering -'FSC'

Marketing Activities: International Marketing.

Total Employees: 50
R&D Staff: 13
Engineering Office Size: 800 square metres.

FOCAL TECHNOLOGIES INC.

40 Thornhill Drive
Unit 7
Dartmouth, Nova Scotia
B3B 1S1

Contact: Mr. Graham Smith
President
Tel: (902) 468-2263
Fax: (902) 468-2249

Background: Manufacturers of slip rings and fibre optic rotary joints used in robotic systems for handling cables/tethers, getting signals and power into/from rotating machinery etc. Eleven years in business. Steady growth, strong R&D, ISO 9000 quality.

Capability/Products: Rotary assemblies for handling electrical, fibre optic and/or fluid cables in robot tethers; telemetry including fibre optics; rotary indexing tables and other industrial rotational applications.

Niches/Achievements: Leading manufacturer of rotary products for ROV's (Remotely Operated Vehicles, i.e. underwater robots) in oil and gas, seismic defence and oceanographic industries. Especially important is our fibre optic technology. Also sell to bomb disposal robots and industrial rotary applications (rotating workstations etc.).

Marketing Activities: Maintain technological lead in marine markets (oil/gas , defence seismic research, oceanographic) with new products, mainly fibre optic rotary joints.

Enter new markets with rotary products (industrial automation, process control, robotics, material handling, cranes).

Total Employees: 32
R&D Staff: 8
Plant Size: 750 square metres

GALLIUM SOFTWARE INC.

303 Moodie Drive
Suite 4000
Nepean, Ontario
K2H 9R4

Contact: Mr. Robert Mimeault
Vice President, Operations
Tel: (613) 721-0902
Fax: (613) 721-1278

Capability/Products: Real time command and control display systems for air traffic control, intelligent vehicle highway systems, surveillance, and military command and control.

Niches/Achievements: H/W independent graphics based on industry standards in high performance applications.

Marketing Activities: Focusing on being industry leader for human computer interface in the air traffic control market, increase awareness and revenues in the military command and control market. Leverage surveillance contracts into new markets.

Total Employees: 50
R&D Staff: 28
Plant Size: 11,000 square feet.

GIFFELS ASSOCIATES LIMITED

30 International Blvd.
Toronto, Ontario
M9W 5P3

Contact: Mr. Jim Wilcox
Vice President
Tel: (416) 675-5950
Fax: (416) 675-4620

Background: Our expertise has developed from two sources
a) Giffels Industrial process design with its roots in the automotive industry, and
b) the Peterborough Robotics Centre and CAD/CAM Center of the former Ontario Centre for Advanced Manufacturing. Today we offer consulting services to analyse manufacturing operations, evaluate process needs, specify and select robotic systems, transfer lines, and integrated automated systems.

Capability/Products: We do not produce or sell components or equipment. Our production engineers have maintained their knowledge in manipulators, end effectors, control systems, visual displays and logic programming. We assist clients in evaluating and applying these technologies.

Niches/Achievements: We regularly undertake assignments in the automotive assembly, automotive parts, construction, engineering, energy, environmental, factory automation, food and beverage, pharmaceutical, general process and manufacturing industries, transportation and natural resource industries.

Marketing Activities: To promote our integrated range of strategic management planning, consulting engineering, and operations consulting services to the industrial community. We use technical seminars and articles to augment the high percentage of repeat business we receive. Giffels actively markets its services to industrial, commercial and government clients, primarily in Canada. Giffels is a single source supplier for consulting services, having all disciplines within the organization.

Total Employees: 230
R&D Staff: 1
Office Size: 50,000 square feet.

GUILDLINE INSTRUMENTS LTD.

P.O. Box 99
21 Gilroy Street
Smith Falls, Ontario
K7A 4S9

Contact: Mr. David Moat
Sales/Technical Support
Tel: (613) 283-3000
Fax: (613) 283-6082

Background: Guildline designs and

manufactures a broad range of electronic metrological instruments. These are sold in over 40 countries through a network of independent distributors.

Capability/Products: Precision electronic test and measurement equipment/instruments. Design and manufacture.

Niches/Achievements: Design, development, manufacturing of precision electronic test and measurement instrumentation, primarily for metrological applications.

Marketing Activities:
Development of established markets in Pacific Rim.
Launch of new markets in South-East Asia and Indian Sub-Continent.

Total Employees: 44
R&D Staff: 5
Plant Size: 1,500 square metres.

HEWLETT PACKARD CANADA LTD.

5150 Spectrum Way
Mississauga, Ontario
L4W 5G1

Contact: Mr. Rick Schwartz
Director, New Business Programs
Tel: (905) 206-3269
Fax: (905) 206-4126

Capability/Products: Supplier of workstations, servers and PCs - includes visual displays and expert system development tools.

Niches/Achievements: Aerospace and Aviation, Automotive, Chemical, Computer/Software, Computer/ Hardware, Electronic, Factory Automation, Government, Office Automation, Pharmaceutical Industries, Other Process and Manufacturing Industries, Telecommunication/Telepresence.

Total Employees: 1400
R&D Staff: 100

HUSKY INJECTION MOLDING SYSTEMS LTD.

560 Queen Street S.
Bolton, Ontario
L7E 5S5

Contact: Mr. James Rodrigues
Product Manager, Robotics Division
Tel: (905) 951-5124
Fax: (905) 857-8014

Background: Supplier of molds, hot runners, machines, robots and complete molding systems to the plastic injection molding industry.

Capability/Products: Husky's Robotic Division supplies robots and end effectors for injection molding machine unloading, loading, and press side post mold operations.

Niches/Achievements: Husky is the world's leading supplier of molding systems for PET beverage bottle preforms. These preforms are then stretch blown by other equipment into final bottles. Husky robots are a key element in the molding systems for preforms.

Marketing Activities: World wide through a network of direct Husky sales people with a few representatives in locations like Korea, Australia/New Zealand etc.

Total Employees: +1200
Plant Size: 27,000 (Robots)

HYDRO-QUEBEC

1800 Mtee Ste-Julie
Varennes, Quebec
J3X 1S1

Contact: Mr. Francois Bousquet
Chef de Service, Robotique
Tel: (514) 652-8340
Fax: (514) 652-8309

Background: Public electrical utility company. Research in Robotics and Computer Science.

Capability/Products:
Robotics: manipulators, teleoperation.
Machine Sensing: visual sensing.
Human Machine Interfaces: visual display.

Intelligent Computation: expert systems.

Niches/Achievements: Computer/Software, Electrical, Energy, Services, Utilities.

Total Employees: 600
R&D Staff: 200

HYMARC LIMITED

38 Auriga Drive
Nepean, Ontario
K2E 8A5

Contact: Mr. Forrest Livingstone
President
Tel: (613) 727-1584
Fax: (613) 727-0441

Background: HYMARC was founded in 1984 as an engineering consulting company. In 1986 the company developed a custom machine vision product for a client. Based on this experience and on further vision related activities, the company decided in 1988 to enter the machine vision market and developed the HYSCAN product line. The first units were in 1990.

HYMARC is continuing to develop hardware and software for the machine vision market and has new products under development.

HYMARC has sixteen employees. In the production of Hyscan, Hymarc carries out assembly and test, subcontracting parts manufacture to local companies. Sales were $1.2 million in 1993 and projected to double in 1994. Major customers are in the automotive and aerospace industries.

Capability/Products: Range sensing using triangulation.

Niches/Achievements: Hymarc sells its Hyscan Laser Digitizer to automotive and aerospace companies. A high speed video rate sensor has been developed for the Canadian Space Agency.

Marketing Activities:
Target Markets: Digitizing for reverse engineering and inspection is a requirement in a wide spectrum of industries. Hymarc has focused on the manufacturing sector, particularly automotive and aerospace.

Distribution Channels: Hymarc has distributors in the United States, Japan and Korea and is seeking representation in Europe.

Total Employees: 16
R&D Staff: 8
Plant Size: 4,000 square feet.

IBM TORONTO LABORATORY

844 Don Mills Road
North York, Ontario
M3C 1V7

Contact: Mr. Jacob Slonim
Head
Tel: (416) 448-2245
Fax: (416) 448-2859

Background: Part of Software Solutions for IBM Canada Ltd. specializing in Software Enabling Technology such as Databases, Compilers, Distributed Computing and Application Development.

Capability/Products: We sell OS/2, DB/2 and 6000 DB/2 to be used as base for others to develop applications in knowledge discovery.

Niches/Achievements: As a Software Company, our mission is to sell to a lot of organizations. Our mandate is to sell these products or solutions world-wide.

Total Employees: 1320
R&D Staff: 1200

ICAM TECHNOLOGIES CORPORATION

1900 Sources Blvd.
Pointe Claire, Quebec
H9R 4Z3

Contact: Mr. John Nassr Jr.
VP, Sales & Marketing
Tel: (514) 697-8033
Fax: (514) 697-8621

Background: ICAM Technologies Corporation

was founded in 1971, since then it has become a leading CAD/CAM software developer and supplier. Primarily a specialist in the NC post-processing field.

Capability/Products: ICAM Technologies is the developer of the leading NC post-processing product - CAM-Post which interfaces between all major CAD/CAM software and all NC machine tools with up to 14 axes of control. CAM-Post incorporates an expert system questionnaire which facilitates the generation of NC post-processors.

Niches/Achievements: ICAM Technologies Corporation's products are used in a wide variety of manufacturing plants from small job shops to the largest multi-national corporations in industries such as: Aerospace, Automotive, Military, Pharmaceutical, Telecommunication and Transportation.

Marketing Activities: ICAM Technologies Corporation specializes in developing, marketing and supporting its current line of NC post-processing products and services.

Total Employees: 30
R&D Staff: 10

IDON CORPORATION

326 Somerset St.W
Ottawa, Ontario
K2P 0J9

Contact: Mr. Herbert G. Bown
President & CEO
Tel: (613) 233-3040
Fax: (613) 233-7088

Background:
Geomatics/GIS.
Electronic Charts/Maps.
Electronic Course ware for Education/Training.
R&D Contracts and Consulting/Joint Ventures.

Capability/Products: Visual displays, natural language interfaces, knowledge discovery in large databases, expert systems, knowledge representation.

Niches/Achievements: Devices for the disabled, Electrical/Electronic Engineering, Computer Software, Defence/Military, Fisheries, Information and Media, Telecommunications/Telepresence, Scientific/Technical, Office Automation, Education.

Marketing Activities:
US/Europe/Asia.
Electronic course ware products/services.
Electronic Map/Charts R&D
Contracts/consulting.
International information leading standards.
Geomatics/GIS R&D.

Total Employees: 8
R&D Staff: 6

IMAGO MACHINE VISION INC.

1354 Wellington Street
Ottawa, Ontario
K1Y 3C3

Contact: Mr. Roy Ball
President
Tel: (613) 728-9831
Fax: (613) 728-0938

Background: Products and R&D in: Vision guided robotic assembly workcell, Video target, Vision based obstacle avoidance and navigation.

Capability/Products: We apply visual sensing including determination of motion range and object orientation to a range of robotic and target tracking applications.

Niches/Achievements: We make the only fully integrated, low cost, portable ground to air video tracker worldwide. Our robotics applications use natural features and do not rely on high contrast special targets. We offer low cost, real-time colour processing as an option. We work in the areas of Aerospace, Automotive, Defence and Security.

Marketing Activities: Most active in U.S.A. and Canada via trade shows and advertising. Have a European distributor and are looking for distribution for Pacific Rim.

Total Employees: 6
R&D Staff: 5
Plant Size: 300 square metres.

INDUSTRIAL CONTROL SOFTWARE INC.

777 Shetland Court
Oshawa, Ontario
L1J 7R3

Contact: Mr. Terry Ruddell
President
Tel: (905) 434-7977
Fax: (905) 434-2933

Background: ICS assists factories in the development of software and electrical equipment for automated processes. The company has extensive knowledge in all makes of programmable controllers, robots and machine tool equipment.

Capability/Products: ICS designs control systems to automate many different processes. Actuators, manipulators, end effectors, flexible links/joints, control systems, autonomous systems, visual sensing, motion sensing, tactile sensing, range sensing, active sensing, remote sensing, sensor integration, interpretation of sensory data, speech interpretation, tactile interfaces, knowledge discovery in large databases, logic programming, expert systems, knowledge representation, pattern recognition, machine learning, fuzzy logic.

Niches/Achievements: ICS has assisted companies and government agencies in almost every area of industry. We have done work throughout Canada, the U.S. and Mexico.

Marketing Activities: Presently spending time in leading edge process design in both the painting and chemical industries.

INFOMAGNETICS TECHNOLOGIES CORP.

1329 Niakwa Road East
Suite 11
Winnipeg, Manitoba
R2J 3T4

Contact: Dr. M. Barakat
President
Tel: (204) 989-4631
Fax: (204) 989-4640

Background: IMT has two Divisions - the Antenna and Applied Electromagnetics specializing in the development design and manufacture of noval antennas for special applications. The Information Systems Division specializes in the design, development, and integration of computer information systems using the latest software technologies and paradigms.

Total Employees: 13
R&D Staff: 8

INFORMATION TECHNOLOGY RESEARCH CENTRE

6 King's College Road
D.L. Pratt Bldg., Suite 286
Toronto, Ontario
M5S 1A1

Contact: Dr. Anne Tyrie
Director, Industry Support
Tel: (416) 978-7205
Fax: (416) 978-7207

Background: Information Technology R&D funding and knowledge transfer agency, Ontario centre of excellence.

Capability/Products: All areas of robotics. Specifically: Artificial intelligence and intelligent control; Fuzzy logic, neural nets, etc; Microelectronics; Software systems and graphics including knowledge representation, expert systems, nat. language etc; Communications and networks; Mathematics of computation.

Niches/Achievements: Telepresence: Joint Ontario and 4 motors of Europe. ATM: large research consortia for computer networks.

Knowledge base management systems. Text Management (Open Text Corp.). Software (Maple Software Inc., WATCOM, NIAL Systems etc.). (spin-off companies).

Marketing Activities: Industry relevant research; small to medium size company consortia for university based research.

Total Employees: Administration - 8, Researchers - 150, Graduate Students - 700, Universities of Toronto, Waterloo, Queens and Western CS and EE departments.

INSTRUMAR LIMITED

P.O. Box 13246, Station A
25 Pippy Place
St. John's, Nfld.
A1B 4A5

Contact: Mr. Robert Vivian
Executive Vice President
Tel: (709) 726-8460
Fax: (709) 726-8613

Background: Development of non-intrusive intelligent sensors for both ice formation and multi phase flow metering. Expertise in analytical modelling, simulation and path planning of robotic manipulators.

Capability/Products: Simulation and modelling of autonomous robotic manipulators for teleoperation using the path planning concept of local experts.

Modelling of planar and three dimensional, sever degree of freedom manipulators.

Application/design of tactile and close proximity sensors.

Niches/Achievements: Applications of Instrumar technology has been to the aerospace/aviation, space and offshore oil industries. Expansion into educational software, fisheries, marine and transportation is well within the scope of Instrumar's technical capability.

Marketing Activities: Priority is marketing and commercial sale of the INSTRUMAR CWDS ™ technology. Joint venture searchfor growth of multi phase flow capability. Marketing of simulation and modelling skills into offshore oil and gas programs.

Total Employees: 14
R&D Staff: 11
Plant Size: 8,800 square feet.

INTELLECTUAL PROPERTY & CONTRACTS OFFICE (UNIVERSITY OF ALBERTA)

University of Alberta
Edmonton, Alberta
T6G 2J9

Contact: Dr. James W. Murray
Director
Tel: (403) 492-9787
Fax: (403) 492-6446

Background: The Intellectual Property and Contracts Office of the University of Alberta expedites the transfer of intellectual properties developed at the university to industry and government establishments. The office also handles contracts research and licensing of university technologies.

Capability/Products: The university has a wide variety of research programs in robotics and artificial intelligence.

Niches/Achievements: Agriculture, Automotive, Biotechnology, Chemical, Computer/ Software, Computer/Hardware, Construction, Devices for the Disabled, Education, Electrical, Electronic, Engineering, Energy, Environmental, Finance/Accounting, Food and Beverage, Forestry, Government, Products, Information and Media, Medical, Mining and Oil Extraction, Materials, Natural Resource Industries, Pharmaceutical Industries, Photonics/Optics, Scientific/ Technical, Telecommunications/Telepresence.

Marketing Activities: The University of Alberta is a major Canadian university with an academic staff of 2,100 and a full-time winter-session student body of 24,000. In 1992/93, the university contracted $81 million in research through grants and contracts. The university has 20 spin-off companies which were established as a result

of research at the university.

The Intellectual Property and Contracts Office provides a service for moving information, technologies and inventions from the university to industry and government. An organization involved with the university in technology transfer can undertake contract research, license inventions and computer programs, use the service of specialized research centres and work with university spin-off companies.

INTERNATIONAL NEURAL MACHINES INC.

96 Rankin Street
Waterloo, Ontario
N2V 1V9

Contact: Mr. Oleg Feldgajer
President
Tel: (519) 746-3890
Fax: (519) 746-3840

Background: Low-cost/high performance pattern recognition software and hardware based on neural networks, genetic algorithms and fuzzy logic.

Marketing Activities: OEMs, specializing in optical character recognition (document management systems), speech synthesis, diagnosis, monitoring, prediction, fax servers, fraud detection and sensory data analysis.

Total Employees: 10
R&D Staff: 10
Plant Size: 1500 square inch.

INTERNATIONAL SUBMARINE ENGINEERING LTD.

34 Broadway Street
Port Coquitlam, British Columbia
V3C 2M8

Contact: Mr. Owen Williams
Project Manager
Tel: (604) 942-5223
Fax: (604) 942-7577

Background:
Land Robotics: Hazardous waste, service industry robotics, aircraft refuelling.
Marine Robotics: Mine countermeasures, oceanography, drilling support, salvage.
Space Robotics: Testbeds, ground control, aeronaut training.
Control System: Industrial process control, machine monitoring.

Capability/Products: Actuators, manipulators, end-effectors, teleoperation, control systems, autonomous systems, visual sensing, motion sensing, tactile sensing, range sensing, active sensing, remote sensing, sensor integration, interpretation of sensory data, visual displays, virtual reality, tactile interfaces, expert systems, pattern recognition, robotic submarines, autonomous underwater vehicles.

Niches/Achievements: Aerospace and Aviation, Automotive, Cleaning, Computer/Software, Computer/ Hardware, Defense/Military, Devices for the Disabled, Electrical, Electronic, Engineering, Energy, Environmental, Factory Automation, Marine Engineering, Mining and Oil Extraction, Space, Telecommunication/Telepresence, Waste Handling.

Marketing Activities:
Land Robotics: Hazardous waste, service industry robotics, aircraft refuelling.
Marine Robotics: Mine countermeasures, oceanography, drilling support, salvage.
Space Robotics: Testbeds, ground control, astronaut training.
Control Systems: Industrial process control, machine monitoring.

Total Employees: 75
R&D Staff: 40
Plant Size: 36,000 square feet.

IRCO AUTOMATION INC.

P.O. Box 1270
Brantford, Ontario
N3T 5T3

Contact: Mr. Dan Moore
General Manager
Tel: (519) 759-5730
Fax: (519) 759-5733

Capability/Products: Robotics positioning devices, tooling, fixturing, software development.

Designer and manufacturer of a full range of Weld Positioning Machinery, Dedicated Automated Systems, Robotic Systems, Jigs and Fixturing.

Typical Users:
Petrochemical industry Gas and Oil; Hot Water Tanks, Transformer Tanks, Lamp Poles; Locomotive Engine and Traction Motor repair; Railroad cars, Bolsters and Rail Car Manufacturing; Loader Buckets and Shovels Hard Surfacing and Weld Overlay; Highway Trailers and Tractors
Offroad Vehicles of All Types; Propane, Gasoline and Air Receiver Tanks
Bridge Girders and Structures; Prefabricated Buildings Agriculture Products of all types; Automotive Exhaust Systems Automotive Stamping , i.e. Chassis, Bumpers, etc; Power Generating Plants, Gas, Oil, Coal and Water; Any product that has to be welded has need for our products.

Robotic Systems and Solutions:
Weight lifting equipment; Repair of components for aircraft engines
Snow blowers; Maintenance repairs; Off road vehicles; Railcar components i.e. Bolsters; Metal furniture; Child's metal safety gate; Suspension systems of highway trailers; Feet for high tension electrical towers; Bearing supports - automotive; Torsion bars - automotive; Exhaust pipe systems - automotive; Mufflers - automotive; Automotive stampings - various; Office furniture
Agricultural components; Gas barbecues; Weld overlay - diesel engines and traction motor; Machine load and unload; Pick and place systems; Fireplace inserts and stoves

Niches/Achievements: Agriculture, Automotive, Factory Automation, Mining and Oil Extraction, Office Automation, Transportation, Waste Handling.

Export to: U.S.A., Mexico, China, North Africa, France, UK, Korea.

Total Employees: 15
R&D Staff: 2
Plant Size: 10,000 square metres

KINETIC SCIENCES INC.

6620 N.W. Marine Drive
Vancouver, British Columbia
V6T 1Z4

Contact: Mr. Guy Immega
President
Tel: (604) 822-5782
Fax: (604) 822-6188

Background: KSI specializes in advanced robotics and automation sensors, controls, and manipulators. KSI sells the Eagle Eye marker tracking vision system, Vision Skin proximity sensor, Tentacle Manipulator, and Autonomous Robotics control systems.

Capability/Products: Artificial muscle manipulators: Tentacle Robot (extend, contract, bend in two regions); Teleoperation: tentacle inverse kinematics; ground control autonomous systems: space station; radioactive waste inspect visual/motion sensing: Eagle Eye Vision System-marker ID and track range sensing: Vision Skin- close range imaging and proximity.

Niches/Achievements: Space: autonomous robots for space station. Environmental: automated inspection of nuclear waste. Products: 1) Eagle Eye Vision System-marker ID and track 2) Tentacle Robot-high strength, extend and bend 3) Vision Skin-fingertips which "see", measure range.

Marketing Activities: Current marketing activities are focused on U.S. DOE (Department of Energy) environmental clean-up (Hanford) using KSI sensors and robotics. KSI has just won a large contract with Lockheed to develop robotic inspectin of stored nuclear waste (based on Eagle Eye Vision System).

Total Employees: 6
R&D Staff: 4
Plant Size: 380 square metres

KLASTEK LIMITED

3 Scholfield Avenue
Toronto, Ontario
M4W 2Y2

Contact: Dr. Ron McCullough
President
Tel: (416) 927-7318
Fax: (416) 927-7318

Background: 20 years of involvement with AI and Robotics including Canadarm, Precarn and CIAR.

Capability/Products: Application and integration of all the above into public and private strategies.

Services: Science and Technology strategy and policy consulting for public and private sector clients.

Total Employees: 1

KNOWLEDGE TRANSFER

P.O. Box 314
Station A
Ottawa, Ontario
K1A 6A0

Contact: Ms. Kay James
President
Tel: (613) 741-0330
Fax: (613) 748-9650

Background: Provides support services for knowledge-based system development projects; knowledge acquisition, interface design, cognitive modelling and formal verification.

Capability/Products:
Knowledge based system development.
Feasibility studies, prototyping.
Systems and user needs analysis.
Human machine interface development.
Knowledge acquisition and representation.
Testing and verification of knowledge-based systems.

Niches/Achievements:
Experienced in these fields:
Construction industry (building codes).
Aviation and Airspace control.
Documentation standards, including SGML.
Manufacturing; medical cost containment; psychometrics.

Total Employees: 1

LASER FIBER OPTICS CANADA LTD.

30 Concourse Gate
Unit 40
Nepean, Ontario
K2E 7V7

Contact: Mr. Darshan Kant
President
Tel: (613) 723-7497
Fax: (613) 723-7794

Background: Laser Fiber Optics Canada Ltd. has been serving the Canadian communications industry for 15 years by designing, installing, and servicing, laser, fiber optic and wireless communication systems.

Capability/Products: Laser Fiber Optics Canada Ltd. is able to provide high speed wireless communication links for robotic teleoperation. Full audio and video information can be reliably transmitted in real time without the need of a restrictive umbilical cord. A wide variety of transmission protocols are available and can be custom designed for specific applications.

Niches/Achievements: Laser Fiber Optics Ltd. has long been an initiator in communication systems in Canada. We provided the first fiber optic systems to the Department of National Defence in 1980. We have provided mission critical fiber optic systems to Hydro Quebec, Manitoba Hydro, Nova Scotia Power and SaskTel. We have also integrated proximity sensors into robotic systems of MacDonald Douglas and Ford.

Marketing Activities: We are currently diversifying into wireless line of sight and spread spectrum communication systems. This will provide robotic applications with high-speed control and feedback interfaces.

Total Employees: 7
Plant Size: 1000 square metres.

LIBURDI ENGINEERING LIMITED

400 Highway 6 North
Hamilton, Ontario
L9J 1E7

Contact: Mr. Lloyd Cooke

Director, Operations
Tel: (905) 689-0734
Fax: (905) 689-0739

Background: Develop, design and manufacture automated welding systems and precision/welding power supplies for the aerospace industry. Computer based Vision Measurement and Robotic Welding Systems used in repair of superalloy gas turbine engine components. Also provide engineering consulting and advanced materials coating and processing services to the industry.

Capability/Products:
Design and integrate precision robotic system and end effectors for automated welding. Design and manufacture advanced Vision measurement systems. Software design group specializing in application programming and user interface, custom machine operator programming languages and Vision recognition algorithms.

Niches/Achievements: Recognized as industry leader in automated welding systems for superalloy materials used in aerospace. International customer list operating Liburdi equipment for jet engine refurbishment includes European and U.S. major airlines and U.S. military bases. Advanced Vision Systems use specialized computer software and are integrated into automated manufacturing equipment for welding and machining.

Marketing Activities: Marketing Automated Welding Systems (Robotics, Vision and Weld Power Supplies) to:

Gas turbine industry (engine manufacturers, airline repair centers, component repair shops, military repair depots).

Aerospace applications for superalloy welding of air frames, space and missile components.

Total Employees: 40
R&D Staff: 13
Plant Size: 2,500 and 500 square metres.

MACDONALD DETTWILER & ASSOC. LTD.

13800 Commerce Parkway
Richmond, British Columbia
V6V 2J3

Contact: Mr. Paul Gorton
Manager, R&D
Tel: (604) 278-3411
Fax: (604) 278-1285

Background: MacDonald Dettwiler builds computer systems in the areas of remote sensing, earth observation, aviation, space and defence.

Capability/Products: Computer systems/software design.

Niches/Achievements:
computer system design for geo-information, aviation management, and space/defence industries noted above. Outstanding Groundstation systems, aeronautical information systems, marine coastal defence system.

Marketing Activities: Markets include Asia, Europe, South America, Australia, North America. Concentration is on competitive pricing, consistent product quality, a worldwide reputation for successful installations and support behind installed systems.

Total Employees: 900
R&D Staff: 80
Plant Size: 180,000

MACHINA SAPIENS INC.

3290 Lacombe Avenue
Montreal, Quebec
H3T 1L7

Contact: Mr. Claude Coulombe
Vice President
Tel: (514) 733-1095
Fax: (514) 733-2774

Background: Machina Sapiens Inc. is a software development firm with a strong specialization in knowledge-based technologies, simulation, artificial intelligence,

natural language processing, robotics and software engineering.
Machina Sapiens Inc. has developed some commercial software products: coursewares, object oriented programming tools and french grammar checker. Machina Sapiens Inc. provides custom A.I. applications to private and governmental clients. The company won: Best Software Design award in 1986, attributed by Quebec's professional DP association (F.I.Q.), 1988 "MICA" award for research excellence by CIEQ (Conseil de l'industrie Electronique du Quebec), Best Software award from the Quebec Minister of Higher Education and Science in 1991 and the 1993 "OCTAS" award for technology by F.I.Q.

Capability/Products: The services offered include the development of knowledge-based systems, CASE tools and programming tools, natural language applications, high-level user-interfaces, robotics software, and the elaboration of tutorial-based interactive videodisk, and multimedia training systems. Machina Sapiens has developed expertise in object-oriented programming, as well as advanced work with Lisp, Prolog, Smalltalk and C++ on Apple MacIntosh, DOS, PC, Windows PC and Unix workstations.

Niches/Achievements: Machina Sapiens Inc. provides custom A.I. applications to private and governmental clients such as Department of National Defence (Combats Simulation, Defense/Military), Quebec and Ontario Education Ministries (Intelligent tutoring systems, multimedia training systems, Education), Levesque Beaubien (Expert system, Finance/Accounting), DMR Group (Natural language processing, Medical), IST Group (Natural language processing, Medical), Noranda Mines (Expert system, Mining and Oil Extraction), Positron (Man-machines interfaces, Telecommunication), RONA Group (Expert system, Office Automation, Finance/Accounting), Rotisseries St-Hubert (Expert system, Office Automation, Finance/Accounting), Videotron (Multimedia, Telecommunication) and the Canadian Space Agency (Robotics, Space).

Marketing Activities: Machina Sapiens Inc. has marketed seven commercial softwares in Quebec and Canada. Our French grammatical checker (Correcteur 101) is distributed in Europe by SOFTMART (23, rue de Clichy, 93584 Saint-Ouen Cedex, France, Tel: 33-1-49-45-25-25, Fax: 33-1-40-10-96-32). Our courseware products are sold in Europe by the publisher Edusoft (132, boulevard Camelinat, 92247 Malakoff Cedex, France, Tel: 33-1-46-73-05-55, Fax: 33-1-46-73-05-65). The company is seeking representatives for Europe, North America (Canada, U.S.A.) and Asia (Japan).
Collaborative Arrangements Sought: distributors or publishers for french grammar checker in the office market, distributors for object oriented programming tools, distributors of training and hypermedia products, value added distributors of robotics products, companies or research center interested in developing advanced robotics systems, companies requiring technical assistance in AI.

Total Employees: 25
R&D Staff: 18
Plant Size: 400 square metres.

MPB TECHNOLOGIES INC.

151 Hymus Blvd.
Pointe-Claire, Quebec
H9R 1E9

Contact: Mr. Marc Olivier
Director, Telerobotics
Tel: (514) 694-6751
Fax: (514) 695-7492

Background: MPB Technologies Inc. (MPBT) undertakes research and development in robotics, nuclear fusion, lasers, electro-optics, space systems, communications and electromagnetics. The personnel of MPBT consists of a unique combination of physicists, electronic and mechanical engineers, and technical staff, backed by experienced, efficient project management.

Capability/Products: The Telerobotics Division of MPB Technologies Inc. is carrying out an R&D program in advanced telerobotics technology. It aims at developing three telerobotic systems. In Micro-Robotics, the Micro-Fabrication Robot will allow teleoperation of microscopic objects, making use of flexible links. The Macro-Robot will enable an operator to handle dangerous objects, such as live transmission lines, in safety; it will incorporate tactile sensing and

range sensing. The Research Robot permits investigation into high accuracy, high speed manipulators, based on a new type of direct drive actuator. All systems will eventually incorporate visual displays and tactile interfaces to give the operator a greater sense of virtual reality in controlling the robot.

Niches/Achievements: The development of the robotic systems incorporates specialized computer software which is being developed to allow realtime control of the devices. Applications of the micro-robot are foreseen in the medical and electronics fields. The macro-robot is designed with liveline electrical maintenance in mind, although dangerous activities in construction, cleaning and chemical and environmental areas could be carried out. The Research Robot may find application in the area of factory automation, due to its high speed. The company has based its activities in a wide range of fields, including defence, nuclear energy, space and undersea telecommunications. Robotic applications will be sought out in these areas.

Marketing Activities: Marketing is being carried out in conjunction with each of the six divisions of the company. In robotics, RFP's have been answered in the Canadian Space Program, and work is now being undertaken in advanced hand controller design within one of these programs. Potential customers are being contacted in various application areas, with a view to setting up the laboratory to demonstrate different applications, from man-sized to micro. Workshops to sensitise the community to the Telerobotics Development Systems (TDS) project will be carried out annually under the auspices of PRECARN Associates, along with presentations at the annual PRECARN/IRIS Conference.

Total Employees: Approximately 200
R&D Staff: 110 (30% with Ph.D's)
Plant Size: 7,000 square metres, 3,000 square metres.
Other: 500

MPR TELTECH LTD.

8999 Nelson Way
Burnaby, British Columbia
V5A 4B5

Contact: Mr. Jerome Gessaroli
Marketing Manager
Tel: (604) 293-5429
Fax: (604) 293-5787

Background: MPR Teltech is a high technology company providing a variety of leading edge telecommunications products and services to both domestic and international customers. With a staff of 600, MPR Teltech maintains a broad technology base that includes digital network products, knowledge-based systems, satellite communications, broadband, ISDN, intelligent software solutions, and customer care systems.

Capability/Products: MPR Teltech has developed a portfolio of products for use by telecommunication service providers and product manufacturers. Its telemarketing account management, long distance toll optimizer, data services advisor and various pricing software systems use a number of technologies including expert systems, logic programming, knowledge representation, graphical user interfaces, usability engineering, etc. Other programs undertaken utilize machine learning and knowledge discovery in large databases.

Niches/Achievements: MPR Teltech's Intelligent Systems group has extensive experience in the design, and deployment of knowledge-based systems in the telecommunications sector. The group can also apply its technology base to other sectors such as: aerospace, education, electronics, government, information and media, office automation, services, transportation, and utilities.

Marketing Activities: MPR Teltech's Intelligent Systems group directly markets its portfolio of telecommunication sales tools, advisors, and productivity tools to end-users in Canada and the U.S.A. The group also pursues project work in new product areas. The Intelligent Systems group's primary focus is within North America. However, any commercially viable opportunity or strategic partnership outside of North America identified would be closely evaluated and considered.

Interested in Trade Fairs, Incoming Missions, Canadian Exhibitions, Outgoing Missions. Would like to receive information on any such

events in which the federal government is active. MPR Teltech would gladly review such potential events to determine our interest in participation.

Total Employees: 680
R&D Staff: 480

MSR INC.

1386 Manotick Station Road
Manotick, Ontario
K4M 1B2

Contact: Ms. Alice Bunt
President
Tel: (613) 821-3632
Fax: (613) 821-3054

Background: The principles of the company have over 20 years experience in CAD/CAM. Computerized Manufacturing and Manufacturing Engineering. Provide solutions for Mechanical CAD, Robot Programming and Manufacturing Management.

Capability/Products: Provide computer based solutions for mechanical design and computer aided and controlled manufacturing including manufacturing management, cost control and scheduling.

Niches/Achievements: Develop and provide software solutions for design of Aerospace, Automotive and Electronic Mechanical Components. Develop manufacturing management and control for small manufacturers.

Marketing Activities: Direct contract with mechanical designers and engineers for CAM solutions and with manufacturing engineers for CAM and manufacturing management solutions. Use trade magazines for visibility by advertising.

Total Employees: 5
R&D Staff: 3
Plant Size: 500 square metres.

MVS MODULAR VISION SYSTEMS INC.

3195 de Miniac
Montreal, Quebec
H4S 1S9

Contact: Mr. Peter Walker
VP, Sales & Marketing
Tel: (514) 333-0140
Fax: (514) 333-8636

Background: Robotic Sensor - 60 images per second.

Capability/Products:
Robotics: End effectors, control systems, cartesian robots autonomous system.
Machine Sensing: Range sensing, sensor integration, interpretation of sensory data.
Intelligent Computations: Expert systems, neural nets, fuzzy logic.

Niches/Achievements: Aerospace, automotive, factory automation, semiconductor, welding, robotics.

Marketing Activities:
Welding - general manufacturing, aerospace.
Semiconductor - inspection.
Machine vision - quality control.

Total Employees: 30
R&D Staff: 18
Plant Size: 800 square metres

NATIONAL DEFENCE-CHIEF OF RESEARCH & DEVELOPMENT- R&D OPERATIONS (CRAD)

305 Rideau Street
Ottawa, Ontario
K1A 0K2

Contact: Col. Conrad Mialkowski
Director General, R&D Operations
Tel: (613) 992-5776
Fax: (613) 996-5177

Background: Military R&D in 15 defence related technologies. CRAD Headquarters, in particular DGRD Operation, sponsors a wide variety of robotics and knowledge-based systems activities in support of the needs of

the Canadian Forces. Specific projects change frequently in response to current requirements. DGRD operations manages and coordinates the activities in consort with the six Defence Research Establishments (DREP-Defence Research Establishment Pacific; DRES-Defence Research Establishment Suffield; DCIEM-Defence and Civilian Institute of Environmental Medicine; DREO-Defence Research Establishment Ottawa; DREV-Defence Research Establishment Val Cartier; DREA-Defence Research Establishment Atlantic) and Canadian industry. For further information on specific projects contact:
DGRD Operations
Tel: (613) 992-5947
Fax: (613) 996-0038

For licensing of DND-owned intellectual property contact:
Director of Industry and University Programs (DIUP)
Tel: (613) 992-5829
Fax: (613) 996-0825

Capability/Products: Teleoperation; Control systems; Visual sensing; Motion sensing; Range sensing; Active sensing; Remote sensing; Sensor integration; Interpretation of sensory data; Visual displays; Virtual reality; Speech interpretation; Expert systems; Knowledge representation; Neural networks; Pattern recognition; Machine learning.

Niches/Achievements:
Aerospace and Aviation; Automotive; Biotechnology; Chemical; Computer/Software; Defence/Military; Devices for the Disabled; Electronic; Engineering; Energy; Environmental; Marine Engineering; Medical; Photonics/Optics; Space; Scientific/Technical; Security; Telecommunication/Telepresence.

NATIONAL DEFENCE-DEFENCE & CIVIL INSTITUTE OF ENVIRONMENTAL MEDICINE (DCIEM)

1133 Sheppard Avenue West
P.O. Box 2000
North York, Ontario
M3M 3B9

Contact: Dr. J.J. Grodski
Head, Telerobotics
Tel: (416) 635-2085
Fax: (416) 635-2104

Background: DCIEM is an R&D establishment of the Department of National Defence. Telerobotics is one of a number of research themes pursued by DCIEM within the mission to "enhance the effectiveness and ensure the health and safety of the human in any human-machine system or adverse environment". The aim of the telerobotics research is to facilitate and enhance telerobotic means, thereby reducing direct exposure of operators to hazardous/dangerous environments and strenuous/dull tasks. Particular attention is paid to the operator-robot interaction (ORI) issues, including the theme of telepresence. DCIEM collaborates in this area particularly within the NATO community.

Capability/Products: DCIEM's interest and technical capabilities involve: telerobotic and teleoperated applications, human-machine interfaces to facilitate telepresence, including multi-sensory sensing (binocular video, tactile, proximity, force, etc.) and multimedia displays (including stereoscopic video, mixed reality or augmented reality encompassing combined real and virtual reality, force feedback, etc.) and control functions. We are involved with the compliant actuation, force generation devices, and have developed a control system for robotic links and their direct control from human muscles. We also have developed new robotic manipulator controls using neural networks.

Niches/Achievements: We are addressing the theme of robotics for unstructured environments to comply with the needs of our primary customer, the military. However, results of our work are equally applicable to various civilian niches. Our Augmented Reality through Graphic Overlays on Stereovideo (ARGOS) technology has a range of potential applications, e.g. hazardous materials handling, medicine, surveillance... Force Generation Device systems based on the Robotic Muscle-like Actuator (ROMAC) technology have applications e.g. in simulators, suspension systems, entertainment, etc. The parametric control system could be applied in industrial robotics, autonomous all-terrain vehicles, as well as in some industrial processes.

Marketing Activities: The overall marketing

of the Crown's Intellectual Property (IP) is handled centrally by the Director Industry and University Programs (DIUP) at National Defence Headquarters. An early marketing of the patented ARGOS technology has led to a precedent in licensing a provincial centre of excellence to pursue sublicencing of the technology for niche applications. Further effort in this area is critical. The patented Parametric Control System concept needs to be marketed while its further enhancements are pursued. The patented Myoelectric control of ROMACs also ought to be marketed. A number of other concepts have been advanced through the work but they need to be patented first before marketing activities are initiated. Our enhancements to the communications link for an Explosive Ordnance Disposal robot are currently not marketed but are potentially useful to the Canadian industry.

Total Employees: 250
R&D Staff: 150
Plant Size: 20,000

NATIONAL DEFENCE-DEFENCE RESEARCH ESTABLISHMENT SUFFIELD (DRES)

Box 4000
Medicine Hat, Alberta
T1A 8K6

Contact: Dr. R. Suart
Director, Defence Technologies
Tel: (403) 544-4721
Fax: (403) 544-3761

Background: DRES is a DND research establishment specializing in defence against chemical and biological warfare agents and in aspects of military engineering, including vehicular robotics, explosive applications and training systems.

Marketing Activities: The support of Canadian Forces requirements through internal and contracted R&D and the pre-positioning of Canadian industry.

Total Employees: 170
R&D Staff: 100
Other: 1000 square mile proving grounds.

NATIONAL DEFENCE-DEFENCE RESEARCH ESTABLISHMENT VALCARTIER (DREV)

P.O. Box 8800
Courcelette, Quebec
G0A 1R0

Contact: Mr. D.L. Smith
Director
Tel: (418) 844-4254
Fax: (418) 694-4538

Background:
To carry out applied research and exploratory development
- in information processing technology.
- to meet the requirements of the Canadian army, navy and air force.
- for the development, acquisition and life cycle management.
- of command and control information systems.

Capability/Products:
Artificial Intelligence: Decision theory, Simulation and modelling, Expert systems, Information fusion, Data fusion.

System Architectures: Systems analysis, Computer networks, Parallel processing, Distributed databases.

Man-machine interface: Graphical user interfaces, Novel I/O devices, Query languages, Work sharing.

Software Engineering: Requirements engineering, Tools and methods, Software metrics, Languages (e.g. Ada), Life cycle management, Trustworthy software.

Marketing Activities: Our client is the Canadian Forces however, technology which we develop is available for commercial exploration through NDHQ/D Pat A.

Total Employees: 51
R&D Staff: 46

NATIONAL INSTITUTE OF AERONAUTICS

5555 Place de la Savane
St-Hubert, Quebec
J3Y 5K2

Contact: Mr. Armand Brisson
Manager
Tel: (514) 678-3560
Fax: (514) 678-1702

Background: The CAD/CAM Centre provides training primarily in the aeronautics industry, but also offers consulting services to assist companies with the installation of new technologies.

Capability/Products:
Robotics: Manipulators, Teleoperation, Control Systems. Machine Interface: Visual displays, Virtual reality.

Niches/Achievements: Aerospace and aviation, education, other process and manufacturing industries.

Marketing Activities: Priorities are in customize training.

Total Employees: 8

NATIONAL OPTICS INSTITUTE (NOI)

369 rue Franquet
Ste-Foy, Quebec
G1P 4N8

Contact: Mr. Charles E. Beaulieu
President & CEO
Tel: (418) 657-7006
Fax: (418) 657-7009

Background: NOI has more than 60 researchers specialized in the various branches of photonics conducting R&D work on five sectors: Optical Systems and Components, Photonic Materials and Processes, Photonics and Guided Optics, Laser Systems Technology and Information processing. NOI works in close partnership with the private sectors doing R&D, developing prototypes and supplying consultation and services on a contractual basis.

Capability/Products:
Robotics: Actuators (micro-machining). Machine Sensing: Range sensing - laser ranging, 3-D imagery. Active sensing - active imagery. Human Machine Interfaces: Visual displays, optical design, holographic diffuser. Intelligent Computation: Optical neural networks. Pattern Recognition: Automatic target recognition, parallel processing.

Niches/Achievements:
Aerospace: Protective coating for low orbit protection; micron gravity: diagnostic system. Aviation: Obstacle avoidance detection prototypes, active imagery for search and rescues. Forestry: Remote sensing Photonics: Optical System, optical design and testing, holographic optical elements, lasers, laser systems, integrated optics, metrology, optical thin films, IR camera, micro-mirrors. Telecommunication: Specialty fibre, doped fibre, fibre amplifier, fibre optic sensors.

Marketing Activities: Priority is given to the development of products for Canadian companies which sell them on the world market. Thus our main marketing activities concern the home market. But, in many cases, NOI has to test the world market with some of its products prior to licensing them to a Canadian manufacturer. For that purpose, NOI publishes a bulletin every three months to promote the results of its R&D out of which 800 are distributed to potential customers all over the world. Besides, NOI participates in and displays its products at a booth in symposia on photonics about three times a year in different countries like the USA, Europe and Japan.

Total Employees: 125
R&D Staff: 60
Lab Size: 8,000 square metres

NATIONAL RESEARCH COUNCIL OF CANADA-INSTITUTE FOR INFORMATION TECHNOLOGY

Montreal Road
Building M50
Ottawa, Ontario
K1A 0R6

Contact: Mr. A. Hlady
Manager

Tel: (613) 993-2491
Fax: (613) 952-0074

Background: Government Research & Development Organization - broad capability in science and engineering research - specialized R&D facilities.

Capability/Products: Description of robotic capability only - Worldwide reputation in 3-D sensor technology and 3-D data interpretation. Extensive experience in visual sensing, tactile sensing, range sensing and interpretation of sensory data human interaction for supervisory control in teleoperation and autonomous systems. Strong capability in software and AI such as machine learning and fuzzy logic systems.

Niches/Achievements: Strength: Computer software, sensor systems, knowledge-based techniques, broadly applicable generic research. Emphasis on environmental, factory automation, forestry, mining, space, security (safety) and waste handling industries.

Marketing Activities: Research and Development support to Canadian industry in nuclear waste clean-up, space, resource sector, mining and forestry. These are currently being given high priority but much of our technology is generic.

Total Employees: 30 (Robotics Activity)
R&D Staff: 25

NATURAL SCIENCES & ENGINEERING RESEARCH COUNCIL OF CANADA

350 Albert Street
Ottawa, Ontario
K1A 1H5

Contact: Mr. Rick Schwartzburg
Program Officer
Tel: (613) 995-6010
Fax: (613) 992-7356

Background: NSERC is the federal council responsible for supporting research in Canadian Universities in the natural sciences and engineering through different programs of support including joint university - industry collaborative projects and applied research in areas of strategic importance to Canada including information technology.

Total Employees: 200

NUMET ENGINEERING LIMITED

P.O. Box 1776
678 Neal Drive
Peterborough, Ontario
K9J 7X6

Contact: Dr. Harry Lowe
President
Tel: (705) 743-2708
Fax: (705) 743-3216

Background: Founded in 1971, the Company established itself as a supplier of high quality process equipment to the domestic and international nuclear power and research industry. Through growth and diversification, NEL has built a strong in-house engineering and development team and has up-to-date manufacturing capabilities. The Company focus is on the supply of complete engineered systems which typically include mechanical, electrical, hydraulic, pneumatic, process and control system design, manufacture, assembly test, installation supervision, commissioning, documentation and training. In-house quality programs include CSA Z299.2 (ISO 9002); ASME SecIII & VIII, NQA1, MIL-I-45208A.

Capability/Products: NEL has extensive experience in the design, build and implementation of specialized remote operated manipulators, material handling systems, automated assembly and test equipment, intelligent end effectors,/tooling incorporating and integrating various feedback sensors such as vision, position force, and temperature. To augment this equipment NEL provides custom control systems ranging from dedicated microprocessors to integrated systems consisting of computers, programmable logic controllers, multi-axis motion controllers and man-machine interfaces for supervisory control, data acquisition and information management.

Niches/Achievements: Engineering design and supply of automated equipment and process systems, remote handling systems,

and equipment for use in hazardous environments. Design and analysis using computer based resources, e.g. finite element, failure modes and effects analysis, modelling and simulation, reliability analysis, project management. Radioactive material handling, transportation and storage equipment. Manufacture with up-to-date CNC machine tools and a wide range of specialized welding. Design and manufacture of testing equipment and testing services. Cost effective, low overhead and competitive "one-stop" system solutions. Current R&D activities: active filtering system for water intakes, efficiency improvements for uranium scavenger beds, nuclear decontamination system for stainless steel fuel tubes. The Company is certified to NQA-1.

Marketing Activities:
Seeking opportunities in the application of manipulator and robotics in the areas of Waste Management and Hazardous Environments.

Require a partner who can provide or arrange to provide, local on-site installation capability, as required, as well as commercial intelligence on opportunities and competitive conditions.

Require a partner who can complement NEL's nuclear industry design and manufacturing skill with expertise in the environmental consulting field.

Total Employees: 45
Plant Size: 2,225 square metres

OPTIMAL ROBOTICS CORPORATION

4700 de la Savane
Montreal, Quebec
H4P 1T7

Contact: Dr. Howard Schneider
President
Tel: (514) 738-8885
Fax: (514) 738-2284

Background:
Self-serve retail checkout systems. Computer based training.

Capability/Products:
Robotics: control systems. Human Machine Interfaces: visual displays, tactile interfaces, knowledge discovery in large databases. Intelligent Computation: expert systems, knowledge representation.

Niches/Achievements: Education, Retail Automation.

PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

P.O. Box 1150
Humboldt, Saskatchewan
S0K 2A0

Contact: Mr. Craig A. Hanson
Project Manager
Tel: (306) 682-5033
Fax: (306) 682-5080

Background: Equipment testing and evaluation for standards compliance and performance qualification, as well as applied research and development services.

In field medium rate data acquisition, data interpretation and analysis, test procedure design and development of sensors and control and monitoring systems.

Programmable logic controller (PLC) implementation. Technology adaptation.

Capability/Products: Implementation of control systems: modelling of physical plant using measurement of functional performance, interpretation of sensory data and definition and analysis of functional parametres, design specification and selection of actuators, visual displays and sensors for process monitoring, motion sensing and range sensing. Design, development and implementation of wireless data links for telemetry, telecentre and teleoperation and of supervised autonomous systems for machine guidance and control.

Niches/Achievements: Application of digital control and data acquisition systems to inhospitable field environment, as encountered in the agriculture, forestry, mining, waste handling, transportation and processing industries.

Adaptation of electronic technology drawn

from aerospace, military, consumer products and computer applications to the infield/onsite digital monitoring and control of physical parametres.

Achieved through application of appropriate scientific and engineering principles, processes and practices and utilization of practical "Hands-On" experience and understanding of the machinery and operating environments encountered in a variety of industries.

Marketing Activities: Currently promoting all services through a direct contact campaign targeted at small and midsized manufacturers, processing and transportation industries and research funding agencies.

Total Employees: 35
R&D Staff: 25
Plant Size: 2000 square metres

PRATT & WHITNEY CANADA INC.

1000 Marie Victorin Blvd.
Longueuil, Quebec
J4G 1A1

Contact: Mr. David C. Thomas
Manufacturing Analyst, R&D
Tel: (514) 647-7739
Fax: (514) 647-2319

Background: Pratt & Whitney Canada is the world's leading producer of small gas turbine aircraft engines. We do not manufacture or distribute robotic products, but we do have extensive knowledge of applications and programming, which we continuously upgrade for our internal purposes.

Capability/Products: We are interested in improving our knowledge in control systems, visual sensing, motion sensing, tactile sensing, active sensing, sensor integration, logic programming, expert systems, neural networks, machine learning, fuzzy logic. We produce nothing that we wish to market, in these areas.

Niches/Achievements: Design and manufacture of small gas turbine aircraft engines.

Marketing Activities: We have no plans to market our robotic technology. It is not within our corporate mandate. Adapting new state-of-the-art equipment to our manufacturing processes is what gives us much of our competitive edge in the global aircraft engine market.

Total Employees: 7,000
R&D Staff: 2,500
Plant Size: Various - 3 Million square metres.

PRODOMAX INDUSTRIAL AUTOMATION INTERNATIONAL

95 Welham Road
Barrie, Ontario
L4M 6E7

Contact: Mr. Robert Burk
President
Tel: (705) 726-5841
Fax: (705) 722-8475

Background: Complete design and manufacture of automated manufacturing systems, CNC machining centres, CNC 4-6 axis grinders.

Capability/Products:
Assembly Automation Robotic or dedicated special purpose equipment. Plastic molding secondary operation equipment. Cycle test and inspection equipment. Robotic welding/spot welding. CNC machining centres for high volume production.

Marketing Activities: Limited national advertising, selective mailings.

Total Employees: 75
Plant Size: 30,000 square feet, 20,000 square feet.

PROLOGIC SYSTEMS LIMITED

75 Albert Street
Suite 206
Ottawa, Ontario
K1P 5E7

Contact: Mr. Keith Langley

President
Tel: (613) 238-1376
Fax: (613) 238-2347

Background: Scientific Software Engineering Professional Services in Support of Research, Prototyping and Integration of H/W & S/W in Remote Sensing Applications and Image Processing Systems for Airborne/Satellite Optical, Digital and Microwave Sensors.

Capability/Products: To use GIS technology and expertise in electronic charting applications. To use visual display tech and expertise in multimedia and virtual reality applications. To use Sensor Fusion, Interpretation and pattern recognition expertise in mission management, teleoperation and target sensing applications. To develop recognition products, voice, tactile interfaces and Smart Cards using Biometrics.

Niches/Achievements: Scientific Software Engineering in support of Research, Prototyping and Application Integration of Space Imaging and Remote Sensing Technologies.
Developed GIS Technologies.
Developed Earth Observing Products being used in Environmental Assessment, Forest Inventory and by Natural Resource Industries.

Marketing Activities: Attempting to capitalize on expertise acquired in Remote Sensing/GIS Applications and re-acquire opportunity of complimentary nature in defence technology engineering which is converging with civilian technology.

Total Employees: 80
R&D Staff: 15
Plant Size: 370 square metres.

QUEEN'S UNIVERSITY

Kingston, Ontario
K7L 3N6

Contact: Dr. Tony R. Eastham
Director, Research Services
Tel: (613) 545-6081
Fax: (613) 545-6853

Background: Queen's University has broad educational and research capability in the areas of robotics and knowledge-based systems, including robot dynamics and control, sensors, psychology of perception, expert systems, artificial intelligence, knowledge representation and machine learning. A number of senior undergraduate and graduate level courses are offered.

Capability/Products: A broad range of relevant research in actuators, manipulators, flexible links/joints, teleoperation, control systems, autonomous systems, visual sensing, motion sensing, active sensing, sensor integration, interpretation of sensory data, virtual reality, natural language interfaces, speech interpretation, tactile interfaces, knowledge discovery in large databases, logic programming, expert systems, knowledge representation, neural networks, pattern recognition, machine learning, fuzzy logic in the departments of computing and information science, electrical engineering, mechanical engineering and psychology.

Niches/Achievements: A wide range of research strengths in Aerospace and Aviation, Automotive, Biotechnology, Chemical, Computer/Software, Computer/Hardware, Devices for the Disabled, Education, Electrical, Electronic, Engineering, Energy, Environmental, Factory Automation, Medical, Mining and Oil Extraction, Materials, Natural Resource Industries, Pharmaceutical Industries, Photonics/Optics, Other Process and Manufacturing Industries, Space, Scientific/Technical, Services, Telecommunication/Telepresence, Transportation, Utilities.

Marketing Activities:
Priorities: Excellence in research, education and services.

Marketing: Achievements and P.R. (printed, software, video).

Total Employees: 3,600
R&D Staff: 1,500

RAMSEY CANADA

385 Enford Road
Richmond Hill, Ontario
L4C 3G2

Contact: Mr. Dave Young
Sales Manager
Tel: (905) 883-1881
Fax: (905) 883-1750

Background: Manufacturer of high technology process controls, and portable XRF elemental analyzers for the petrochemical, mining, pulp and paper and environmental industries.

Capability/Products: Non-contacting motion sensing, radar, ultrasonic and nuclear level monitoring. Portable X-ray fluorescence elemental analyzers (XRF).

Niches/Achievements: Portable XRF environmental analyzers, factory automation for the mining, petrochemical and pulp and paper industries.

Marketing Activities: Products are marketed direct, and through technical representatives.

Total Employees: 29
R&D Staff: 1
Plant Size: 950 square metres

RHODES & ASSOCIATES INC.

177 Jenny Wrenway
Willowdale, Ontario
M2H 2Z3

Contact: Dr. Wayne Rhodes
President
Tel: (416) 494-2816
Fax: (416) 494-0303

Background: Human Performance and Modelling; Cognitive Engineering and Analysis; Human-Computer Interface Analysis; Human Reliability Analysis; Maintainability Safety and Human Factors Engineering and Analysis

Capability/Products:
Human Machine Interfaces:
Human-Computer Interface Analysis, Rapid Prototyping, Task Analysis, Workload Analysis (Mental and Physical), Human Factors Engineering of HMI, Telerobotic operator modelling, safety analysis, maintainability analysis.

Niches/Achievements: We are one of the leading human factors consulting houses in Canada. We have served the aerospace, military, nuclear and transportation industries since 1982. Projects include the design of complex military systems, the Mobile Servicing System for the U.S. Space Station, Air Traffic Control Tower, and the human factors in the design and operation of nuclear power plants. Dr. Rhodes has served on the Canadian Standards Association's Committee for the Safety of Industrial Robots.

Marketing Activities: Expansion of the company over the next few years - utilize a very large network of highly talented specialists - focus on industrial applications and manufacturing.

Total Employees: 3
R&D Staff: 2

ROBERT I. ROBOTICS INC.

958 Leathorne Street
Suite 5
London, Ontario
N5Z 3M5

Contact: Mr. Robert B. Isaac
President
Tel: (519) 686-1003
Fax: (519) 686-1004

Background: Robert I. Robotics Inc. is a robotic integration systems house which manufactures flexible, automated productive systems: typical applications include material handling, palletizing, painting, welding, machine loading/unloading, forging, soldering and part assembly operation. We also manufacture a line of remote controlled vehicles for operation in environments that are hazardous to humans, such as bomb disposal, nuclear power plant surveillance and manipulative functions, damage control, toxic or other hazardous waste removal.

Capability/Products: We develop solutions for

robotic needs by combining proven off-the-shelf components with custom-built features designed for particular application(s). Through 3-D CAD simulation, we have the capabilities to simulate and integrate discrete and continuous factory floor events for realistic visualization, analysis and management of complex manufacturing systems. We are also capable of CAD design, evaluation and programming of robotic workcells off-line. In addition, we are involved in utilizing actuators, industrial robots and tele-operated systems. We have a proven ability in developing custom solutions to meet individual customers' automation needs.

Niches/Achievements: Robert I. Robotics offers a selection from individual robots to complete system solutions, from requirement evaluation, through design and integration, to installation and training. Related expertise exists in the following industries automotive, food, beverage, plastic products, furniture and fixtures, fabricated metal products, machinery, transportation equipment, electrical and electronic products and fiberglass products. Just recently, our tele-operated units were purchased for testing in a bomb-disposal capacity by the Defense/Military.

Marketing Activities:
Current marketing activities include:

Industrial and Engineering Journals - Press Releases and Advertising, Outside Sales, Telemarketing, Networking, Referrals, Canadian Consulate Marketing, Canadian Government Information Data Bases.

Current priorities include:
Integration of pre-engineered automation components.
Design and integration of turn-key automation systems.
Marketing of our tele-operated unit in bomb disposal and hazardous material handling.

Total Employees: 6
Plant Size: 1,500 square metres

ROBOTECH INDUSTRIES LIMITED

4040 Brandon Street S.E.
Calgary, Alberta
T2G 4A8

Contact: Mr. Derrick Hunter
President
Tel: (403) 243-4446
Fax: (403) 243-4628

Background: Robotech is the manufacturer of the "HazHandler" radio-remote controlled multi-task vehicle. The HazHandler has a 1300 lb. payload and same 60 available attachments, rendering the vehicle suitable for use in a wide variety of hazardous environments.

Capability/Products: Robotech is engaged in the design, development, manufacturing and marketing of teleoperated vehicles. The company offers a variety of control systems, visioning systems and attachments to meet the unique requirements of each situation. We are investigating the use of various end effectors as a further product offering.

Niches/Achievements: The company has successfully demonstrated its technology at a nuclear waste storage facility in New Mexico. We have also worked with the Canadian military in developing a vehicle capable of remotely operated mine detection and other military functions.

Marketing Activities: Robotech HazHandler and ANCAEUS systems have application in environmental site clean ups involving radioactive, explosive and other hazardous wastes. The company represented by a dealer network of 23 authorized agents in the USA and participants frequently as a subcontractor on various DOD and DOE proposals. We are presently undertaking a series of product demonstrations.

Total Employees: 5
R&D Staff: 2
Plant Size: 200 square metres.

RODEX TECHNOLOGIES INC.

434 Hamilton Ave. S
Ottawa, Ontario
K1Y 1E3

Contact: Dr. Joseph S.-C. Yuan
President
Tel: (613) 725-5288
Fax: (613) 725-5174

Background: At Rodex Technologies Inc., we offer consulting services in robotics and control system engineering. Our goal is to help our clients improve business competitiveness by applying innovative technology to where it is both technically feasible and economically justifiable.

Capability/Products: Feasibility Studies; Engineering Design; Prototype Development; Technology Surveys; Technology Training; Contract Research; and Product Development & Marketing.

RPC

921 College Hill Road
Fredericton, N.B.
E3B 6Z9

Contact: Mr. Roy St. Laurent
Tel: (506) 452-1655
Fax: (506) 452-1395

Background: Contract R&D, Product Development, Special Sensors.

Capability/Products: 6 degree of freedom end reflectors, combined tactile and proximity sensing, fiber optics tilt sensors.

Niches/Achievements: Combined tactile and proximity sensing, optic tilt sensor to measure tube sag in nuclear plants (high electromagnetic radiation).

Marketing Activities: Increase customer base.

Total Employees: 180
R&D Staff: 20
Plant Size: 30,000 square metres

RSI RESEARCH LTD.

203 Harbour Road
Suite 3
Victoria, British Columbia
V9A 3S2

Contact: Mr. Jack Wilson
President
Tel: (604) 360-1025
Fax: (604) 360-1161

Background: RSI specializes in remote and telerobotic works systems and products for use in hazardous and unstructured environments. Products include manipulator, ROV's, remote tools, camera mounts and controls for heavy equipment.

Niches/Achievements: RSI's primary markets are: subsea, forestry, hazardous material, handling, research labs.

Achievements include recovery at Challenger booster rocket, record ocean depth recoveries etc.

Marketing Activities:
A. Subsea - telemarketing, occasional trade shows.
B. Forestry - telemarketing, direct contact.
C. Hazardous materials - primarily through Spar Aerospace.

Total Employees: 10
R&D Staff: 5
Plant Size: 20,000 square metres.

S.L. ROSS ENVIRONMENTAL RESEARCH LTD.

717 Belfast Road
Suite 200
Ottawa, Ontario
K1G 0Z4

Contact: Mr. Randy Belore
Vice President
Tel: (613) 232-1564
Fax: (613) 232-6660

Background: 15 years experience in marine oil and chemical spill R&D, contingency planning and training, behaviour and impact modelling.

Capability/Products: State-of-the-art oil and chemical spill modelling in a marine setting.

Models utilize elements of logic programming, expert system and knowledge base concepts.

Niches/Achievements: We provide oil spill fate modelling expertise and biological resource impact assessments for the environmental divisions of the offshore oil and gas industry.

Marketing Activities:
U.S. market remains our primary focus.
Have recently made efforts through External Affairs in Mexico and Australia.
S.E. Asia hold promise due to current levels of activity but we have yet to make a serious effort.

Total Employees: 12
R&D Staff: 6

SASKATCHEWAN RESEARCH COUNCIL

15 Innovation Blvd.
Saskatoon, Saskatchewan
S7N 2X8

Contact: Mr. Jim Hutch
President
Tel: (306) 933-5402
Fax: (306) 933-7896

Capability/Products: Expert systems, knowledge representation, neural networks, pattern recognition, fuzzy logic.

Niches/Achievements: Agriculture, Energy, Environmental, Factory Automation, Mining and Oil Extraction.

Total Employees: 221

SERVO-ROBOT INC.

1380 Graham Bell
Boucherville, Quebec
J4B 6H5

Contact: Mr. Jean Paul Boillot
President
Tel: (514) 655-4223
Fax: (514) 655-4963

Background: Servo-Robot was established 10 years ago to develop, manufacture and supply high-quality 3D laser scanning vision systems for process control and factory automation. Servo-Robot's success is closely linked to the development and implementation of industrially-reliable opto-electronic technology by its in-house team of engineers and scientists.

Capability/Products: Servo-Robot develops, manufactures and supplies high- technology products and systems for process control and industrial automation.

A unique auto-synchronized 3D laser technology is used in compact high-precision 3D camera systems featuring high-speed image acquisition. These systems are used for factory automation, inspection 3D digitization, autonomous robotics, information technology, 3D imaging sciences and medical data acquisition. Each system includes a laser camera and a powerful control and multiprocessing unit and is supported by a series of modular software packages designed for a variety of applications such as automated seam tracking, surface digitization and dimensional measurements.

Niches/Achievements: Servo-Robot is now recognized worldwide as a leader in the field of 3D laser vision systems. It also develops and integrates complete automatic systems for factory automation and inspection, as well as for surface digitization and metrology. One important niche for Servo-Robot is related to robot guidance in industrial applications like welding, glueing, etc. Our systems offer the most advanced capabilities in those types of applications.

Marketing Activities: Servo-Robot has a network of distributors and agents covering many Western European and East Asian countries. Current expansion plans will lead to the establishment of joint venture associations in the United States and Japan.

Total Employees: 30
R&D Staff: 16
Plant Size: 1,500 square metres.

SILICO COMPUTER SYSTEMS LIMITED

1455 Woodroffe Avenue
Nepean, Ontario
K2G 1W1

Contact: Mr. Gerry Scarcella
Vice President, Marketing
Tel: (613) 727-0465
Fax: (613) 727-5003

Background: Silico's primary objective is to provide both the private and public sectors of the business community with consulting and professional services in Electronic Data Processing. We are committed to the highest standards of professionalism, both in the selection of personnel to satisfy client requirements and in the superior quality of our products and services. Silico is prepared to provide project management and associated resource support as part of our dedication to client satisfaction. This ability to provide comprehensive professional and management expertise has been a vital element in the success of our company.

Capability/Products: Silico has available personnel with expertise in the following areas: actuators, autonomous systems, expert systems, neural networks, manipulators, sensor integration, knowledge representation, patter recognition, fuzzy logic, control systems, human machine interfaces.

Niches/Achievements: Silico has successfully completed projects within the following industries: computer/software, office automation, telecommunications, finance/accounting, services.

Marketing Activities: Silico is currently marketing computer professional services to a variety of departments within the Federal Government.

Total Employees: 37
R&D Staff: 2
Plant Size: 2,000 square metres.

SMART TECHNOLOGIES INC.

240 - 11th Avenue S.W.
Suite 599
Calgary, Alberta
T2R 0C3

Contact: Mr. David A. Martin
President
Tel: (403) 233-9333
Fax: (403) 262-3524

Background: Pioneer in development of large screen touch displays.

Capability/Products: SMART is a leader in large surface (4 foot by 3 foot) interactive touch displays. Primarily used with conferencing software co-developed by SMART and Intel Corporation, these systems are known as electronic whiteboards and have application in data conferencing for business meetings or training.

Niches/Achievements: SMART is a world leader in developing/integrating technologies that combine telecommunications with computers. Known as "Telepresence", the company's products have wide application to all market segments.

Marketing Activities: Products sold directly in Canada, through value added resellers in the U.S. and through distributors in Europe, Japan, Australia, Taiwan, Hong Kong and Korea.

Total Employees: 43
R&D Staff: 17
Plant Size: 10,600 square feet, 4,000 square feet.

SOFTAC SYSTEMS LTD.

3046 Westwood Street
Port Coquitlam, British Columbia
V3C 3L7

Contact: Mr. Don Stewart
Chief Engineer
Tel: (604) 464-8505
Fax: (604) 464-2242

Capability/Products: The robotics operation our company is involved with is to paint large

complex patterns automatically and very quickly. Area is approximately 64 square feet. We are also involved with precision range finding in a industrial applications data from the range finding equipment is used in an expert system to make optimum decisions.

Niches/Achievements: We are primarily involved in the Forest Products Industry helping to optimize lumber recovery from the natural resource.

Marketing Activities: We are becoming more involved in image processing work - marketing is expanding into the U.S. - mostly involving our optimization product.

Total Employees: 30
R&D Staff: 10

SPAR AEROSPACE LIMITED

9445 Airport Road
Brampton, Ontario
L6S 4J3

Contact: Mr. Chris Butt
Manager, New Technologies & Venture
Tel: (905) 790-2800
Fax: (905) 790-4430

Background: Spar Aerospace Limited is a world leader in space robotics/manipulators, solar arrays, nuclear robotic systems and infrared systems (ATS division).

Capability/Products: Actuators, manipulators, end effectors, flexible links/joints, teleoperation, control systems, visual sensing, motion sensing, tactile sensing, range sensing, remote sensing, sensor integration, interpretation of sensory data, visual displays, natural language interfaces, logic programming, expert systems, knowledge of representation, neural networks, pattern recognition, machine learning and fuzzy logic.

Niches/Achievements: In North America and around the world, Spar Aerospace Ltd. is best known for its very visible contribution to NASA's space shuttle fleet, the famous Canadarm. Within the global satellite manufacturing and communications networks communities, Spar is universally recognized as a world-class spacecraft prime and subsystems contractor, and it is fast building a similar reputation for communications networks and customer driven end-to-end systems solutions.

Marketing Activities: Spar Aerospace is firmly established in the U.S. and is looking to increase penetration on the European and Pacific Rim countries. Strategies of interest include joint ventures, teaming agreement, licensing and local agents/representatives.

Strategic Alliances have moved Spar from its origins as a hardware manufacturer for the defense and aerospace industries to a future that teams the company with such world market heavyweights as Hughes Aircraft and Martin Marietta in the United States, Matra in France, and NPO-PM in Russia.

Total Employees: 2,800
R&D Staff: 1,680
Plant Size: (ATS division) 292,000 square feet

TECHNO SCIENTIFIC INC.

60 Caster Avenue
Woodbridge, Ontario
L4L 5Y9

Contact: Dr. M. Macecek
President
Tel: (905) 851-9958
Fax: (905) 851-6314

Capability/Products: Robotic welding cell, automated inspection cell, plurality of sensors/ intelligent sensors.

Niches/Achievements: Robotic welding cell (automotive industries), automated inspection lines (seamless tubing) for manufacturers of tubes, aerospace component inspection (NASA).

Marketing Activities: Various international trade directories, trade fairs and strategic alliances with emphasis on China and South East Asia. Also have conducted various activities in developing European countries. Smaller interest in the U.S. and Middle Eastern markets.

Total Employees: 30

R&D Staff: 15
Plant Size: 10,000 square metres

TEKTREND INTERNATIONAL INC.

2755 Pitfield Blvd.
St. Laurent, Quebec
H4S 1T2

Contact: Ms. Claudette Roy
Marketing Coordinator
Tel: (514) 333-7371
Fax: (514) 333-7381

Capability/Products:
"AIRSAT" Remote sensing - application environment for management and interpretation of remotely sensed and other multi-spectral and similarly complex images.

EXPERT SYSTEM
"ICEPAK" A.I. to capture decision making knowledge of specialists.
"ARIUS" Pattern recognition technology to simplify and automate data ultrasonic application with robotic scanning systems for data acquisition, advanced imaging and image enhancement.
"ARIES" Eddy current application - Robotic scanning system.

Niches/Achievements:
Software for Robotics on arm of "Space Station Freedom". Scanners and software for prestigious aerospace companies. In-house development software for pattern recognition, used worldwide. Experts in Hydrogen study and research. Retrofitting software to most any existing automated system.

Marketing Activities:
Priorities are reaching customers who need scanners and software.
Selling our software products.
Marketing activities take place in phoning, writing, magazine ads, trade shows, company literature, follow up in contracts, newsletters.

Total Employees: 15
R&D Staff: 9
Plant Size: 400 square metres.

TELECOMMUNICATIONS RESEARCH INSTITUTE OF ONTARIO (TRIO)

340 March Road
4th Floor
Kanata, Ontario
K2K 2E4

Contact: Mr. Peter Leach
President
Tel: (613) 592-9211
Fax: (613) 592-8163

Background: University based pre-competitive research in telecommunications systems and technologies. The institute provides a bridge between industry and academe and is a partnership for innovation and wealth creation between over 30 corporations, 2 federal government laboratories, 6 universities and several other not-for-profit organizations and industry associations.

Capability/Products: Communications systems/protocols for teleoperation control systems for telecommunications networks. Sponsors research and an NSERC industrial chair in multi-media databases. Expert systems for network and fault management in telecom networks, antenna and signal processing for source detection and pattern recognition for radio and audio signals.

Niches/Achievements: Major program in telepresence ($5.0 M over 3 years) as Canadian part of a five country research program in the development of applications of telepresence functionality. Development of 4k-bit voice coding algorithm, low-power monolithic frequency synthesizer; wavelength division multiplex 10 Gbit to 1 Tbit systems; extension of fault diagnosis to fetal monitoring; satellite communications systems and design approaches e.g. digital forming; software design methods for large real time systems.

Marketing Activities: Royalty free access for partner corporations for use research partnerships (funding assistance included) for industrially based student research and for University based training for industrial researchers -partner corporations only technology and knowledge transfer initiatives, preferential access to graduating students - partner corporations only.

Total Employees: Administration - 7, University Professors - 72, University Students approximately 400 (130 funded).

THOMSON-CSF SYSTEMS CANADA INC.

49 Auriga Drive
Nepean, Ontario
K2E 8A1

Contact: Mr. Jim Youngs
Manager, Business Development
Tel: (613) 723-7000
Fax: (613) 723-5600

Background: Thomson Systems is a system engineering company that specializes in commercial-based high technology applications for military and space systems.

Capability/Products: Thomson Systems is involved in ground control for robotics up to the level of autonomous systems. We have developed sensor integration programs and have developed experts systems, as well as normal network applications and pattern recognition algorithms.

Niches/Achievements: Thomson Systems' primary focus is in the Aerospace and Defence sectors. We have the capability of developing, designing, producing, and supporting throughout the complete life cycle, complex high technology systems in command and control and countermine applications.

Marketing Activities: Thomson Systems has focused on two business areas, command and control and countermines.

Total Employees: 55
Plant Size: 2500 square metres.

UNIVERSITY OF VICTORIA

P.O. Box 3055
Victoria, British Columbia
V8W 3P6

Contact: Mr. Meyer Nahon
Assistant Professor
Tel: (604) 721-6040
Fax: (604) 721-6051

Background: Extensive capabilities in modelling, design and testing of robotic systems. Software and hardware evaluation of controllers.

Capability/Products: Complete capability for simulation (software or hardware) of flexible link/flexible joint multi-armed robot systems. Evaluation of direct drive and harmonic drive actuators. Control systems design. Autonomous undersea vehicle simulation and control.

Niches/Achievements: Space robots -- modelling capability and test facility computer software for dynamics, control and collision avoidance.

VIBRO-METER INC.

2115, Fernand-Lafontaine
Longueuil, Quebec
J4G 2J4

Contact: Marius Cloutier
President
Tel: (514) 646-2157
Fax: (514) 646-2164

Background: Manufacturing of Monitoring Systems for big rotating machinery such as Hydro Generators of electricity.

Capability/Products: control systems, motion sensing, tactile sensing, range sensing, active sensing, remote sensing, sensor integration, interpretation of sensory data, tactile interfaces, knowledge discovery in large databases, logic programming, expert systems, special flat capacitive sensors.

Niches/Achievements: Computer/Software, Energy, Diagnostic expertise in the Hydroelectric sector.

Marketing Activities: Advertising in specialized magazines, direct representation, mailing, phone calls, specialized conferences and exhibitions.

Total Employees: 33

R&D Staff: 12
Plant Size: 1000 square metres

WARDROP ENGINEERING INC.

6725 Airport Road
Mississauga, Ontario
L4V 1V2

Contact: Mr. Ernie Card
Vice President
Tel: (905) 673-3788
Fax: (905) 673-8007

Background: Multi-disciplinary engineering services to aerospace and other high technology industries services: feasibility studies, conceptual designs, prototyping development, detailed design, fabrication, commissioning and operating assistance. Wardrop designs prototypes and develops specialized component systems and mechanisms for robotic and aerospace industries.

Capability/Products: Experience in robotic and remote handling from master slave manipulators for nuclear cells through on power refuelling of CANDU reactors to space applications: remote manipulators for space program. Other projects AECB fuel verifier (nuclear), Plydey recycling machine, remotely operated mechanisms for major particle accelerators.

Niches/Achievements: Aerospace and aviation - Canadarm remote manipulator, for NASA space shuttle, on-power fueling machine for Douglas Point and Gentilly Nuclear Stations, single channel shifter for pickering NGS, high torque tooling for Bruce NGS, hot cells for handling highly radioactive materials.

Marketing Activities: Public and private sectors of Canada and internationally with emphasis in high technology industries, food processing, automotive, general manufacturing, nuclear, chemical, transportation, aerospace and robotics.

Total Employees: 230
R&D Staff: 20
Plant Size: 4000 square metres

WASTEWATER TECHNOLOGY CENTRE

867 Lakeshore Road
Box 5068
Burlington, Ontario
L7R 4L7

Contact: Mr. Abbas Zaidi
Industrial Process Manager
Tel: (905) 336-4618
Fax: (905) 336-4765

Background: The WTC specializes in the application of wastewater treatment expertise for the solution of environmental problems. In particular the use of expert systems for the solution of industrial wastewater treatment application.

Capability/Products: Expert systems for industrial environmental solutions in particular:
Gold mining expert systems
Produced water expert system
Metal finishing expert system in planning stage.

Niches/Achievements: Environmental, Government, Mining and Oil Extraction, Scientific/Technical.

Marketing Activities: Our priorities include the development of software solutions for environmental wastewater problems.

Total Employees: 120
R&D Staff: 70

XILLIX TECHNOLOGIES CORPORATION

2339 Columbia Street
Second Floor
Vancouver, British Columbia
V5Y 3Y3

Contact: Mr. Imre Togyi
Business Development Manager
Tel: (604) 875-6161
Fax: (604) 872-3356

Background: Xillix is a 6 year old public company striving to become the world leader in commercializing medical imaging devices

for the earlier detection of cancer. Experience and strengths in bio-medical research, optical and robotic engineering, international business and marketing.

Capability/Products: Xillix utilizes robotics in microscope slide handling. Machine vision is involved with computer control to move slides in 3 axes. A unique human interface was designed for interactive use. Strong focus is represented in expert systems, knowledge bases and image libraries. Current tools involve programming for pattern and cell recognition with the application of support technologies including fuzzy logic, neural networks and discriminate functions to optimize object separation in multi-dimensional space objectives for medical imaging - diagnostic applications.

Niches/Achievements: Xillix scientists and medical researchers are recognized world pioneers and leaders in the fields of Malignancy Associate Changes (MAC's) and Tissue Auto Fluorescence. Hand in hand, these two new scientific fields, and the resulting Xillix devices, have the potential to revolutionize the way the world's medical practitioners detect, diagnose and treat cancer.

Marketing Activities: Current marketing activities and priorities center on: Developing and maintaining an international dealer network.
Creating customer awareness in the major market areas of the U.S., Western Europe and Asia.
Placing product with key innovators/opinion leaders for the purpose of conducting further research into new applications for our devices.

Total Employees: 65
R&D Staff: 25
Plant Size: 3,000 square metres, 750 square metres.

YORK UNIVERSITY

4700 Keele Street
North York, Ontario
M3J 1P3

Contact: Mr. Michael Jenkin
Associate Professor
Tel: (416) 736-2100
Fax: (416) 736-5872

Background: Mobile robotics, computer vision, consulting.

Capability/Products: Autonomous systems, visual sensing, motion sensing, range sensing, interpretation of sensing data, virtual reality.

Niches/Achievements: Computer/Software, Computer/Hardware.

Marketing Activities: Applied Research in Robotics, Vision and Computer Graphics.

Total Employees: 5 (in robotics).
R&D Staff: 5 (in robotics)

ZEPF TECHNOLOGIES INC.

70 Rankin Street
Waterloo, Ontario
N2V 1V9

Contact: Mr. Larry Zepf
CEO
Tel: (519) 884-6470
Fax: (519) 884-7456

Background: Design, Manufacture, Install, Packaging lines.

Capability/Products: manipulators, control systems, autonomous systems, visual sensing, sensor integration, interpretation of sensory data, logic programming, pattern recognition, machine learning.

Niches/Achievements: Factory Automation, Other Process and Manufacturing Industries.

Marketing Activities: 31 countries mostly USA and Europe.

Total Employees: 95
R&D Staff: 10
Plant Size: 10,000 square metres

CAPABILITIES MATRIX

ROBOTICS & KNOWLEDGE-BASED INDUSTRIES
CAPABILITIES MATRIX

COMPANIES	Robotics								Machine Sensing								Human Machine Interfaces						Intelligent Computation						
	Actuators	Manipulators	End Effectors	Flexible Links/Joints	Teleoperation	Control Systems	Micro Robotics	Autonomous Systems	Visual Sensing	Motion Sensing	Tactile Sensing	Range Sensing	Active Sensing	Remote Sensing	Sensor Integration	Interp. of Sensory Data	Visual Displays	Virtual Reality	Natural Langu. Interf.	Speech Interpret.	Tactile Interfaces	Knowledge in dBase	Logic Programming	Expert Systems	Knowledge Represent	Neural Networks	Pattern Recognition	Machine Learning	Fuzzy Logic
MANUFACTURERS, RESEARCH & DEVELOPMENT, AND SOFTWARE PRODUCERS																													
A.T. Schindler Communication Inc.					X	X																							
Aastra Corporation	X				X						X	X									X								
ACDS Graphic System Inc.																						X	X	X					
Agra Industries Limited	X	X	X	X	X	X										X	X						X						
Algo Design																							X	X	X	X	X	X	X
American Business Computer Ltd.						X											X					X	X	X	X				
Applied AI Systems Inc.						X	X	X	X	X	X	X	X			X		X	X	X	X			X		X	X	X	X
Applied Robotics Inc.					X	X		X	X	X		X			X									X		X	X		X
Array Systems Computing Inc.					X	X		X							X	X										X	X		
ATS Automation Tooling Systems Inc.	X	X	X						X																				
Autodyne Inc.	X	X	X						X	X		X		X	X	X	X				X		X				X		
Automated Mining Systems Inc.					X			X	X			X			X		X												
Berclain Group Inc.																								X					

COMPANIES	Robotics								Machine Sensing								Human Machine Interfaces						Intelligent Computation						
	Actuators	Manipulators	End Effectors	Flexible Links/Joints	Teleoperation	Control Systems	Micro Robotics	Autonomous Systems	Visual Sensing	Motion Sensing	Tactile Sensing	Range Sensing	Active Sensing	Remote Sensing	Sensor Integration	Interp. of Sensory Data	Visual Displays	Virtual Reality	Natural Langu. Interf.	Speech Interpret.	Tactile Interfaces	Knowledge in dBase	Logic Programming	Expert Systems	Knowledge Represent	Neural Networks	Pattern Recognition	Machine Learning	Fuzzy Logic
Bombardier Inc., Canadair, Defence Systems Division					X	X								X	X		X						X						
Brandt Manufacturing Inc.	X	X	X																				X						
CAE Electronics Ltd.	X	X			X	X		X		X	X		X	X	X	X	X	X			X		X	X	X		X		
CDL Systems					X	X									X	X	X												
Cemtech						X																				X	X		X
CoGentex Inc.																			X	X			X	X	X				
Comdale Technologies (Canada) Inc.																								X		X	X		X
Compengserv Limited						X												X					X	X	X	X	X	X	X
Computing Devices Canada Limited															X	X								X					
Control Digital Inc.						X			X																				
Cortex Engineering Inc.						X				X							X												
CRS Plus Inc.		X	X			X		X	X	X					X	X	X		X		X								
Cyberworks					X	X		X	X	X		X	X	X	X	X		X					X	X			X	X	X
Derlan Aerospace Canada Ltd.	X	X	X	X																									
Dewey McMillin & Associates Ltd.									X							X						X			X	X			X
Diffracto						X			X			X				X													
Dipix Technologies Inc.									X	X		X			X	X													

COMPANIES	Robotics								Machine Sensing								Human Machine Interfaces						Intelligent Computation						
	Actuators	Manipulators	End Effectors	Flexible Links/Joints	Teleoperation	Control Systems	Micro Robotics	Autonomous Systems	Visual Sensing	Motion Sensing	Tactile Sensing	Range Sensing	Active Sensing	Remote Sensing	Sensor Integration	Interp. of Sensory Data	Visual Displays	Virtual Reality	Natural Langu. Interf.	Speech Interpret.	Tactile Interfaces	Knowledge in dBase	Logic Programming	Expert Systems	Knowledge Represent	Neural Networks	Pattern Recognition	Machine Learning	Fuzzy Logic
Dynamic Control Systems									X			X																	
Escher-Grad Technologies Inc.		X	X	X		X			X	X	X	X	X		X	X													
Engineering Services Inc. (ESI)	X	X	X	X	X	X		X		X	X	X	X	X	X	X								X		X			
Ferguson Simek Clark																						X			X		X		
Focal Technologies Inc.	X					X										X													
Gallium Software Inc.						X											X												
Guildline Instruments Ltd.																X													
Hewlett-Packard Canada Ltd.																	X							X					
Husky Injection Molding Systems Ltd.			X			X										X													
Hymarc Limited												X				X													
IBM Toronto Laboratory																						X	X	X	X	X	X	X	X
ICAM Technologies Corporation																								X					
IDON Corporation																	X	X				X		X	X				
IMAGO Machine Vision Inc.									X	X		X																	
Industrial Control Software Inc.	X	X	X	X		X		X	X	X	X	X	X	X	X	X				X	X	X	X	X	X		X	X	X
InfoMagnetics Technologies Corp.						X			X								X						X	X		X			
Instrumar Limited		X			X			X			X																		

COMPANIES	Robotics								Machine Sensing								Human Machine Interfaces						Intelligent Computation						
	Actuators	Manipulators	End Effectors	Flexible Links/Joints	Teleoperation	Control Systems	Micro Robotics	Autonomous Systems	Visual Sensing	Motion Sensing	Tactile Sensing	Range Sensing	Active Sensing	Remote Sensing	Sensor Integration	Interp. of Sensory Data	Visual Displays	Virtual Reality	Natural Langu. Interf.	Speech Interpret.	Tactile Interfaces	Knowledge in dBase	Logic Programming	Expert Systems	Knowledge Represent	Neural Networks	Pattern Recognition	Machine Learning	Fuzzy Logic
International Neural Machines Inc.						X			X	X	X	X	X	X	X	X										X	X	X	X
International Submarine Engineering Ltd.	X	X	X		X	X		X	X	X	X	X	X	X	X	X	X	X			X			X			X		
IRCO Automation Inc.		X				X										X													
Kinetic Sciences Inc.	X	X		X	X			X	X	X		X		X															
Laser Fiber Optics Canada Ltd.				X	X																								
Liburdi Engineering Limited		X	X	X		X			X																				
MacDonald Dettwiler & Assoc. Ltd.					X	X			X	X		X	X	X	X	X	X	X	X			X	X	X	X	X	X		X
Machina Sapiens Inc.					X												X	X	X			X	X	X	X	X	X		X
MPB Technologies Inc.	X	X		X	X		X				X	X					X	X			X								
MPR Teltech Ltd.																						X		X	X			X	
MSR Inc.						X																	X						
MVS Modular Vision Systems Inc.			X			X		X				X			X	X								X		X			X
Numet Engineering Ltd.		X	X	X	X	X		X	X	X	X				X		X				X		X	X					
Optimal Robotics Corporation						X											X				X	X		X	X				
Pratt & Whitney Canada Inc.						X			X	X	X		X		X								X	X		X		X	X
Prodomax Industrial Automation Int'l	X	X	X			X		X	X				X		X	X	X						X	X			X	-	-
Prologic Systems Limited					X											X	X	X		X	X						X		

COMPANIES	Robotics								Machine Sensing								Human Machine Interfaces						Intelligent Computation						
	Actuators	Manipulators	End Effectors	Flexible Links/Joints	Teleoperation	Control Systems	Micro Robotics	Autonomous Systems	Visual Sensing	Motion Sensing	Tactile Sensing	Range Sensing	Active Sensing	Remote Sensing	Sensor Integration	Interp. of Sensory Data	Visual Displays	Virtual Reality	Natural Langu. Interf.	Speech Interpret.	Tactile Interfaces	Knowledge in dBase	Logic Programming	Expert Systems	Knowledge Represent	Neural Networks	Pattern Recognition	Machine Learning	Fuzzy Logic
Ramsey Canada						X				X						X													
Robert I. Robotics Inc.	X				X	X																							
Robotech Industries Limited		X	X		X	X			X																				
RPC (Consultants)			X							X	X	X	X																X
RSI Research Ltd.	X	X	X	X	X	X		X	X		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
Servo-Robot Inc.						X			X							X														
Smart Technologies Inc.						X															X								
Softac Systems Ltd.		X	X	X		X						X												X					
Spar Aerospace Limited	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X		X		X		X	X	X	X	X	X	X
Techno Scientific Inc.	X					X		X	X	X		X	X	X	X	X							X				X	X	
Tektrend International Inc.														X										X	X	X	X	X	
Thomson-CSF Systems Canada Inc.						X		X							X									X		X	X		
Vibro-Meter Inc.						X				X	X	X	X	X	X	X					X	X	X	X					
Xillix Technologies Corporation						X	X		X													X		X	X	X	X		X
Zepf Technologies Inc.		X				X		X	X						X	X							X				X	X	
GOVERNMENT AND NOT-FOR-PROFIT ORGANIZATIONS																													
Atomic Energy of Canada Limited (AECL)		X	X					X									X							X		X	X		

	Robotics								Machine Sensing								Human Machine Interfaces						Intelligent Computation						
COMPANIES	Actuators	Manipulators	End Effectors	Flexible Links/Joints	Teleoperation	Control Systems	Micro Robotics	Autonomous Systems	Visual Sensing	Motion Sensing	Tactile Sensing	Range Sensing	Active Sensing	Remote Sensing	Sensor Integration	Interp. of Sensory Data	Visual Displays	Virtual Reality	Natural Langu. Interf.	Speech Interpret.	Tactile Interfaces	Knowledge in dBase	Logic Programming	Expert Systems	Knowledge Represent	Neural Networks	Pattern Recognition	Machine Learning	Fuzzy Logic
B.C. Advanced Systems Institute	X	X			X		X	X	X			X		X		X	X	X	X			X	X	X	X	X			
Canadian Industrial Innovation Centre																						X							
Canadian Space Agency	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Centre de Recherche Informatique de Montréal (CRIM)					X	X		X								X	X	X	X	X				X	X	X			X
Centre for Information Technology Innovation (CITI)																			X					X		X			
CRIQ Automatisation	X	X	X	X	X	X	X	X																					
Hydro-Quebec		X			X				X								X							X					
Information Technology Research Centre		X	X		X	X		X	X	X	X				X	X	X		X	X	X	X		X	X	X	X	X	X
National Defence (CRAD)					X	X			X	X		X	X	X	X	X	X	X		X				X	X	X	X	X	
National Defence (DCIEM)		X		X	X	X			X		X	X					X	X								X			
National Defence (DRES)					X	X		X								X													
National Defence (DREV)																	X					X	X	X					
National Institute of Aeronautics		X			X	X											X	X											
National Optics Institute (NOI)	X								X			X	X				X									X	X		
National Research Council of Cda.- Institute for Information Technology					X	X		X	X		X	X	X		X	X	X	X						X	X			X	X

COMPANIES	Robotics								Machine Sensing								Human Machine Interfaces						Intelligent Computation						
	Actuators	Manipulators	End Effectors	Flexible Links/Joints	Teleoperation	Control Systems	Micro Robotics	Autonomous Systems	Visual Sensing	Motion Sensing	Tactile Sensing	Range Sensing	Active Sensing	Remote Sensing	Sensor Integration	Interp. of Sensory Data	Visual Displays	Virtual Reality	Natural Langu. Interf.	Speech Interpret.	Tactile Interfaces	Knowledge in dBase	Logic Programming	Expert Systems	Knowledge Represent	Neural Networks	Pattern Recognition	Machine Learning	Fuzzy Logic
Natural Sciences & Engineering	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Prairie Agricultural Machinery Institute	X			X	X	X		X		X		X				X	X												
Saskatchewan Research Council																								X	X	X	X		X
Telecommunications Research Institute of Ontario (TRIO)					X	X																		X			X		
Wastewater Technology Centre																								X					
INSTITUTIONS																													
Assoc. of Cndn. Commnty. Colleges	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Brock University																				X			X	X		X		X	
Carleton University	X	X	X	X	X	X	X		X	X		X	X	X	X										X		X	X	
Intellectual Property & Contracts Office (University of Alberta)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Queen's University	X	X		X	X	X		X	X	X	X		X		X	X		X	X	X	X	X	X	X	X	X	X	X	X
University of Victoria	X			X		X		X																					
York University								X	X	X		X				X		X											
CONSULTANTS																													
Atlantic Nuclear Services Ltd.					X	X									X	X	X							X		X	X	X	X
Autonetics Research Association																X			X	X				X		X	X	X	

COMPANIES	Robotics								Machine Sensing								Human Machine Interfaces						Intelligent Computation						
	Actuators	Manipulators	End Effectors	Flexible Links/Joints	Teleoperation	Control Systems	Micro Robotics	Autonomous Systems	Visual Sensing	Motion Sensing	Tactile Sensing	Range Sensing	Active Sensing	Remote Sensing	Sensor Integration	Interp. of Sensory Data	Visual Displays	Virtual Reality	Natural Langu. Interf.	Speech Interpret.	Tactile Interfaces	Knowledge in dBase	Logic Programming	Expert Systems	Knowledge Represent	Neural Networks	Pattern Recognition	Machine Learning	Fuzzy Logic
British Columbia Research Inc.	X			X		X								X	X	X	X				X	X	X	X	X		X		
Behavioural Team																	X	X	X	X	X	X			X				
Canpolar Inc.														X	X														
CLC Limited																							X	X	X			X	
Cognisys Consultants Inc.																X													
Expert Solutions																						X		X		X	X		
Giffels Associates Limited		X	X			X											X						X						
Klastek Limited	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Knowledge Transfer																	X		X			X	X	X	X			X	X
Rhodes & Associates Inc.																	X					X							
Rodex Technologies Inc.	X	X	X	X	X	X		X		X	X	X	X		X	X													
S.L. Ross Environmental Research Ltd.																							X	X	X				
Silico Computer Systems Limited	X	X				X		X							X	X	X	X	X	X	X	X		X	X	X	X		X
Wardrop Engineering Inc.		X			X	X																							

COMPANY INDEX

COMPANY INDEX