**CS 375 Robotics Project**

This project aims at using robotics to engage and inspire students to learn concepts in the Computer System course.

Objectives

1. To use robots, an example of embedded systems, as a case study to contrast and compare architectural and organizational characteristics between embedded systems and general-purpose computers.
2. To stimulate students’ interest and appreciation in hardware-level programming using hands-on labs that will require students to control robots by programming in assembly language.
3. To demonstrate the concept of multithreading using robotics.

Project Description

The project consists of three parts

1. Research (40%) – done independently, NOT a group project

Compare and contrast computer system features of Lego NXT Robot and your computer by completing the table provided to you on page 3. The features include:

1. CPU (manufacturer, architecture, and clock rate)
2. Volatile memory (type and capacity)
3. Non-volatile storage (type and capacity)
4. Input devices
5. Output devices
6. Data communication mechanisms
7. ISA (instruction style and endian)
8. CISC or RISC
9. Programming (60%) – group project

This is done as in-class robotic activities to solve the following problem.

(Your first task is to give your robot a cool name.)

Problem description

**A not so long time ago**

**in a galaxy not so far, far away …**

**(music …) The robot bravely attempts to**

**deliver supplies to the Sky Trouper Base 42**

**by navigating on a short Straight Space Track**

**that can be detected by a special device installed**

**on the robot. But the evil Dark Vapor is sabotaging**

**the mission by positioning a big asteroid to block the**

**route. The robot should go around the asteroid using**

**a different section of the Space Track to accomplish the**

**mission by following the instructions given by Commander χ.**

**Help me, the Robot Builders, you are my only Hope!**

Details:

Develop a multithreading program in NXB to accomplish the following task:

- Start the robot. It moves forward, senses touch, rotates 180 degrees, and moves forward.

- Clap, sensed by the sound sensor, and light sensor is activated to begin reading and following the track

- Once the robot makes it around the track, wave hand in front of the ultrasonic sensor. The robot should rotate 180 degrees, move forward a bit, stop, and play a song/music.

(Potential extensions

1. The track is free-shaped, i.e., not limited to oval.

2. Others suggestions are welcome.)

1. Tournament? (Extra fun)
2. Survey (Extra credits)

Submission

The project is due 4:00PM December 5, 2018. Submit the research report and code to D2L. A demo should be given (and the optional tournament will be held) on that day as well.

**Acknowledgement:**

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CS 375 Robotics Project Part I - Research Student Name:

|  |  |  |
| --- | --- | --- |
|  | My Computer | Lego NXT |
| CPU  Manufacturer  Architecture  Clock rate |  |  |
| Volatile memory  Type  Capacity |  |  |
| Non-volatile memory  Type  Capacity |  |  |
| Input devices |  |  |
| Output devices |  |  |
| Data communication mechanisms |  |  |
| ISA  Instruction style  Endian |  |  |
| CISC or RISC |  |  |