School of Science and Engineering

ENG103 Internet of Things

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Major IoT Project

Overview

This assessment gives students the opportunity to implement a major project using the micro-computer and Python programming, electronics circuits, sensors and/or actuators, and IoT communication networks. Students can either do a defined IoT project or an open IoT project based on student interest to meet the assessment rubrics. Students will communicate the findings and outcomes of the project through a poster.

As part of the project, students are required to provide individual reports outlining each member's contribution into the completed project and complete a peer assessment of the contribution from other members of the group. Guidance will be provided on teamwork skills, how to manage group processes, and giving and receiving constructive feedback.

Student Name: ___________________

Student ID: ______________________

1 Learning Objectives

In this assessment, students will undertake a major IoT project and be assessed on:

- Implementation of digital and analogue sensors and programmatically interpret their signals;
- Creation of automated solutions by finding and modifying simple microcontroller programs;
- Interpretation of program code and scripts in a range of applications,
- Navigation of a command-line driven operating system to control a computer and configure a range of applications; and
- Designing a poster to communicate the project findings and outcomes.

2 Project Specification

The major project will be undertaken from Weeks 9 to 13 using an Agile "Sprint" methodology. Each sprint is a piece of time boxed work (in our case, each sprint is a week) which is a short, modularised piece of development/testing which aims to meet the sprint goal/milestone. The project design and outcomes will be documented in a report and poster. There are five sprint tasks for the project as shown in Table 1. Note that the "weighting column" is only for guidance on the amount of recommended effort/time to spend on each task and milestone.

Table 1. Sprint tasks for Major IoT Project.

5-Week IoT Major Project Sprint		
Week	**Task and Milestone**	**Weighting**
9	Task 1: Problem definition and conceptual design	10%
10	Task 2: Hardware design (sensors, electronic circuits, Raspberry Pi connections, e.g. Fritzing)	10%
11	Task 3: Software design (algorithm and Python code)	10%
12	Task 4: Additional functionalities (e.g. IoT communications, database, graphical output, etc.), preliminary poster for peer feedback	10%
13	Task 5: Submission of final report and poster	10%

Students can either do a defined IoT project or an open IoT project based on student interest. Students will communicate the findings and outcomes of the project through a poster.

2.1 Defined IoT Project

The specifications of the defined IoT project for this year is shown below.

IoT Home Healthcare System

Pulse oximeters are devices used to measure blood oxygen levels or the saturation of oxygen in the blood. For your major IoT project, design and implement an IoT healthcare system for home use using the Raspberry Pi which is able to measure the patient heartbeat (beats per minute (BPM)) and the amount of oxygen in the blood (pulse oximetry). A conceptual diagram of the heartbeat sensor and pulse oximeter operation is shown below.

The IoT system will have the following basic capabilities:

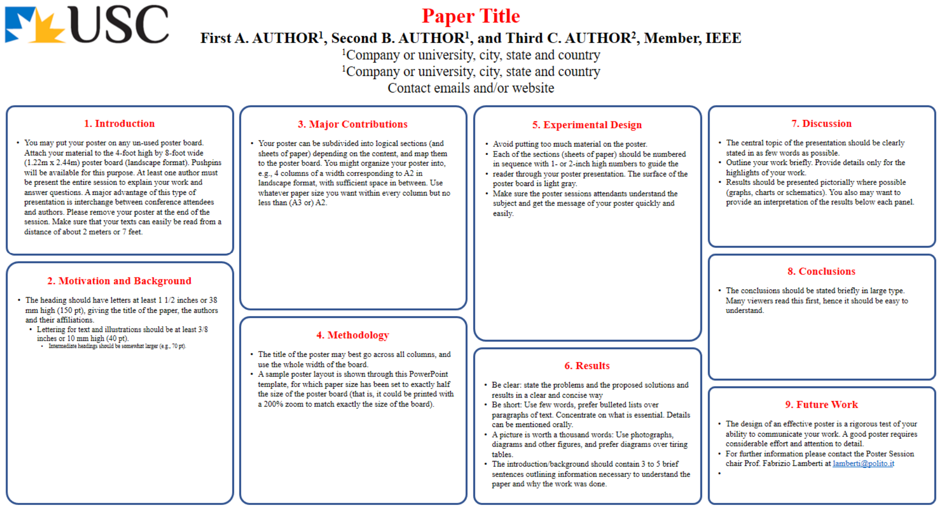
1. Measure and display the heartbeat in terms of BPM on a screen (PC or otherwise).
2. Measure and display the oxygen level in terms of S_pO_2 on a screen (PC or otherwise).
3. Set critical thresholds for the S_pO_2 and BPM levels. If the measured levels go below the critical thresholds, the system will:
   a) Rapidly blink a red LED; and
   b) Send a SMS message to a mobile phone with the message "ENG103 << your group member names >> Health Alert: Oxygen level is xx% and BPM is yy%" where xx% and yy% are the measured S_pO_2 and BPM levels.

2.2 Open IoT Project

Instead of doing the Defined IoT Project in 2.1, students have the flexibility and option to do an Open IoT Project based on student interest to meet the requirements of the assessment rubrics. Note that the complexity and effort required for the Open IoT Project needs to be judged to be at least equivalent to the work required for the Defined IoT Project. Students opting to do the Open IoT Project agree that the terms and letters in the rubrics serve only as guidelines for marking, and that the spirit in which the rubrics are given will also be considered in the grading.

2.3 Poster

Students will communicate the findings and outcomes of the project through a poster. The format of the poster is open to interpretation but should include the title of the project, the names of the group members, the affiliation of the students ("University of the Sunshine Coast" with either the Moreton Bay or Sippy Downs address), and an abstract/introduction. A sample is shown below. In Week 12, students have the opportunity to upload a preliminary version of their poster to obtain feedback from other students before submitting the final poster in Week 13.



2.4 Assessment Rubrics

The assessment rubrics are shown below.

Criteria	FL	PS	CR	DI	HD
Problem definition and conceptual design (10%)	The problem is not defined and no conceptual design is given.	The problem is somewhat defined and the conceptual design does not make a clear argument for the scientific validity.	The problem is adequately defined and the conceptual design makes a sufficient argument for the scientific validity.	The problem is well defined and the conceptual design makes a good argument for the scientific validity.	The problem is comprehensively defined and the conceptual design makes a precise argument for the scientific validity.
Hardware design (sensors, electronic circuits, Raspberry Pi connections, e.g. Fritzing) (10%)	The hardware design is not appropriate to the project.	The hardware design is somewhat documented, uses at least one sensor/actuator component and demonstrates little usefulness for the integration.	The hardware design is adequately documented, uses at least two sensor/actuator components and demonstrates partial usefulness for the integration.	The hardware design is well documented, uses at least three sensor/actuator components and demonstrates some usefulness for the integration.	The hardware design is comprehensively documented, uses at least three sensor/actuator components and demonstrates strong usefulness for the integration.
Software design (algorithm and Python code) (10%)	The software design is not appropriate to the project.	The software design is somewhat documented, makes little use of Python features, and demonstrates little usefulness for the application.	The software design is adequately documented, makes some use of Python features, and demonstrates partial usefulness for the application.	The software design is well documented, makes good use of Python features, and demonstrates good usefulness for the application.	The software design is comprehensively documented, makes excellent use of Python features, and demonstrates strong usefulness for the application.
Additional functionalities (e.g. IoT communications, database, graphical output, etc.) (10%)	The project does not demonstrate any additional functionalities.	The project demonstrates one additional functionality which somewhat integrates into the hardware and software.	The project demonstrates one additional functionality which usefully integrates into the hardware and software.	The project demonstrates two additional functionalities which somewhat integrates into the hardware and software.	The project demonstrates two additional functionalities which usefully integrates into the hardware and software.
Poster (10%)	The poster is not appropriate to the project.	The poster is distractingly messy or very poorly designed. It is not attractive.	The poster is acceptably attractive though it may be a bit messy.	The poster is attractive in terms of design, layout and neatness.	The poster is exceptionally attractive in terms of design, layout, and neatness.

2.5 Report Submission and Poster

Q1. Upload your report as a PDF file and paste into the box below to demonstrate that you have successfully completed this task. Your report should contain four sections corresponding to the four tasks and milestones (Tasks 1 to 4). [40 marks]

Q2. Upload your poster (Task 5) as a PDF file and paste into the box below to demonstrate that you have successfully completed this task. [10 marks]