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

Why would anyone want two robots to follow each other?

What good could an autonomous robot do?
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

- Image of debris and rocks
- Image of a drone
- Image of people working in water with a yellow buoy
- Image of a robot near a car
LEGO MINDSTORMS

Easy to use
Easy to program
Fun!
Multiple sensors
Bluetooth capable
STEP 1:
FOLLOW THE BLACK LINE

Using a light sensor, the robot is able to distinguish between dark/light areas and follow this black line.
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
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
PROGRAM I:
Light: Turn left... send 2
Dark: Turn right...send 5

PROGRAM II:
1: Hard left
2: Easy left
3: Go straight
4: Easy right
5: Hard right
send 1 → 5
Success!

...not actually.
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 to Linear Functions and the concept of rate of change and slope. The Mindstorm NXT Robot will be used in the activity.
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.


