DEPARTMENT OF ELECTRONIC AND
ELECTRICAL ENGINEERING

UCL

BEng Project

Interim Report

Dynamic Modelling of a Continuum Robotic Snake-arm and its Performance Evaluation by Analysing Robustness

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Department: Department of Electronic and Electrical Engineering

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Abstract

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Chapter 1

Introduction

1.1 Description and Motivations for the work

(Advantages if this robot): - can access remote areas (slender or heavier payload) - has no electronics in the robot itself makes it access hazardous environments with no issues (easy risk assessment) benign - high data quality

1.2 Aims and Objectives

1.3 Literature Review

1.4 Approach

Chapter 2

Mathematical Modelling

2.1 Understanding the system

2.2 Kinematic Modelling

2.3 Dynamic Modelling

2.4 Testing the model behaviour

2.5 Discussion

Chapter 3

Initial Simulation Results

Chapter 4

Conclusions

4.1 Discussion of Progress

4.2 Failure Risk Assessment

4.3 Safety Risk Assessment

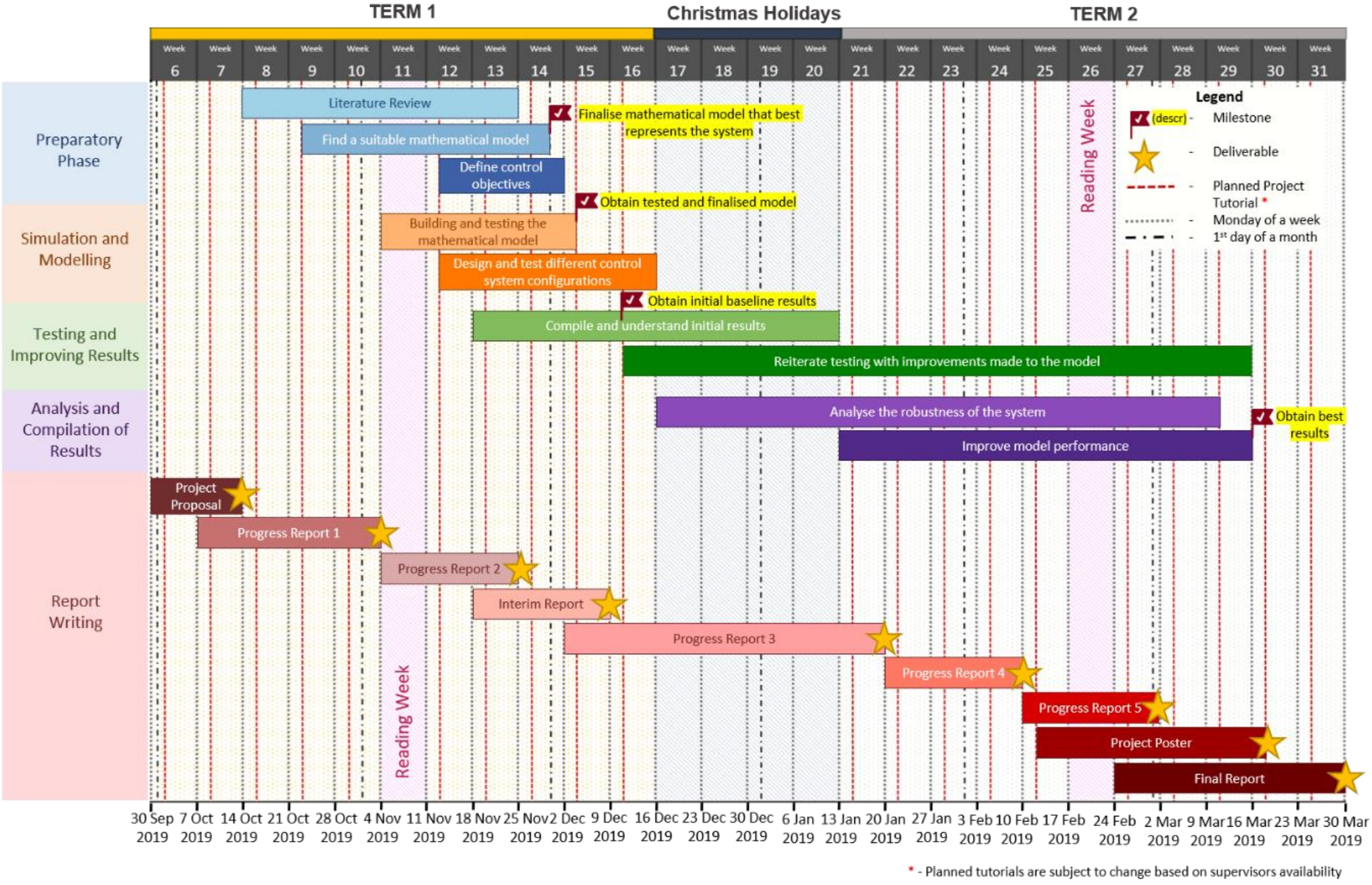
4.4 Additional Work to complete goals

Appendix A

Project Gantt Chart

The following page contains the Project Gantt Chart.

Project Gantt Chart



* - Planned tutorials are subject to change based on supervisors availability

Appendix B

Risk Assessment

The following pages includes a summary of the approved risk assessment generated using RiskNET.

Risk Assessment

Summary

Reference: **RA030578/1** **Sign-off Status:** **Authorised**

Date Created:	05/10/2019	**Confidential?**	No
Assessment Title:	ELEC0036: Third Year Project - Arundathi Shaji Shanthini		
Assessment Outline:	This risk assessment is being carried out prior to the third year individual project (Module code: ELEC0036) undertaken as part of my undergraduate course.		

Area Responsible (for management of risks)		**Location of Risks**	On-Site
Division, School, Faculty, Institute:	Faculty of Engineering Science	**Building:**	Roberts Building
Department:	Dept of Electronic & Electrical Eng	**Area:**	Ground and Above
Group/Unit:	All Groups/Units	**Sub Area:**	Laboratory

Further Location Information:	
RISK_HE_FORMA_COUNTRYLABEL:	**RISK_HE_FORMA_COUNTRY_HEADER**
	UNITED KINGDOM

Assessment Start Date:	05/10/2019	**Review or End Date:**	05/10/2020

Relevant Attachments:

Description of attachments:

Location of non-electronic documents:

Assessor(s):	SHAJI SHANTHINI, ARUNDATHI
Approver(s):	SARAH SPURGEON
Signed Off:	SARAH SPURGEON (16/10/2019 12:07)
Distribution List:	

PEOPLE AT RISK (from the Activities covered by this Risk Assessment)

Reference: **RA030578/1** **Sign-off Status:** **Authorised**

1. Working in Computer Lab / Study Spaces

Description of Activity:	The project undertaken mainly involves working on a computer and the following are the risks associated to working in computer labs or study spaces.

Hazard 1. Eyestrain

Long continuous hours of looking at the screen, poor DSE workstation and lack of suitable corrective eyewear can lead to eyestrain.	**Existing Control Measures** Ensure the screen colours are easy to look at, and that the characters are sharp and legible. Ensure that the contrast and brightness settings are suitable for the room lighting conditions. Reposition the screen to avoid glare/bright intrusive light from lights or windows. Look away from the screen into the distance for a few moments to relax your eyes; focus on something 30 metres away for 30 seconds every 30 minutes. Keep the screen clean and use a desk lamp to make it easier to see. Zoom into the text file being read such that the text is large enough to read easily on screen when sitting in a normal comfortable working position. Utilise eye test provisions (if required)

Hazard 2. Poor posture

Postural issues may give rise to discomfort or injury and can arise through a poor or inadequate workstation set up.	**Existing Control Measures** Ensure that sit upright with your back positioned comfortably on the backrest of the chair. Sit close to the desk to prevent leaning forward uncomfortably. Ensure that your eyes are at the same height as the top of the screen. Take short and frequent breaks and change position if possible.

Hazard 3. Repetitive movements involved with working on a computer	
Poorly designed workstations or uncomfortable working postures might cause repetitive strain injuries or problems like carpal tunnel syndrome	**Existing Control Measures** Sit upright and close to the desk to reduce working with the mouse with your arm stretched. When typing stretch use the space in front of the keyboard can help you rest your hands and wrists when not keying. Position the mouse within easy reach, so it can be used with a straight wrist. Sit upright and close to the desk to reduce working with the mouse arm stretched. Stretch and change position. Take short, frequent breaks. Look into the distance from time to time, and blink often. Do not overstrain muscles by overstretching fingers when typing or holding onto the mouse with a tight grip. Make sure there is space under the desk to move legs.
Hazard 4. Tripping over objects	
Congested layout of room, temporary obstructions, trailing wires near printing equipment etc. can be reasons that can cause tripping over objects and cause injury	**Existing Control Measures** Be mindful and careful of obstructions on the floor/walkways even in rooms that you are used to working in. Avoid walking around looking into the screen of the computer. Report the responsible management if any major obstruction with potential risk is noticed. This may include damaged floors, trailing cables, inadequate housekeeping, incorrect lighting levels etc.
Hazard 5. Poor lighting conditons	
This refers to both insufficient lighting as well as excessive lighting of a room. Poor lighting conditions may cause headaches or sore eyes.	**Existing Control Measures** Control the lighting in the room suitably. Adjust the blinds to control natural light levels or to avoid glare on screens. Inform responsible management of insufficient lighting or broken lights in the room .
Hazard 6. Lone working	
When working alone in the office there is risk of injuries, emergencies etc. with inadequate provision of help.	**Existing Control Measures** Avoid non-routine working. Be aware of the risks and precaution associated to the work undertaken especially when working alone. Have the information and knowledge of how to deal with emergencies

Hazard 7. Fire	
If trapped in the event of a fire, one could suffer fatal injury from smoke inhalation or burns.	**Existing Control Measures** Make sure that when working in a room you are aware of the nearest emergency exit and assembly point. Be aware of the instructions on the notices or information boards in the room installed by the management for such events. Inform the responsible management if any obstructions are noticed near emergency exits.
Hazard 8. Contact with electricity	
Exposed electrical conductors in general office / computer lab equipment can cause electric shocks, burns and injuries.	**Existing Control Measures** Be mindful and careful of exposed electrical conductors which may be live on the floor/walkways even in rooms that you are used to working in. Avoid walking around looking into the screen of the computer. Report any exposed electrical conductors or damaged equipment that can cause electric shock.
Hazard 9. General Welfare	
Inadequate facilities or unplanned work can affect the general welfare of a person.	**Existing Control Measures** Report any problems with basic facilities in the building like lack of source for potable water, toilet and hygiene facilities, heating and lighting provision etc. In case of unlikely extreme situations like stress, bullying or disturbances from another student/staff, use university services provided like Student Support and Wellbeing to report and to receive help. To avoid stress ensure that a plan for the work is in place and avoid working long hours. Ensure that the regular discussions take place with the supervisor and raise any issues with him/her.

Risk Level	
With Existing Controls:	
Risk Level	**A - Very Low / Trivial**