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Project-02: Pre-Proposal

Book Shelving Robotic Arm

It has been more than a decade since robots have become to be used extensively in our daily lives, besides their use in manufacturing and storages. In the global scope, while sectors ranging from self-driving cars to household items like Roomba are becoming casual ways of managing tasks, there are still places that have not been given enough focus compared to our frequent usage. One of these places are libraries. Although books have become digital now than ever before, people still enjoy going to libraries to either borrow hard copies or sit and read or do their work in the quite and appealing space. Thus, except for few well-funded huge libraries that are beginning to try out a robotic system for sorting and retrieving books, most local libraries still rely on manpower to retrieve books from shelves, regardless of their height. Therefore, the objective of this project is to design a simple robotic arm stationed on one edge of a bookshelf that's able to move to the various rows vertically, extend to the different books in a given row, have a reaching end effector that can extract the book and rotate to change the orientation of the book, and a rotating arm base with a joint and two links so that the robot can accommodate to different types of shelves with varied row dimensions.

Motivation for this idea was obtained from vending machine designs that manually extract the selected item and place it to slot in front of the customer. Thus, as shown on the rough sketch in Figure 1, by having such installation, both librarians and readers can shelf and access books, respectively, with ease.

Parts: - Vertical Bar (1, Prismatic joint attached) – robot arm base uses to travel vertically

- Robot Arm Base (1, Prismatic joint attached) – Extends from Bar to book column
- Robot bottom link (1, Revolute joint attached) – Rotates from arm base to next joint to adjust height for end effector
- Robot upper link (1, Revolute joint attached) – Rotates from joint connecting it to bottom link to reach more shelves
- Book grapple Base (1, Prismatic joint attached) – Extends end effector from upper link to get book gripper next to book.
- Book gripper (1, Revolute joint attached) – Picks up book and can also rotate along the grapple base axis to place book by the plate attached to bottom link

Sensors:- Camera (Robot base reading book shelf + column number), gyroscope (measure angle), Lidar (to measure gripper proximity to book)

the Book Extractor

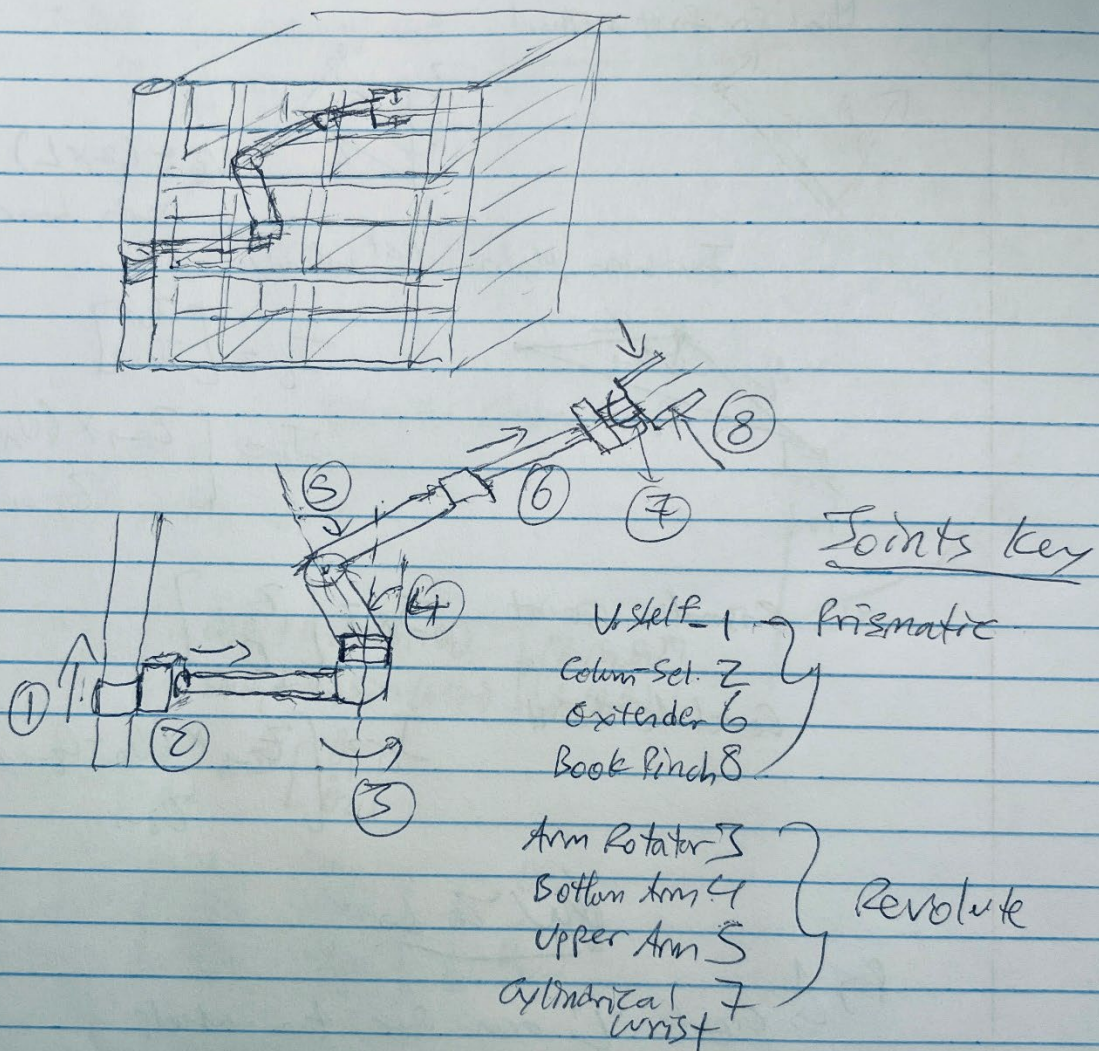


Figure 1. Sketch of Book Shelving Robotic Arm