DE 1.3 Electronics 1

Team Project Specification - 2018

Peter Cheung, v2.0

AIM

To integrate programming with electronics in order to apply what you have learned in the DE 1.3 Electronics module to implement a vehicle that can avoid obstacles, "sniff" out rocks on the simulated Mars surface and participate in a soccer penalty shootout competition.

LEARNING OUTCOMES

To learn practical application of electronics and programming in the following four areas:

- Drive – how to drive and control electrical motors (DC and servo)
- Sense – how to capture, handle and process sensor signals
- Link – how to communicate between two electronics modules
- Do – how to use computer programmes to provide a degree of intelligence and adaption to the environment

TEAM PROJECT

Students will work in teams of four to design and build a robot vehicle with multitude of capabilities. This will be based on a two-wheel motor chassis which is provided, and the group is required to design the rest of the vehicle including the mounting for the Black Board containing the microcontroller and other electronic modules. The controller is based on the PyBoard running MicroPython, and the remote control will be through Bluetooth connection to an iPhone or an Android phone running a mobile application (provided). The team is required to design the necessary physical mechanism and develop the Python program to meet three milestones as specified below. Note that your design must be such that it can disassembled without destroying things! Therefore do not use glue-gun or sticky tapes.

The project provides scopes for students to:

- apply their design skills to create a robotic vehicle that works well and looks good;
- apply what they learned in electrical engineering to build the electronic system including the sensors, the drive motors and the microcontroller hardware;
- apply what they learned in computing to provide "intelligence" to the vehicle to adopt to the environment to achieve specified goals.

Assessment for the Group Project will consist of:

- Short team Oral with an Examiner on Tue 26th June 2018 and demonstrate the capability of the team's vehicle on three milestones.
- Achievement in Mars roving and rock sniffing competition.
- Achievement in penalty shootout competition.

This project will contribution to 20% of the DE1.3 module. 50% of the Team Project marks will be common to all team members, and the remaining 50% will be allocated using **Web PA**. Anyone NOT participating in web PA will be subjected to a penalty mark being deducted.

TEACHING STAFF

Module Leader: Professor Peter YK Cheung
Project Assessors: Dr James Davis, Dr David Boyle and Mr Erwei Wang

ORGANISATION AND STRUCTURE

There will be sixteen teams, each with four students (except one with three), form from two Lab 4 pairings.

Each team is provided with two sets of motor chassis, two Pyboards, two BlueFruit boards, two ultrasound, infrared and Hall effect sensors, and various basic components that they need. They will use their own laptop computers to program the Pyboards.

MILESTONES AND DELIVERABLES

1. **Roaming Car** - To build the vehicle so that it roams around a room without bumping into walls. This involves first designing the vehicle chassis to mount the motors, the Black Board and a third "wheel". Obstacle detection is through one or more infrared sensors. You must write a Python program for the Pyboard and using the infrared sensor module and the PWM motor control chip to implement an autonomous vehicle that does not bump into things.

   Target completion date: 14th June. Demonstration on 26th June.

2. **Moon rover with rock sniffing** – To implement a remote-controlled rover that explores the moon surface to identify three types of rocks: inert, ultrasonic and magnetic. Only one vehicle is required.

   Target completion date: 21st June. Competition on 26th June.

3. **Penalty Shootout** – To design and make a "ball kicking" mechanism such that the car will go backward 0.5m from a ping-pong ball, then advance forward and "kick" the ball towards a goal. The kicking mechanism can be in any form of actuation, and does not need to physically imitate the kicking action. Only one vehicle is required.

   Target completion date: 21st June. Competition on 26th June.

SCHEDULE (TEAM PROJECT)

Date	Target Goal
7th June 2pm – 5pm	Team Project – Session 1 (Start of Project & Lab Oral)
14th June 2pm – 5pm	Team Project – Session 2 (Complete obstacle avoiding vehicles)
21th June 2pm – 5pm	Team Project – Session 3 (Mars rover and penalty kicker)
26th June 2pm – 5pm	Team Oral, Demonstration, Competition

DE 1.3 Electronics Project Team (2018)

Team	Surname	First Name	Group
1	Coudray	Elvire	12
1	Ibanez Jimenez	Angela	12
1	Newman	Medad	15
1	Ridge	Mark	15
2	Brown	Rachel	4
2	Hunt	Maxim	4
2	Cope	Ella Grace	8
2	Kotler	Jordan	8
3	Imrie	Hannah	16
3	Shi	Wu Jie (Helen)	16
3	Collis	Benjamin	25
3	Melconian	Marcus Richard	25
4	Bazanye-Lutu	Sean	28
4	Paul-Ebiai	Emma Uloma	28
4	James	Edward	31
4	Scheel	Imogen	31
5	Kundrak	Franciska	17
5	Stevensen	Max	17
5	Alves De Freitas	Higor	24
5	Higgins	Maria	24
6	Posirisuk	Pasinee (Muk)	10
6	Supanwanich	Sirada (Noom)	10
6	Garland	Robert	14
6	Kerr	William	14
7	Morjaria	Priyen	5
7	Pitt	Barty	5
7	Cowan	Natasha	30
7	Hung	Rikki	30
8	Manzano Kharman	Aida	22
8	Murray	Felix	22
8	Maltby	Esther	27
8	Prior Hope	David	27

Team	Surname	First Name	Group
9	P-Powell	Jessica	6
9	Qureshi	Hannah	6
9	Knaze	Tomas	23
9	Upton	Harvey	23
10	Albanell Flores	Jordi	7
10	Elfadil	Mohammed	7
10	Hussey	Sacha Mary	18
10	Taicher	Mia	18
11	Anderson	Joshua	1
11	Hay	Euan	1
11	Arcos	Clara	19
11	Luo	Alison	19
12	Ng	Meng Jing	20
12	Ng	Jingtong	20
12	Tai	Aisling	20
13	Hillery	Luke	3
13	Hussain	Muhamm	3
13	Alexander	Grace	13
13	Soneji	Puja	13
14	Holland	Luke	11
14	Lee	Elvis	11
14	Dowling	Lauren	26
14	Lomax	Alisa	26
15	Fung	Trevor	21
15	Ho	Chun Hei (Ryan)	21
15	Pirmohamed	Sana	29
15	Thurston	Daniel Francis	29
16	Mather	Amy	2
16	Moody	Joshua	2
16	Sosa	Bettina	9
16	Weill	Judith	9