# ird to gain respect and funding

## Intelligent Systems

"Intelligent systems," says Dr. Len Schubert of Computing Science, "is a very comprehensive term." It generally refers to teaching a computer to 'think' and solve problems. The way the machine is taught to do this is by equipping it with procedures from making inferences, and for breaking down the task it has been set into separate tasks and problems that must be solved. Intelligent systems research is also concerned with making machines understand 'natural' languages so that commands can be given to them by humans without having to translate them to mathematical 'machine' languages.

"The emphasis in natural language understanding is on software development; there is less need for hardware," says Schubert.

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"The goals of ACMIR are to promote the application of new computer technology..."

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The group is also working with a form of computer vision that would make precise movements of a robot less of an issue. The robot would be taught to "look at its action and correct is," says Schubert. This involves teaching the machine to identify all the things it sees, not just a limited number of them.

There are already some labs in place to allow research. The Intelligent Systems lab is used for research on "knowledge-based systems. Dr. Renee Elio of the Computing Science Department has been directing research in this lab, developing systems for storm forecasting and for qualitative reasoning and concept learning.

The Intelligent Robotics lab is equipped with an extensively modified Heathkit Hero robot that is linked to a powerful computer. The robot can use its ultrasound perception system to orient itself and to locate, grasp and move about a two-foot-high "tree" in the laboratory. A vision system is slowly being installed in it.

## Integrated Production Facility

The Integrated Production Facility group is not currently being funded and thus has no concrete demonstrations to show off. Yet, according to Dr. Toogood of Mechanical Engineering, an integrated production facility would be state-of-the-art in a province that is "15 to 20 years behind the world in the field of automated manufacturing."

As envisioned, the IPF would serve as an "industry scale environment" for other groups within ACMIR to try out their new developments. What Toogood and his associates picture is something called a "work cell". A cell would contain machine tools, robots to add raw materials and remove the finished product, and a warehousing area to store materials and products. Such a cell would "adequately demonstrate the technology by the lowest common denominator," says Toogood. The cell would be self-contained and would allow the benefits and problems of both the tested procedure and cell technology to be discovered.

The IPF would serve two purposes, says Toogood. The first would be to educate both engineering students and industries in Alberta about robotics technology. Now local manufacturers must go to Ontario to find information on integrated manufacturing, robotics, etc. The second aim would be to promote research in robotics, automation, and engineering management, because the resources of the IPF would be available to the campus.

"The IPF is the ideal environment to demonstrate technology and to be used as a research tool," says Toogood.

Despite the lack of visible progress, says Toogood, "we haven't been idle. We can talk about it a lot, because we keep up to date, but we can't show manufacturers how to produce their product. (But with funding), in six months to a year we could be state-of-the-art. We have an evolving image in our minds of what the cell contains. We could almost immediately set up equipment."

These four groups, with their varying states of equipment, form the nucleus of the artificial intelligence and robotics research at the University of Alberta. For the Centre to make any headway, the people involved are unanimous in their emphasis on the importance of funding.

The provincial government's department of Telecommunications, Research and Technology, which funds the Alberta Research Council, supports the ARC's own Advanced Technology Division in Calgary. The Calgary group was formed before ACMIR.

The Alberta Research Council "is not set up to fund science and technology research. They support industry, but have very little theoretical base," says Dr. Wayne Davis, acting director of ACMIR. The ARC "should be a funnel between research work and industry." Instead, other groups have been set up on campus to fulfill that function, such as the Microelectronics Centre, the Laser Research Institute, and the Telecommunications Research Centre. ACMIR, on the other hand, was "set up to foster research at the University rather than an initial direct contact with the industry."

Davis and others associated with ACMIR see the attitude of the provincial government as a major stumbling block towards the continuation of their research. Says Davis, "The government would like to encourage and create industry, but in university the work isn't always directly applicable to industrial problems. However, you have to have a good theoretical grounding before you can do the practical work... you need to support the theory and then you develop the applications."

"The big problem with research," Davis continues, "is that for every good idea that comes out, there's 50 or 100 that don't work."

Davis contrasts the funding for science with that of medicine. "The Alberta Heritage Foundation for Medical Research is getting funding... it's appropriate, but the provincial government has not done similar things with science and technology. That's really quite inappropriate. Medicine is an applied science — if you can't do basic science, you won't be able to apply the techniques."

"There's a touch of paranoia... people don't want to die, therefore it is easy to justify spending large amounts of money on medical care. It's not easy to convince people to spend money on image processing, robotics, where the fundamentals come from."

"Everyone would like to have more research funding," says Bischof of the Computer Vision group "but a lot of work will be created in the area of artificial intelligence. It is something local industries could profit from. Alberta can't survive the next 50 years on grain and oil."

"If the government is serious about the high tech age, they need to supply funding," says Schubert.

Adds Toogood, "It is embarrassing for us, the second largest university in Canada, not to have a real (industrial type) robot."
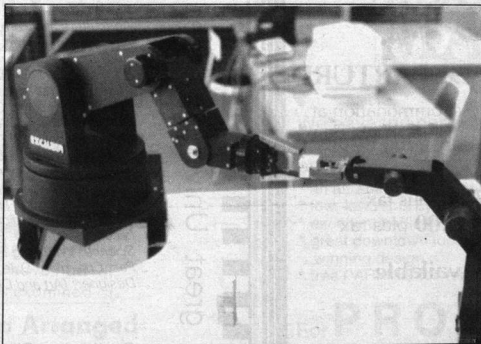


Photo Bruce Gardave

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