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PROJECT PLAN

CCE4999 PROJECT ACTIVITY

MOHAMED AL-JANABI M00461666

SHIRWA HAJI

# Introduction

The purpose of this document is to serve as a systematic and reasonable approach, to the allocation of workloads and deliverables. A project plan must fully map out; who does what, and when things will happen.

Furthermore, this is a breakdown of the work packages that will be developed and tested to deliver the elements necessary, appropriate and fit for a project of this scope.

A carefully devised and well thought through project plan can make a different between success and failure. It is therefore up to the team players to make sure this can be implemented, by listing certain tasks and operations that must happen within a reasonable timeline, through approximate calculations.

As no project plan is ever guaranteed to reach a 100% expectation mark, it can however act as a guideline and the team players can refer to it systematically and work in harmony with it. It is the responsibility and duty of the team players, to make sure they can delegate and work in accordance.

Co-coordination, consistency and co-operation are key to making this project a success.

## What needs to be done?

A project of this scope needs profound research time and careful analysis of all components and elements. They must blend in harmony and make sure that all the components and elements harness appropriately. For such, if any of these components are picked out of hastiness, due to poor lack of time management skills, then this can result in unnecessary delays. These delays can be avoided with good time management skills, which is really what the IT industry demands.

First, there has to be an evaluation of the 6DOF Stewart Platform chair. The reason this is important is because the team players have to become familiar with the mechanisms and dynamics of the chair. It is also useful to take pictures and film footage, in order to analyze where certain hardware devices (e.g. sensors) will be assembled. This saves unnecessary delays and leg work.

The team players must also meet up to study the 3 modules that will be built and in what programmed language is deemed fit. The 3 modules that need to be created are: Watcher (now known as ***Monitor***), Test Command Server and Sensor Server.

Once it has been decided what programming language will be used to build the 3 modules, the participant must take it upon himself to study the programming language and create the modules.

While all this is going on, the other member must research into appropriate sensors that meet the reading measurements criteria for the project. This will be documented and a range of sensors will be considered, as well as including the costs.

In summary this is what needs to be done for the preliminary stage of the project:

* Analyze the 6DOF Stewart Platform Chair
* Take pictures of the chair and film footage for referral means
* Study the project brief and decide on a suitable and appropriate programming language for the 3 modules
* Research into sensors and microcontrollers, in order to help complete this project successfully
* Meet with Co-partner and present findings on suitable hardware’s
* Divide the workload between the members and agree to frequent meetings, to reflect on current progress and advance

## Who is going to do the tasks?

This can simply be answered by referring to the allocation of tasks in the subsequent pages. The allocation of tasks helps in cutting down the workload, in which every team player has his ‘niche’. This ‘niche’ is about facing up to the challenges and committing to them.

**Shirwa** will solely focus on the technical and practical side of the project. The actual execution of tasks can be seen on page 4. The *technical side* of the project is only a consolidated term, for the half of the project he is committed to. He is mainly responsible for the hands on practicality of the project.

This includes:

Wiring up of the microcontrollers, configuring sensors, obtaining sensor readings, measuring sensor data etc.

**Mohamed** will focus on the remainder of the project, which involves a chunk of coding to be implemented, for the 3 modules to be created. The opted programming language is Python scripting. A compilation of literature mixed with technical information will also be written up, in order to make sure the work flow is consistent, professionally formatted and fully documented.

This is mainly:

**Informatics Research based** – Researching into sensors and assessing the value it has to the project. Researching into the 6DOF Stewart Platform chair is also an appropriate example. It is a means of assessing the physical nature and dynamics of the chair, how it behaves and how it responds.

**Programming research based** – Researching and learning about Python scripting, in application to the 3 modules.

**Literature research based** – A good example of this is looking into appropriate sensors that match the accuracy requirements.

**General overview** – This is making sure the entirety of the project is progressing naturally and that each member is applying consistent and continual effort.

**Conducting Meetings** – This is a frequent process in which the 2 members meet and discuss what’s outstanding.

To keep an open mind and engage with third party sources (Eric). In addition, this also helps in obtaining relevant experience, which can save detriment to this project, just by communicating and seeking a third party opinion.

# Work breakdown structure

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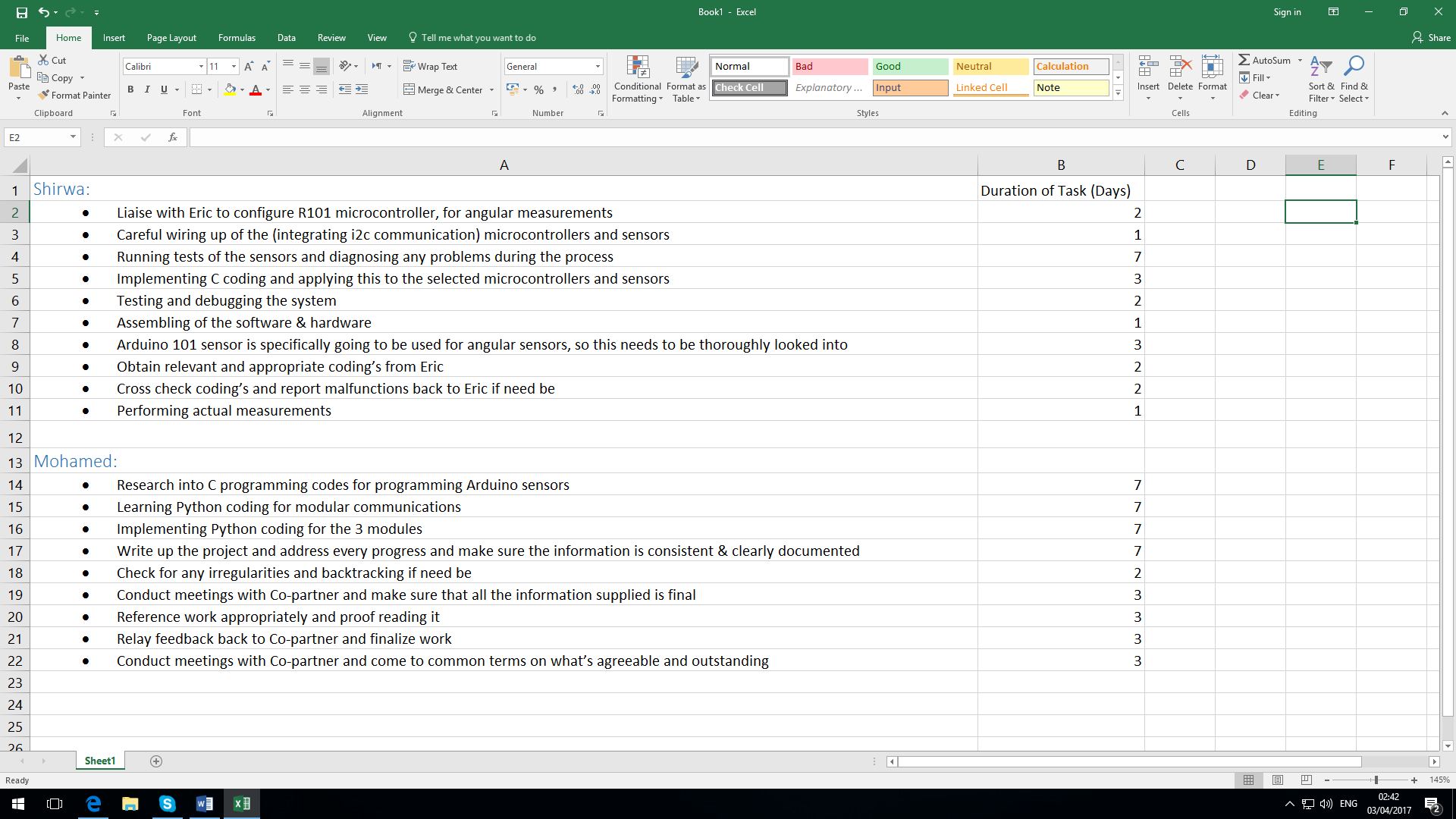
# Work Distribution:

## Shirwa:

* Study the Prototypes.Zip folder, System Overview.PDF file. Conduct research on the background of the project and what needs to be achieved
* Obtain necessary hardware’s (Microcontrollers & Sensors) for dummy data use
* Discover and understand the protocols being used between the boards (i2c communication)
* Begin to learn C programming for Microcontrollers & Sensors implementation
* Liaise with Eric to configure R101 microcontroller, for angular measurements
* Careful wiring up of the (integrating i2c communication) microcontrollers and sensors
* Find a suitable and feasible approach in displaying errors
* Running tests of the sensors and diagnosing any problems during the process
* Implementing C coding and applying this to the selected microcontrollers and sensors
* TCP port from the Middleware is configured, to instruct the ChairServer to orientate in various positions
* Testing and debugging the system
* Assembling of the software & hardware
* Arduino 101 sensor is specifically going to be used for angular sensors, so this needs to be thoroughly looked into
* Obtain relevant and appropriate coding’s from Eric
* Cross check coding’s and report malfunctions back to Eric if need be
* Performing actual measurements
* Presentation slides are prepared and a preliminary test demonstration of the Middlesex chair is conducted for rehearsal use

## Mohamed:

* Study the Prototypes.Zip folder, System Overview.PDF file. Conduct research on the background of the project and what needs to be achieved
* Research into C programming codes for programming Arduino sensors
* Research into suitable sensors and compile appropriate research literature. Present the findings to module leader and receive feedback
* Receive feedback from lecturer and consider alternatives if need be
* Further look into sensor technologies and study their datasheets. To be used in order to obtain accuracy, specification contents etc
* Study the 3 modules in the ‘*System* *Overview*.PDF’ file and understand the protocols between the modules, for implementation use
* Start deciding with Co-partner on suitable programming languages
* Learning Python coding for modular communications
* Implementing Python coding for the 3 modules
* Expand resourcefully and acknowledge other bona fide sources for guidance on project
* Write up the project and address every progress and make sure the information is consistent & clearly documented
* Presentation slides are prepared and a preliminary test demonstration of the Middlesex chair is conducted for rehearsal use
* Feedback is reported and current progress is overlooked. Documentation is written up and updated routinely
* Check for any irregularities and backtracking if need be
* Conduct meetings with Co-partner and make sure that all the information supplied is final
* Reference work appropriately and proof reading it
* Relay feedback back to Co-partner and finalize work
* Conduct meetings with Co-partner and come to common terms on what’s agreeable and outstanding



## Dependencies

There are a variation of dependencies that are key to making sure there are no setbacks.

* Coding cannot begin on the sensors until suitable sensors have been selected
* Coding cannot begin on the microcontrollers, until it has been decided which microcontrollers are appropriate
* Shirwa is responsible for making sure the implementation, design and practical information is relayed to Mohamed. Without this, there can be no documentation and can result in unnecessary time being wasted
* Without frequent meetings, there can be no progression, only the assumption that everything is fine at present
* Coding of the sensors have to be programmed accurately. By accurately, this means; error, syntax and compilation free
* Slave devices (Mega boards) have to be sending data at the same time to the Master (R101)
* The cylinder that generates the pressure to be applied to the actuator, is in full operation and free from defect

# 

# Work Scheduling

Below is a work scheduling format, which covers the duration of 24 weeks, starting from October 2016. Each independent task has a specified duration (in weeks), which is an approximation on how long the tasks will take. The documentation task is a continuous process, which is most demanding and requires constant attention. This requires frequent modifications and additions, which runs concurrently with other tasks.

## List of tasks that need to be done (Weeks 1-24)

Week 1: Study the Prototypes.Zip folder, System Overview.PDF file. Conduct research on the background of the project and what needs to be achieved

Week 2: Research into suitable sensors and compile appropriate research literature. Present the findings to module leader and receive feedback

Week 3: Receive feedback from lecturer and consider alternatives if need be

Week 4: Further look into sensor technologies and study their datasheets. To be used in order to obtain accuracy, specification contents etc

Week 5: Study the 3 modules in the ‘*System* *Overview*.PDF’ file and understand the protocols between the modules, for implementation use

Week 6: Start deciding with Co-partner on suitable programming languages

Week 7: Establish findings on suitable programming languages. Consider what scripting languages would be suitable for Microcontrollers, Sensors and modules

Week 8: Communicate findings with lecturer and co-partner. Start dividing the workloads and agree on weekly deliverables

Week 9: Obtain necessary hardware’s (Microcontrollers & Sensors) for dummy data use

Week 10: Meet with Co-partner, confirm and divide the workloads

Week 11: Co-partner (Shirwa) begins to learn C programming for Microcontrollers & Sensors implementation

Week 12: Mohamed begins to learn Python coding for creation of the 3 modules

Week 13: Both team players meet and relay feedback on current progress

Week 14: Establish third party contact with Eric and obtain his experience, in working with Arduino

Week 15: Expand resourcefully and acknowledge other bona fide sources for guidance on project

Week 16: Feedback is reported and current progress is overlooked. Documentation is written up and updated routinely.

Week 17: Discover and understand the protocols being used between the boards (i2c communication)

Week 18: Chosen sensors (Maxbotix MB1043 Sonar sensors) and Microcontrollers (Arduino Megaboards) are obtained for project. Middlesex 6DOF chair is observed for it’s dynamical and physical nature. Also the behaviour of the chair is studied, influenced by the actuators.

Week 19: Find a suitable and feasible approach in displaying errors. (Python shell is used to display errors. Values are saved in an XML file, which can show data in the form of a graph.)

Week 20: TCP port from the Middleware is configured, to instruct the ChairServer to orientate in various positions

Week 21: Tests are run on the Middlesex 6DOF chair and readings are saved in a chosen format. Data is analyzed and information is relayed to Mohamed for Test Specification documentation.

Week 22: Documentations are further updated and relayed to supervisor for feedback

Week 23: Feedback from supervisor on project and goals to date

Week 24: Presentation slides are prepared and a preliminary test demonstration of the Middlesex chair is conducted for rehearsal use

# Tasks that need to happen for Technical Specification implementation

The tasks that need to happen for Technical Specification implementation are:

* Establishing communications between the Arduino Megaboards (Slave devices) and making sure they send data to the Arduino R101
* The creation of error detection mechanisms and error correction handling
* Testing debug functionality
* Understanding sonar technology for the sensors, via their response time and behavior ( since the sonar sensors emit sound waves)
* Test benching and experiment on sensor readings, whether there is interference or not
* Learning Python and C coding for implementation - **Python coding is used for the modules and C coding is used for both sensors and microcontrollers**
* Establishing sensors and microcontrollers communication with the computer system
* Obtaining weights for the use of chair calibration (each Client is of different body mass – For experimental use only)
* Obtaining sensor readings
* To conduct research into i2c protocol for boards communication
* Establishing Middleware communication with the chair
* Configuring TCP port for system communication with the chair
* Monitor module is receiving requests from the Middleware module

# What presently has been done?

The communication between the Slave devices (Megaboards) and the R101 has been established. The slave boards send dummy data, but the readings keep fluctuating and the readings are occurring at a very fast rate.

# What needs to be done?

The TCP port has to be configured from the Middleware side and establish communication with the ChairServer. The Watcher/Monitor module has to receive requests from the Middleware and report the error data in the form of an XML Spreadsheet. The 6DOF Middlesex Chair has to be analyzed and the physical nature of the chair has to be comprehended. This involves understanding the influence of actuators and its influence on the chair collectively.

# Conclusion:

This document looks to encapsulate what tasks need to be addressed and what the realistic timelines.

It has already been mentioned that the programming for the 3 software modules will be programmed using Python scripting. The sensors will be programmed using C programming. The selected use of programming languages was chosen due to simplicity, past minor and contemporary experience.

However, it was important to address every key element explicitly and comprehensively, in order to harmoniously combine all components. The remainder of the project should unfold and progress naturally, without any hindrances or further difficulties.

With a working and fully documented Functional Specification, this should act as a guidance, in building the system incrementally and in a systematic manner.