Contents

1 ABSTRACT

Background:

Aim:

Approach:

Significance:

2 INTRODUCTION

Guide: *Goal: provide context and encourage reader to read the paper.*
1. Background and motivation (1 paragraph)
2. Overview of the paper and contributions (1-2 paragraphs)
3. More details and summary of the approach
4. Summary of the results and conclusions.

Overview: Q4. Why should the community care?

Related work: Q1. What did the community know before you did whatever you did?

Contribution: Q3. Why exactly did you do?
We focus on....
We propose ABC algorithm...
We prove that ....
We demonstrate the EFG problem through x case studies (Section 3.4). We evaluate the ... (Section 4,5).

3 PROBLEM FORMULATION

djdhdjkh

4 ALGORITHM\METHODOLOGY

Version1:

Version2:

5 EVALUATION

Simulations:

Experiments:

Discussion: Q2 & Q3
- Q2: What are the new things you learned after you did whatever you did?
- Q3: What exactly did you do?

6 CONCLUSION AND FUTURE WORK

Questions: Q4. Why should the community care?

Should do: - Overview of Q1, Q2, and Q3; plus
- What does the community still not know?

7 ETHICAL ISSUES

This research proposal will be conducted by the Ph.D. candidate under the guide of supervisors without any ethical issues. No any sensitive data and no harmful chemicals will be used in this research.

8 DATA STORAGE

Refer to the Data Management Plan in Appendix A.

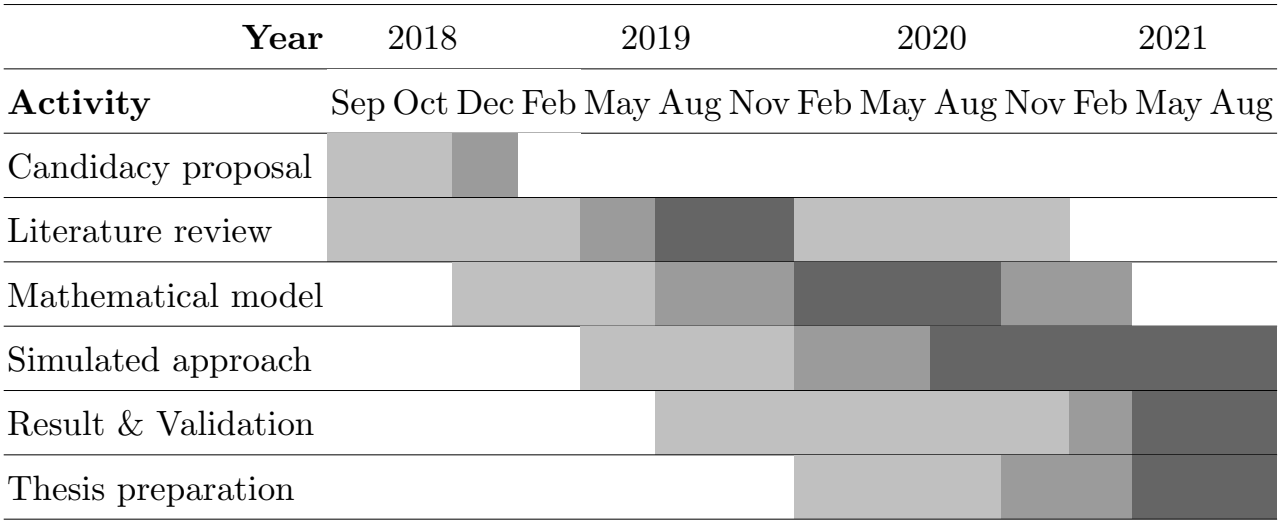
9 FACILITY AND RESOURCES

Refer to the Table 1, the facility and resources base on Curtin University and Open Source.

Table 1: Table of the resources and facilities required for the research and the provider

Resources	**Provider**
Robot Operating System	Open Source
MatLab	Curtin University
BarrettHand	Curtin University
ABB Robotic Arm	Curtin University
Computer and Printing	Curtin University

10 TIME LINE



11 Reviews from Prof. Jonathan Paxman for PhD Candidacy Proposal

• Include a discussion of the motivation and advantages for rolling contact for in-hand manipulation
• Reduce the length of the discussion on modelling the kinematics of rolling motion
• Add a brief review of path planning for two general objects under nonholonomic constraints
• Simply the aims: remove specific techniques and algorithms, and describe the broad aim of the project general terms, and in one or two sentences. Ensure that specific objectives are framed so that the aim can be achieved.
• Include a section which describes how a discretised model will be produced such that the discrete planning algorithms described can be applied. How is this discrete model to be obtained from the continuous-time models discussed?
• If optimal planning is discussed, ensure you are specific about in what sense the solution is optimal. In some cases, optimality is not required, only a satisfactory or satisficing solution in the sense of a cost function being below some bound. In such cases, sampling-based solutions (such as RRT) are appropriate.
• Please also review the writing for grammatical correctness (seek some assistance on this if needed).
• Note Robot Operating System (not Software) in Table 1.

A APPENDIX

Research Data Management Plan

Rolling-Based Robotics In-Hand Manipulation

Supervisor	Lei Cui
Data Management Plan Edited by	Ngoc Tam Lam
Modified Date	18/02/2019
Data Management Plan ID	CUI00L-SE05997
Faculty	Science and Engineering

1 Research Project Details

1.1 Research project title

Rolling-Based Robotics In-Hand Manipulation

1.2 Research project summary

Rolling-based is to be a vitally important capability for robots with in-hand manipulation, which is considered necessary to analyze the moving object in an aspect of rolling contact. Besides, manipulation of the multifingered robot hands via tactile fingertips has been significantly considered to enhance dexterity in term of object manipulation. Nonetheless, the discrete contact theory of discrete differential geometry has not been proposed in in-hand manipulation through rolling contact.

The target of this project is to eliminate obstacles with in-hand manipulation by using the discrete differential geometry to generate a discrete contact theory. It is also important to consider the curvature theory of smooth surfaces and the Lie group theory in kinematics multifingered robotic hands with rolling contact. To be demonstrated the problem of rolling contact under the discrete space, improving discrete path planning method - RRT and using Bellman equation for optimal discrete path planning can be effective methods in different tasks.

Solving the path planning task is one of the crucial stages of the research. From the literature review, there are several methods to tackle Bellman's Equation for discrete path planning problem including policy iteration, value iteration, and linear programming. A discrete contact theory between an object and multifingered hand will be also developed by using differential geometry theory in terms of moving frame, curvature, and Lie-group theory.

Rolling-based contact may improve the dexterous ability of multifingered robot hands to arbitrarily configure or reorient manipulated objects. The developing of the discrete contact theory based on differential geometry will be applied to robot in-hand manipulation that can contribute to the advance of industrial robotic technology.

1.3 Keywords
Discrete path planning, in-hand manipulation, multifingered robot

2 Research Project Data Details

2.1 Research project data summary

The research data will be collected from the tactile sensor from BarretHand device which integrated to ABB robot hand.

2.2 Will the data be identifiable

- Not applicable — no human data used

2.3 Will data, including biospecimens, be sent overseas?

No

2.4 Data organisation and structure

After solving the discrete contact theory, the theory will be applied for multifingered robot hand - BarretHand. Next step is to do the experiment at robotics lab. The data may be collected from lab computer.

3 Research Project Data Storage, Retention and Dissemination Details

3.1 Storage arrangements

The data will be saved in the biorobotics lab's computer and then transfer to HDR student's computer.

3.2 Estimated data storage volume

Should not exceed 5TB

3.3 Safeguarding measures

Data may only the digital number which is safe for human.

3.4 Retention requirements

7 years (All other research with outcomes that are classed as Minor)

3.5 Collaboration

The data will be accessed by HDR student and interim supervisor. And the decision for others who can be accessed needs to contact to interim supervisor.

3.6 Data dissemination

Depending on the decision of interim supervisor and Curtin data safety management.

3.7 Embargo period

Depending on the decision of interim supervisor and Curtin data safety management.