Initial Plan

Project Title: Outreach Engagement Activity
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Module Code: CM3203
Module Title: One Semester Individual Project
Credits: 40

Project Description

The Raspberry Pi and the Arduino have caught the imagination of people from the age of 8 to 80. They both provide an excellent opportunity for people to learn how to programme and how to integrate hardware and software. This project aims to teach students of ages 14/15 to learn how to programme using a robot that will be made using the Raspberry Pi and the Arduino. Therefore it is my challenge to come up with a robot that uses both the Pi and the Arduino. The Raspberry Pi will be used for all the high computational requirements where as the sensors and other peripherals will be connected to the Arduino. This would involve building a Robot Operating System (ROS) and creating a way in which the two devices can communicate with each other.

Project Aims and Objectives

- **Build a moving robot/vehicle.**
  - Using a Raspberry Pi and Arduino.
  - Discuss why to use the Raspberry Pi and Arduino for such a project?
  - Get the Raspberry Pi and Arduino talking to each other.
  - Allow the robot to take simple input commands for its navigation.
  - Make the Robot use sensors to navigate its path without bumping into objects.
- **Teach school children the basics of programming by making them type in commands that make the robot move.**
  - How computers work?
    - Take individual instructions as input and execute them them.
    - Take multiple instructions as input and execute them (script).
  - Where robots are used in today's society?
  - Link the students back to the Cardiff School of Computer Science Curriculum.
  - Evaluate whether the project is aimed at the right age group (14/15) and if not then what age group it should be aimed at.
- **Discuss other commercially available robots that offer similar services.**
  - What makes them successful.
  - Where there is room for improvement.
  - E.g: Lego WeDo 2.0, Codie

Secondary Aims and Objectives

- Make it follow a certain path which could be laid out using masking tape.
- Allow student to come up with designs for the robot.

Build Plan

Step 1:
• Connect Raspberry Pi and Arduino and exchange information between them
Step 2:
• Connect sensors and motors
• Have sensors and motors feed/receive data to and from the Arduino/Raspberry Pi
Step 3:
• Connect wheels and base

Work Plan

Week 1 - (25th - 31st January)
• Do research into available hardware and choose according to usefulness to the project.
• Acquire basic hardware and set-up hardware.
• Deliverable: Small write up discussing the various hardware solution.
Week 2 - (1st - 7th February)
• Learn the Basics of the Raspberry Pi and Arduino.
  • Get them to communicate and share information with each other
• Do research into available sensors, motors, robot base and wheels.
Week 3- (8th - 14th February)
• Acquire motors and sensors.
• Start basic build of Robot.
• Milestone: Built Robot (does not have to be functional in terms of movement).
Week 4 - (15th - 21st February)
• Acquire wheels and Robot base.
• Start programming Robot to take inputs and execute single inputs.
• Milestone: Robot moves taking simple inputs.
Week 5 - (22nd - 28th February)
• Start programming Robot to take multiple inputs and execute scripts.
• Deliverable: Robot that moves taking input of a script with many instructions.
Week 6 - (29th February - 6th March)
• Develop a lesson plan
• Deliverable: Lesson plan
Week 7 - (7th - 13th March)
• Develop test and evaluation plans
• Deliverable: Testing plan and evaluation methods
Week 8 - (14th - 20th March)
• Potential visit to school
• Testing and evaluation
Week 9 - (21st - 27th March)
• Testing and evaluation
• Report writing
• Secondary objectives
  • Make the Robot follow a certain path.
• Deliverable: Final testing and evaluation report.
Week 10 - (28th March - 3rd April)
• Report Writing
• Secondary objectives
  • Make the Robot follow a certain path.
Week 11 - (4th - 10th April)
• Report Writing
• Secondary objectives
  • Make the Robot follow a certain path.
Week 12 - (11th - 17th April)
• Report Writing
• Deliverable: Final individual report.

Please note that the final report is due 6th of May 2016 therefore I have given myself three weeks just in case of delays due to failure of any of the components or delays in receiving the components and incase the school visit cannot take place for when it is scheduled.

Please find below the list of supplies needed and the relevant costs. For items that have not been chosen with 100% certainty I have used the abbreviation TBC (To Be Chosen).

Item	Alternative Link	Alternative Link 2	Cost	Amazon Link	Cost
Arduino Uno Rev3	http://tinyurl.com/jgj4bxg	http://tinyurl.com/jm35css	£16/£22.20	N/A	N/A
Raspberry Pi 2 Model B Board 1GB RAM	http://tinyurl.com/hjzkx74	N/A	£27	http://tinyurl.com/hhc3d2l	£29.5
Raspberry Pi 2 Model B Board 1GB RAM + Starter Kit	N/A	N/A	N/A	http://tinyurl.com/hhc3d2l	£50
SunFounder Project Universal Starter Kit For Arduino	N/A	N/A	N/A	http://tinyurl.com/zvzump5	£16
Solderless Breadboard - MB102 830 Tie-point Quad Power Rails	http://tinyurl.com/zgxz3o6	N/A	£3.75	http://tinyurl.com/zc6t5fx	£2.75
USB Wireless WiFi Dongle Adapter 150 MPS	N/A	N/A	N/A	http://tinyurl.com/jgzkxa2	£6
IR Obstacle Sensor	http://tinyurl.com/zb7yfgh	N/A	£4.15	http://tinyurl.com/jguyyhy	£5.50

Item	Alternative Link	Alternative Link 2	Cost	Amazon Link	Cost
InfraRed IR Line Sensor/ Follower	http://tinyurl.com/h2bywh5	N/A	£2.20	TBC	N/A
HC-SR04 UltraSonic Distance Sensor	http://tinyurl.com/hcf9byk	N/A	£1.95	TBC	N/A
DC Motors	TBC	TBC	N/A	TBC	N/A
Servos	TBC	TBC	N/A	TBC	N/A
Robot Base	TBC	TBC	N/A	TBC	N/A
Wheels	TBC	TBC	N/A	TBC	N/A
Item	Alternative Link	Alternative Link 2	Cost	Amazon Link	Cost