2013 RESEARCH EXPERIENCE FOR TEACHERS - ROBOTICS

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BACKGROUND

Can be deployed in hazardous areas
Solar Explorations
Contamination cleanup
Assist the elderly
Assisting soldiers
Autonomous spacecraft
Search and rescue
Unmanned vehicles
Asteroid research

What good could an autonomous robot do?

Why would anyone want two robots to follow each other?
GOAL OF PROJECT

Our goal is to get multiple robots communicating with one another via Bluetooth connectivity.

Set up a Lead-Follow relationship between two NXT Lego robots using Mindstorms programming.

CURRENT RESEARCH

- Monitoring elevation changes in glacial regions using vision based odometry
- Passenger carrying robots
- Assistive Robotics
- Natural Disasters
- Search and Rescue
MONITORING ELEVATION CHANGES

Large crevasse

Irregular surface and melt pools

ASSISTIVE ROBOTS
SEARCH AND RESCUE

LEGO MINDSTORMS

- Easy to use
- Easy to program
- Fun!
- Multiple sensors
- Bluetooth capable
Using a light sensor, the robot is able to distinguish between dark/light areas and follow this black line.

**STEP 1:**
**FOLLOW THE BLACK LINE**

**PROGRAMMING**

**PROGRAM I:**
- Light: Turn left
- Dark: Turn right

**PROGRAM II:**
- 1: Hard left
- 2: Easy left
- 3: Go straight
- 4: Easy right
- 5: Hard right
LINE FOLLOW TROUBLESHOOTING

Sensor reads <50%

Sensor reads >50%

Sensor reads <50%

Sensor reads >50%
CHALLENGES

Now that the lead robot can successfully follow a black line, our next challenge is finding the most efficient method of getting the other robot to follow.

- What do humans do?
- Use sensors?
- Communicate actions?

Programming Bluetooth on each robot:
- Need a program for lead robot to send a message
- Need a program for follow robot to receive a message
Success!

...actually not.
BLUETOOTH AND NXT-G

Ability to access and adjust Bluetooth settings is limited.

NXT-G allows for approximately 13 messages per second with delays between messages at about 100 msec.

Continuous synchronization between sent and received Bluetooth messages prevented reliable communication.

ALGEBRA LESSON PLAN

Students will use direct variation as an introduction Linear Functions and the concept of rate of change and slope. The Mindstorm NXT Robot will be used in the activity.
PHYSICS LESSON PLAN

Balloon Drop Activity:
Students will use knowledge of kinematics equations and the movement of falling objects to coordinate the timing required to drop a water balloon on a robot moving at a constant velocity.

REFERENCES