Robot Arm Satellite Positioning Simulator Part 2

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*Abstract*— A Robot Arm Satellite Positioning Simulator is presented in this paper. This simulator is a 6-axis robot arm that can be put on the Robot Arm Satellite Positioning Simulator (RASPS) Part 2 (RASPS2) rail system. 6-axis robot arm [5] rely on a tool that can move in six different directions. To achieve this goal, this robot arm is designed to have 6 joints with one motor in each joint. For accuracy, each motor is connected to an encoder, so that each motor’s rotation can be detected and corrected. These motors and encoders are controlled by motor drivers connecting to a mainboard, which can receive commands from a computer. A software with graphical user interface (GUI) is designed to make a user control the robot arm easily. For safety, an emergency button is designed to connect the mainboard of our robot arm, which can cut off the power supply when the button is pressed. The prototype of this simulator is not working properly due to the lack of some gears and bearings, so the motors can’t be correlated to each other motors and beams properly.

Keywords—Robot arm, six-axis, motor, motor driver, encoder, GUI.

# Introduction

Alberta Sat and various researchers at the University of Alberta have developed and continue to develop Earth satellites. However, they lack the facilities to model and simulate the motion of satellites, which is useful for testing things like attitude control where it’s important the satellite be in the right orientation for some reason. The ability to model and simulate the motion of one or two satellites relative to each other would enable research and development for problems related to inter-satellite communication, capture of dead satellites, and others.

To help model the motion of the satellites, the Robot Arm Satellite Positioning Simulator rail system is designed and built. This system has two robot arms installed on a rail. The first robot arm can do lateral movement along the rail, the second one is fixed on the rail without supporting traversing the rail system. These two robot arms should cooperate with each other and be controlled by the same software. And this paper is about the second one.

The final version of this arm should follow the user's instructions imputed on the computer to move with high precision. And the head of this robot arm should be installed with the tools needed to simulate the satellites’ movements with high accuracy.

The robot arm we designed has a higher cost and lower accuracy than any commercial product on the market because it’s just a prototype that has not been improved perfectly yet. The lack of mass production lines leads to ineffective cost reduction, and a large number of custom parts leads to increased costs. The 3D-printed cases are also less delicate and accurate than those produced by industrial molds. Lack of user feedback and lack of testing due to missing parts also lead to immature application and UI design. But because the prototype itself doesn't have to be perfect, we still think our design is acceptable.

This robot arm is a prototype used by researchers exclusively, which means it is not a commercial product, so it has no impact on society and industry. To reduce the impact on the environment, this robot arm’s shell is constructed using Polylactic acid, which is a type of renewable resource.

• 3 marks; Provide at the end of the Introduction an outline of the rest of the report.

# Prototype Design, Implementation, and Results

## Proposal response

what were the key elements that guided the rest of the project,

## Preliminary design

Identify applicable funding agency here. If none, delete this text box.

preliminary design including system architecture and key (not all) FRs and PRs.

## Prototype component (hw and sw/fw) selection and evaluation,

## Main development tasks and timelines

(keep high-level, do not show people assigned), and integration and test results.

## Analysis

• issues and solutions are clearly identified and described, • analysis of requirements compliance is clear and complete (focus can be on key FRs and PRs). Explanations are provided for requirements not met,

• issues with project execution and delivery are identified and discussed

• overall effectiveness of the prototype solution is summarized • clear definition of the kind of project (more R&D or more product oriented)

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*a**b* 

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