

Mechanical System

Daniel Yu

June 13, 2025

1 Introduction

The goal is to have a mechanical system that do one SAR scan with related SAR parameters: $\Delta x, \Delta y, Points_x, Points_y$.

The mechanical system has a specified X and Y dimensions.

Two stepper motors are used for x-axis and y-axis. A stepper motor has two parameters, DIR and PUL(technically PUL+, but PUL- is grounded). Relative to the mechanical system implementation of the previous group, these pins are connected to Arduino pins, and pushing high or low to them move the radar in a certain way. Specifically:

Motor Pins	HIGH	LOW
DIRx	Right	Left
DIRy	Down	Up
PULx	Move 1 microstep	Not move
PULy	Move 1 microstep	Not move

One stepper motor microstep corresponds to 0.04mm by the implementation of the mechanical system from the previous group.

Thus, the final program output will look something like this:

Set fixed values for parameters $\Delta x, \Delta y, Points_x, Points_y$:

Motor move with radar from origin to end(arbitrarily specified, but should occupy the whole grid), completing one SAR scan. After completion, it returns to origin.

Additionally, it do so discretely with synchronization. Specifically:

Given $Points_x = N, Points_y = M, \Delta x = dimX/Points_x, \Delta y = dimY/Points_y$

The mechanical system has a fixed dimension: around 40 cm x 40 cm

$\Delta x = P_{xi+1} - P_{xi}, i = 1, 2, \dots, N$

Algorithm 1 Implement this for now

```
1: loop
2:   loop
3:     Traverse  $P_{xi}$  to  $P_{xi+1}$ 
4:     Stop motor, pause 2 sec
5:     Send prompt to console
6:   end loop if reaches end of row
7:   Move  $\Delta y$ 
8:   Stop motor, pause 2 sec
9:   Send prompt to console
10: end loop if reaches end of column
```



Figure 1: Very Very Pretty Drawing On How This Works

2 Implementation

Check files, there are already things implemented

3 Organization

- chill and have fun
- get all As for your summer classes
- finish this

4 Deadline

just do stuff bro.