

## A Linear Positioner

For my senior design project, I'd like to work on the linear positioner in Professor Maxwell's lab. This project would have three main tasks and a potential extension that would use the accomplishments of the tasks to provide a useful dataset to the Computer Vision community.

### Task 1: Mechanical

This is probably the simplest of the tasks. The linear positioner uses Hall effect sensors to determine when each of its sliding mechanisms has reached the end of its rail. Currently, the sensors are held in place by tape, and often fall off. The first task would be to create a more permanent fixture for the sensors, enabling greater accuracy and repeatability from the system as well as preventing the sliders from being driven past the ends of the rails, which would damage or destroy the positioner.

### Task 2: Software Design

A Graphical User Interface (GUI) does currently exist to control the linear positioner, but in its current state it is unintuitive, and capable of performing only very simple operations. My second task would be to improve the GUI to allow more complicated motion, but with a simpler interface. This task would probably represent the bulk of my work, as it is the most appealing and most open-ended of the three.

### Task 3: Performance Testing

The motors that drive the linear positioner can supposedly be controlled to achieve positional accuracy within a fraction of a millimeter: thus, the positioner's true accuracy is limited only by the Hall effect sensors that it uses to repeatedly derive 'position 0'. My third task would be to measure the true accuracy of the positioner as preparation for the extension.

### Extension: Creating a dataset for Computer Vision

A popular topic in Computer Vision at the moment is to calculate the motion undergone by a camera given a video that it takes during the motion. A fully functional, well-calibrated linear positioner could provide position data to go along with video taken by a camera that the positioner moved around. The video could be run through different existing algorithms, and their results could be compared to the positioner's data to evaluate the accuracy of each of the algorithms.