

Crane & Hoist

The Business Of Heavy Lifting

CANADA

Volume 1 Issue 2

SPRING 2010 \$5.00

SUPERSIZED

World's largest crane helps lift Alberta's air quality

Never used since being built a quarter-century ago, Krøll K-10000 finds a home at Syncrude's Mildred Lake oil sands operation

STEPHEN DAFOE

A \$1.6-billion project at Syncrude's Mildred Lake oil sands operation in northern Alberta needed a big crane for a key part of the project.

Syncrude is at the mid-point of its mission to retrofit two of the facility's original 1970s cokers with a new flue gas desulphurization scrubber. The company had previously introduced the technology when it expanded its operations in 2006 to include a third coker. Syncrude is anticipating that when the current project is completed, it will be able to reduce sulphur emissions to 60 per cent below current allowable levels.

But working in the tight confines of an active and live facility required a special crane.

Tino Vena, Syncrude's Emission Reduction Project Services manager, said the original concept had been

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INNOVATIONS FROM NEW BRUNSWICK



A gantry crane unloads a container in a demonstration of a programmable logic controller (PLC) system developed a few years ago by Dr. Don Kim and Dr. Jason Bond of the University of New Brunswick. Photo courtesy of Dr. Don Kim

Fuzzy logic lets gantry cranes steer themselves

University of New Brunswick engineers ready to test their software on the Mississippi River.

KEITH NORBURY

Imagine giant gantry cranes steering themselves, without need of an operator, around obstacles on a dock.

A University of New Brunswick (UNB) professor and his team are poised to test such a system in the coming months on the mighty Mississippi River. Dr. Don Kim, an adjunct professor in the university's Department of Geodesy and Geomatics Engineering, is developing the proprietary software to integrate a fuzzy logic controller with the Global Positioning System to enable a gantry crane to steer itself. He is actually doing the work off-campus through a separate company,

Gemini Navsoft Technologies Inc (<http://www.gemini-navsoft.com>).

Kim said he expects to test the system at an undisclosed location on the Mississippi some time in June. "The end of development is by the end of May and then we will deploy the system on site and we'll go through site tests," he said.

The tests will take place on a smaller inland gantry crane but the system is scalable to any size of crane, of any type, "any kind of heavy-duty machinery, or a small car," he said. As evidence of the technology's diversity, one of Kim's other recent projects was to develop a system for robotic lawnmowers.

"It's very computationally intensive," he said. "Normally I need a Pentium processor. It doesn't need much memory. It's

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ECONOMY

Canadian industries awaken from recession

From east to west, crane and hoist businesses reveal what parts of the country are booming and what parts are still sleeping

KEITH NORBURY

How's business in Canada's crane and hoist world so far in 2010 as the country awakens from the Great Recession?

It depends on who answers the question.

In a completely unscientific exercise, we talked with several people in the industries, from companies big and small, from the Maritimes to B.C. As a whole, they're optimistic but realistic. For some business has never been better. For others, it's been a struggle.

But let's let them explain.

"We are quite happy the way things are," said **Shirley MacDonald**, the secretary and go-fer at family owned **Hubtown Crane Service** of Truro, N.S. "There are times when we could use more

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COVER

Fuzzy logic lets gantry cranes steer themselves

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the processing power that is the limitation.”

The amount of power depends on how frequently instructions need to be communicated between the fuzzy logic controller (or FLC) and the GPS. Much depends, for example, on whether those instructions have to be sent every second, 10th of a second or 100th of a second.

“So the general idea is depending on the application, maybe you need a low-grade Pentium level processor. Or if it’s a really safety critical robotics application, then maybe you need really good processing power.”

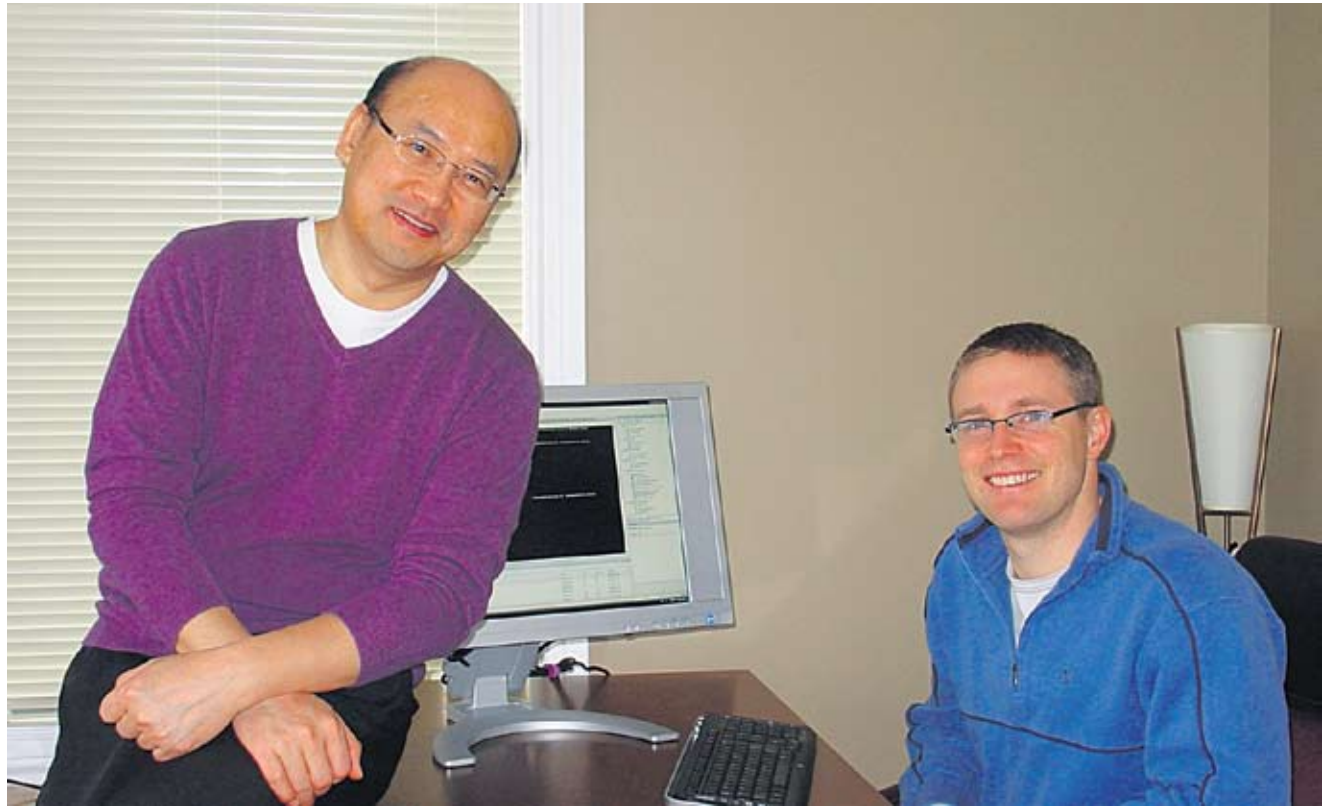
While the system is designed to allow a crane to maneuver autonomously, whether a company allows a crane to move around without a human operator will be up to the company, Kim said. Safety will be a

consideration, he noted.

Today’s GPS units are extremely accurate, with a resolution of one centimetre and a confidence level of 99 per cent, said Kim, who is originally from South Korea and has been at UNB since 1998.

“There is always a safety feature. If the crane senses something is wrong, there is a warning to the operator or it (the crane) will just stop,” Kim said.

He and his colleague, Dr. Jason Bond, are in the processing of a registering a trademark for the system so he didn’t wish to reveal that name until the registration is complete. The latest project builds on work they conducted from 2001 to 2003 that combined a programmable logic controller (PLC) with GPS receivers to determine a crane’s orientation and position.



Dr. Don Kim (left) and Dr. Jason Bond of the University of New Brunswick will soon test their proprietary autonomous gantry crane steering system. Photo courtesy of Dr. Don Kim

Unlike earlier systems, such as digital cameras and transponders, that PLC system does not rely on painted lines to determine the position of the crane’s rubber tires. Instead it uses an electronic map with virtual lines and the GPS to locate the

A note about the controllers

A **programmable logic controller (PLC)** is a microcomputer with hardware and software specifically designed to perform industrial control operations. Unlike general-purpose computers, the PLC is designed for multiple inputs and output arrangements. Controllers (i.e., control systems) could be built based upon different control logics as:

1. A **proportional-integral-derivative controller (PID)** controller is a generic control loop feedback mechanism widely used in industrial control systems. A PID controller calculates an error value as the difference between a measured process variable and a desired setpoint. The controller attempts to minimize the error by adjusting the process control inputs.
2. A **fuzzy logic controller (FLC)** is a control system based on fuzzy logic — a mathematical system that analyzes analog input values in terms of logical variables. Fuzzy logic has the advantage that the solution to the problem can be cast in terms that human operators can understand, so that their experience can be used in the design of the controller. This makes it easier to mechanize tasks that are already successfully performed by humans.

The advantage of FLC compared to PID is that FLC has the capability to control non-linear, uncertain systems even in the case where no mathematical model is available for the controlled system.

tires precisely.

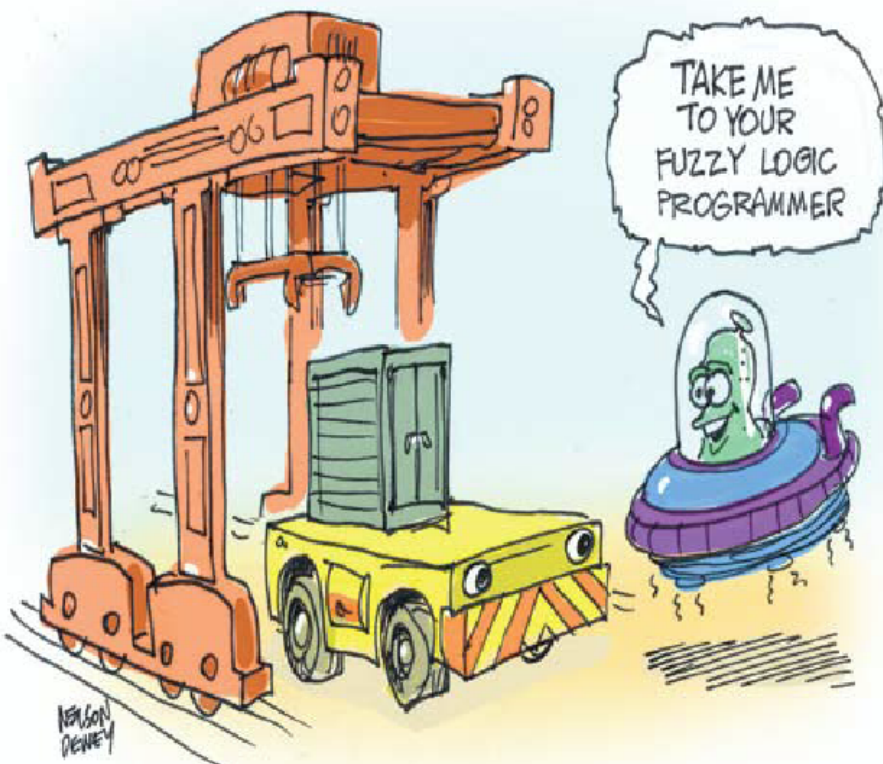
“Induction-loop and transponder systems have a limited effective range of about 10 centimeters,” Kim explained in posting on his website. “If a crane exceeds this range for some reason, there is no way to get it back on track easily. Furthermore, these systems require frequent maintenance.”

In contrast, the crane control system, improves “container-handling productivity and operational safety.” That system consists of three parts: “the anti-sway system, which helps operators accurately

position a crane’s spreader to grab containers; the position detection system, used to identify and cross-check the positions of stacked/unstacked containers; and the auto-steering system, which keeps the wheels of a rubber-tired gantry crane (RTGC) moving along a track (consisting of) either a painted line or an electrical guide wire and prevents it from hitting containers or other cranes in the tightly packed yard.”

One of Kim’s next projects will be to work on a network-based, high-precision, monitoring system with millimeter level preci-

sion. Dr. Bond will lead this project in conjunction with Kim. The final product will be employed in long-term monitoring applications for more static structures, such as buildings or dams. The project is part of a U.S. government initiative to put into place infrastructure for providing safety in populated areas susceptible to natural disasters. Kim has also done aerospace research in Korea and counts among his honours the 2003 Samuel M. Burka Award from the Institute of Navigation for his paper on “ultrahigh-precision GPS positioning and navigation.”



About our cartoonist

Nelson Dewey has been a prolific cartoonist for over 50 years. If his work looks familiar, maybe you read a lot of car comic books when you were younger.

In the 1960s, '70s and '80s, Dewey was a frequent contributor to those comics, particularly *CARtoons*. He also drew for *Hot Rod Cartoons*, *CYCLEtoons*, *SURFtoons* and *SKItoons*. In all, he produced nearly 2,000 pages in those publications.

He has also published cartoons in *Cracked Magazine*, *Maclean's*, *Oui*, *Reader's Digest* and *Motor Trend*, as well as community newspapers in B.C. and Alberta, in addition to illustrating dozens of books. And he shared an Emmy Award in 1988 for his work on storyboards for the *Arthur* cartoon series on television.

To take a trip down memory lane and see samples of Dewey’s car cartoons, go to the website, www.crazy.ca.

ON THE WEB:

<http://gge.unb.ca/Personnel/Kim/gssit/Home.html>.