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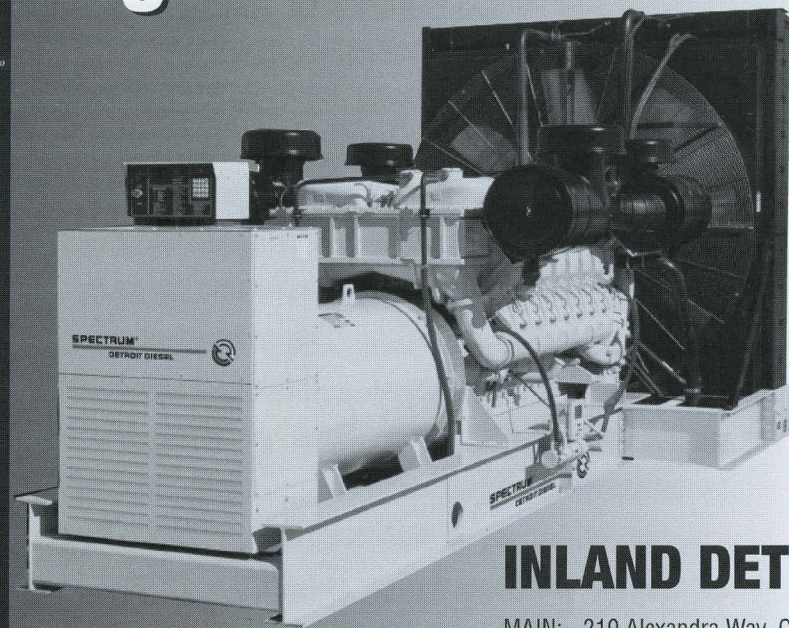
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SCANFAX

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Chicago Section Executive Committee Meeting

Tuesday, December 14, 2004, 7:00 p.m.

DeVry DuPage, Room TBA, 1221 N. Swift Rd., Addison, IL

No Registration Needed

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Researchers Learn How to Give Commands to Robots in English

By Paul Zukowski



When Alexander Graham Bell discovered in 1876 how sound waves could be converted to undulating electrical current and be transmitted over wires, he used his device to summon his assistant with the now-famous words, "Mr. Watson, come here. I want you."

If a modern researcher in robotics said, "Mr. Roboto, come here," to the average mobile robot in another room, it would not know how to respond, and might bump straight into the nearest wall. "Here" would not be meaningful without a detailed route map indicating every turn and distance with some sort of reference system worked out in advance. In other words, natural language is not very meaningful yet to electro-mechanical devices.

Being able to direct mechanical devices with natural language could be invaluable in a number of settings, not the least of which is in the military. So the Navy Center for Applied Research in Artificial Intelligence at the Naval Research Laboratory in Washington, D.C., sponsors

a great deal of the research in this area, as does DARPA.

One of the active university centers studying spatial language for human-robot dialogs is at the University of Missouri-Columbia, where the Electrical and Computer Engineering Department and the Computer Science Department work together on ways to convey linguistic spatial descriptions and other spatial information to robots, and have them respond to questions about their location.

In a paper that appeared in the May 2004 special issue on human-robot interaction of the IEEE Transactions on SMC, lead author, Associate Professor Marjorie Skubic, laid out the case this way:

"In conversation, people often use spatial relationships to describe their environment — 'There is a desk in front of me and a doorway behind it' — and to issue directives — 'Go around the desk and through the doorway.' In our research, we have been investigating the use of spatial relationships to establish a natural communication mechanism between people

and robots, in particular, for novice users. In this paper... we show how linguistic spatial descriptions and other spatial information can be extracted from an evidence grid map and how this information can be used in a natural, human-robot dialog."

She further asserts that the language we humans use to describe our environment shows how we think of that environment, and the ability to use spatial language illustrates a fundamental understanding and reasoning capability. When facing and unstructured environment, spatial reasoning is essential for both humans and mobile robots.

In the experiments, a multi-modal robot interface was used that was developed at the Naval Research Laboratory. It uses sonar sensor readings to generate spatial language from a static snapshot.

The robot spatial reasoning and the NRL Natural Language Processing system provide the capability of natural human-robot dialogs using spatial language. For example, a user may ask the robot, "How

many objects do you see?" The robot responds, "I am sensing 5 objects." The user continues, "Where are they?" The robot responds, "There are objects behind me and on my left."

The paper explains that there has been considerable research on the linguistics of spatial language for humans, but only limited work has been done in using spatial language for interacting with robots. One area that has been explored is a control strategy for directing a semi-autonomous wheelchair along a specified route in a hospital using a sequence of route descriptions, such as "turn left," "enter right door," or "follow corridor." Another researcher equipped a robot with two laser range-finders mounted on pantilt heads and had it respond to commands that specified destination, direction, and speed.

Because humans use speech, gestures, and diagrams to give directions, the robots were equipped to interpret all three. Spoken commands went through an IBM ViaVoice speech recognition system that produces a text string as output which is then analyzed by a natural language understanding system to obtain a semantic representation that can be mapped to a representation the robot understands. PDA-sketched commands are similarly processed into terms the robot understands.

Finally, hand and arm gestures are processed by a Gesture Interpreter and provide input to the representation. For example, the experimenter could point to a location and say "Robot, go over there," or indicate a distance manually while saying, "Robot, back up this far." The interface also provides error handling if a verbal instruction is not linguistically well-formed, or an appropriate gesture is not perceived. The robot is able to generate synthesized responses such as, "Where?" or "How far?"

To get started, for each object in the field of view, the robot computes two histograms of constant forces and gravitational forces, which represent the relative spatial position between that object and the robot.

Features from the histograms are extracted and input into a system of fuzzy rules to generate a three-part linguistic spatial description: (1) a primary direction (e.g., the object is in front), (2) a sec-

ondary direction which acts as a linguistic hedge (e.g., but somewhat to the right), and (3) an assessment of the description (e.g., the description is satisfactory). A fourth part describes the Euclidean distance between the object and robot (e.g., the object is close). Algorithms then enable to robot to compute a path based on going to the right or left of an object, or around it. The spatial language system also supports queries such as, "Where is the nearest object on your left?"

Here is an example of the type of human-robot dialog that is possible:

Human: "How many objects do you see?"

Robot: "I am sensing 4 objects."

Human: "Where are they?"

Robot: "There are objects in front of me. I am surrounded from the rear. The object #4 is to the right of me."

Human: "Where is the nearest object on your left?"

Robot: "The object #1 is mostly in front of me but somewhat to the left. The object is close."

Human: "Where is the nearest object in front of you?"

Robot: "The object #3 is in front of me but extends to the right relative to me. The object is very close."

It's not exactly like having a conversation with 3CPO, but may lay the groundwork for communicating with the next generation of mobile robotic devices.

If you want to try your own experiments, both the ATRV-Jr. and B21r robots used in the above research are commercially available from iRobot. See <http://www.irobot.com>. ■

Paul Zukowski is a freelance writer in Madison, Wis., who often writes on technical topics.



Questions and answers on how NRTL's removed the monopoly for Safety Testing

What is an NRTL?

An NRTL is a Nationally Recognized Testing Laboratory that OSHA has accredited to perform safety testing in the United States.

Why have NRTL's been established?

Formerly Underwriters Laboratories held a virtual monopoly on safety testing. On March 6, 1984, OSHA proposed a comprehensive overhaul of safety regulatory procedures thus establishing the NRTL program. Their goal was to take advantage of developments by others in organizing and evaluating product certification systems and in accrediting laboratories for testing. This established an open competitive market for safety compliance testing and certification similar to the open competitive market for EMC compliance testing.

What is the advantage of having NRTL's?

An open market for safety testing will result in a more competitive turn around time for testing and certification to be completed and will also allow for a more competitive pricing structure. When a manufacturer is not getting satisfactory service from an NRTL, he/she will have the option of going to a different NRTL where they find the service meets their particular needs.

Where do I find an NRTL?

A list of NRTL's can be found on the OSHA web site at www.osha.org/nrtl. There are currently eighteen NRTL's located throughout the United States and Canada. For example, UL, CSA, and TUV are some well-known names that are now NRTL's. There are also several, lesser known organizations with limited scope such as CCL, WL, and ARL. Because of their designation by OSHA, all eighteen NRTL's have the same legal status in the United States.

Is there any place locally where I can get NRTL safety approval?

Yes, there is UL (Underwriters Laboratories) and TUV both in Northbrook, IL. There is also D.L.S. Conformity Assessment, Inc. in Wheeling, IL an Agent of CSA.

What is an Agent of CSA?

CSA (Canadian Standards Association) was established 84 years ago as the Safety Standards Agency in Canada, similar to UL in the United States. CSA, which became an NRTL in 1991 has offices in Cleveland, OH and Irvine, CA. D.L.S. Conformity Assessment, Inc. in Wheeling, IL has become a CSA Agent. Recently CSA established an APD (Agent Program for Data Acceptance) for Testing Laboratories. D.L.S. Conformity Assessment, Inc. was the first laboratory recognized in this program. As a CSA APD Laboratory, D.L.S.

can locally test products to the safety requirements for Medical Devices, Laboratory and Measurement Equipment, ITE Equipment, Industrial Machinery, Household Appliances, Industrial Controls and others.

Testing at a CSA ADP Agent (courtesy of D.L.S. Conformity Assessment, Inc.)

What safety mark will appear on my product?

The safety mark placed on your product will show the NRTL at which it was tested and whether it was tested for the U.S. only, Canada only, or both the U.S. and Canada. Following are some of the Safety Marks for the US and Canada. For a complete listing, see the OSHA web site www.osha.org/nrtl.

For U.S. Only
For U.S. and Canada
UL Marks
CSA Marks
TUV Marks

How can I get more information about NRTL's?

Contact OSHA at www.OSHA.org/nrtl
Contact UL at www.ul.com or at 847-272-8800
Contact D.L.S. at www.dlsemc.com or at 847-537-6400
Contact TUV at www.us.tuv.com or at 203-426-0888

Lunch Meeting

Chicago Chapter of the IEEE Power Engineering Society
Arc Flash

Wednesday, December 8, 2004

Dave Mertz
Burns & McDonnell

About the Topic:

The protection of personnel from the hazards of electrical arc flash produced by electrical equipment has become a priority for utility, industrial and large commercial facility operators. Mr. Mertz will describe the cause of arc flashes, how to determine the potential severity of arc flash events, and how to protect personnel from arc flash hazards. He will also provide references to OSHA and NFPA documents that have made arc flash hazards a topic of recent concern. A time for questions will follow the presentation.

About the Speaker:

Dave Mertz is a senior electrical engineer for Burns & McDonnell Engineering

Company. He is a senior member of IEEE and past chair of the Chicago Chapters of the IEEE-PES and IEEE-IAS. He is a graduate of Valparaiso University and licensed as a Professional Engineer in Illinois and 7 other states. He has 18 years of electrical engineering experience in heavy industrial, utility, transportation, and institutional applications.

Location:

Chicago Bar Association, 321 South Plymouth Court, Chicago, IL (near the intersection of Jackson and Dearborn)

Time:

11:30 Social
12:00 Lunch (optional)
12:10 Presentation
1:00 Adjourn

Reservations:

Lunch tickets can be purchased in the lobby bookstore (\$12.00). Please call the IEEE Business Office by noon on Monday, December 6 2004 at (312)253-4333 or (800) 898-IEEE to make your reservation.

Continuing Education:

IEEE technical meetings may be acceptable as continuing education where required for maintenance of professional engineering licensure. Refer to the individual state's requirements for details.

For More Information:

Please visit the Chicago Chapter IEEE PES web site: <http://peschicago.org>

Evening Meeting

Electronics in Medicine and Biology
Holiday Party/Business Meeting
Monday, December 13, 2004

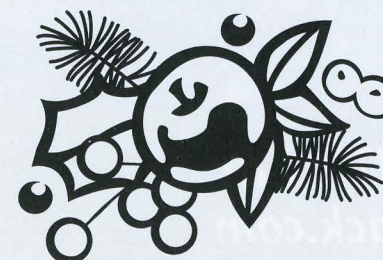
After helping to plan activities for the New Year, toast to their success! Student paper competition staffing and student mentoring programs will be among the topics.

Location:

DeVry University - DuPage
1221 North Swift Road
Addison, Illinois

Time:

7:00 p.m. - 9:00 p.m.



Evening Meeting

The IEEE EMC Society Chicago Chapter
2004 Holiday Party
Tuesday, December 21, 2004

Join your EMC colleagues for great food, fun, and games at this great year-end event!

Location:

Dave & Busters
1155 N. Swift Rd. • Addison, IL 60101 • 630-543-5151

Time:

7:00 p.m. - 10:00 p.m.

Cost: \$5.00/person (includes food and beverages. Cash Bar Only)

RSVP: by Monday, December 6, 2004 to: Carla Robinson
935 National Parkway • Schaumburg, IL 60173
847-874-2063 • carla_robinson@usr.com

For More Information:

IEEE EMC Society www.ewh.ieee.org/soc/emcs/chicago/

Technical Seminar

IEEE – IAS/IES Technical Seminar
2005 NEC® Changes • Saturday, February 19, 2005

About the Topic:

This one day seminar covers the most significant 2005 NEC® code changes, including their relationship to the design, installation, and maintenance in residential, commercial, and industrial locations.

About the Speaker:

NFPA recognized National Electrical Code expert.

Agenda:

- 7:30 a.m. Registration and Continental Breakfast
- 8:00 a.m. Analysis of Definitions; Branch-Circuit Analysis; Service and Feeder Applications; Feeder or Service Neutral Load
- 9:45 a.m. Break
- 10:00 a.m. Grounding and Bonding; Wiring Methods; Conductors for General Wiring; Boxes and Fittings
- 12:00 p.m. Lunch
- 12:30 p.m. Motors, Motor Circuits and Controllers; Hazardous (Classified) Locations; Health Care Facilities; Emergency and Standby Systems

- 2:00 p.m. Break
- 2:15 p.m. Signaling Circuits; Communications Circuits; CATV Circuits; NFPA 70E – Electrical Safety in the Workplace
- 4:00 p.m. Wrap up

Location:

Midwest Conference Center
 401 West Lake Street • Northlake, IL 60164

Time:

7:30 a.m. to 4:00 p.m.

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Reservation:

No online reservations can be made. Please visit our website to download the mail-in registration form. www.iaschicago.com

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EDITORIAL SCHEDULE*

2005	January Issue Editorial Focus: Circuits and Devices Space Reservations and Camera Ready Materials Due: Nov. 25, 2004
	February Issue Editorial Focus: Industrial Applications Space Reservations and Camera Ready Materials Due: Dec. 25, 2004
	March Issue Editorial Focus: Communications Technology Space Reservations and Camera Ready Materials Due: Jan. 26, 2005
	April Issue Editorial Focus: Electromagnetics and Radiation Space Reservations and Camera Ready Materials Due: Feb. 25, 2005
	May Issue Editorial Focus: Education/Universities Space Reservations and Camera Ready Materials Due: March 25, 2005
	September Issue Editorial Focus: Energy and Power Engineering Space Reservations and Camera Ready Materials Due: July 26, 2005
	October Issue Editorial Focus: Computers Space Reservations and Camera Ready Materials Due: Aug. 25, 2005
	November Issue Editorial Focus: Signals and Applications Space Reservations and Camera Ready Materials Due: Sept. 27, 2005
	December Issue Editorial Focus: Systems and Control Space Reservations and Camera Ready Materials Due: Oct. 25, 2005

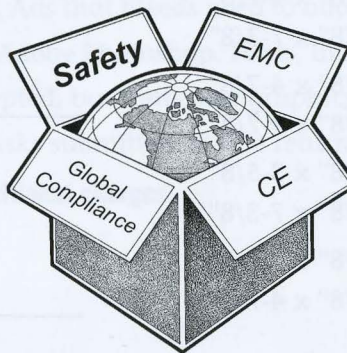
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