

**CG3002 Embedded System Design Project**

Semester 1 2017/2018

**“Dance Dance”**

**Design Report**

<Remember to save this report as G***XX***.docx, where XX is your project group number>

<Think about how to split your teams into sub-teams, i.e. software, firmware, hardware. It is also a good idea to have a nominal team/subteam lead.>

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Group **XX** | Name | Student # | Sub-Team | Role |
| Member #1 |  |  |  |  |
| Member #2 |  |  |  |  |
| Member #3 |  |  |  |  |
| Member #4 |  |  |  |  |
| Member #5 |  |  |  |  |
| Member #6 |  |  |  |  |

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The main aim of this report is to **explain your ideas and designs.** Make sure the reviewers have enough details to give you feedback and advice.

The report will be graded based on:

1. Quality of information.
2. Quality of design: Clearly thought out, Feasible, Easy to manage etc.

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**Section 1 System Functionalities**

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Describe the intended system functionalities**.** It is important to let us (the reviewers) have a clear idea of how the system functions from an external viewpoint (i.e. the user viewpoint).

You can use any of the following:

* Use case diagram with use case description
* Feature lists
* User story

Note that you are not limited to the above options.

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**Section 2 System Architecture**

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Please give:

1. Use a UML deployment diagram or similar to illustrate the high level system architecture of the intended system. Among other things, indicate clearly:
   1. What do you intend to implement on the Raspberry Pi and the Arduino Mega.
   2. The communication protocol between the Mega and Pi, and between Pi and Server.
   3. Any additional hardware components (in addition to the standard set given).
2. Description / drawing of the intended final form of the system, i.e. as a wearable shirt, vest etc. Try to indicate the placement of the hardware components if possible.

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**Section 3 Component Interactions and Design**

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Please give:

1. The main algorithm for the activity detection problem. Start with a 4-6 major steps algorithm then briefly elaborate how to accomplish each step (e.g. what known algorithm to use, what hardware component plays a part, if machine learning is used, how training data is gathered and used etc).
   1. If appropriate, give a UML sequence / collaboration diagram.
2. Briefly explain how you will port FreeRTOS for the Arduino Mega and how you will leverage it.
3. List the set of processes that you intend to create on the Mega and RPi, the purpose of each process, and synchronization mechanisms that you will use to coordinate the processes.
4. Show a detailed algorithm on how you intend to coordinate between the Mega and the RPi.
5. Detail how you will communicate between the RPi and the evaluation server. Explain when and how secure communications is ensured.

Throughout, explain why you chose this design, adding references to prior research where appropriate.

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**Section 4 Hardware Details**

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Please provide:

1. Clear identification of components/devices (part numbers), as well as the supporting components required to get them to work, such as resistors and capacitors. Attach / give links to the datasheets.
2. Pin table: Which pins/interfaces of RPi/Arduino will be used, and how the various components/devices are connected to these pins.
3. Operating voltage level and current drawn by each component/device, and how your design takes care of these requirements.
4. Some idea of the algorithms / libraries you would be using to get these hardware to work (including links), or if you are writing own code, the relevant registers and configuration commands.
5. Identify all the subsystems in your prototype and estimate their power consumption.
6. Do the necessary calculations for battery design (ensure that you have the correct battery characteristics graph based on the type of your battery).

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**Section 5 Project Management Plan**

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Give a brief timeline (weekly will do) of your internal deliverables and milestones. Try to align with the tentative evaluation timeline to make sure you have enough time to meet all CA requirements. Gantt chart or similar is a good way to summarize your plan.

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**Section 6 Societal Impact <Final Report>**

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This is where you get to dream big and discuss potential societal implications of your project!

How can your dance detector be generalized to other forms of activity detectors, and used for greater societal impact? How will activity detector systems impact ethical concerns, for instance privacy? How can such concerns be balanced? Go wild! ☺

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**References**

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List all references here.

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