Curtin University

Research Data Management Plan

Rolling-Based Robotics In-Hand Manipulation

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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.