# Midpoint Demo - Team 5: Cart-i B

#### **Demoing**

- Cart-i B following human as human walks forward and backward
- Incorporation of pivot turns

#### **Issues that Arose**

- Roomba cannot make sweeping turns → modify our algorithm so it doesn't always preference either turns or moving straight
- Wire to the roomba easily pops out causing it to go out of control → safety mode used
- Camera stick bows and moves too much → moved camera lower and plan to use wires/fishing line to keep it in place

#### Where We Are

- Milestones:
  - Test separate components (X)
  - Move forward/backward (X)
  - Pivot turns (X)
  - Incorporate sensors + Path Planning
  - Cart to wait when picking up from aisle
  - Incorporate logic for sharp turns (out of aisles)
  - Setup Final Demo Components → jacket, obstacles, etc
- Stretch Goals:
  - Incorporate Roomba sensors
  - Have an "on/off" button

### Plan to Complete Rest of Our Features

- Incorporate sensors + Path Planning
  - Pallavi has already wired up sensors
  - Need to build platform for sensors/arduino
  - Plan for path algorithm
    - General idea: Always see in which direction the robot should be moving and pivot robot accordingly → check sensor values → if possible with total clearance = proceed → if obstacle collision possible = pivot accordingly and then repeat
    - (Pseudo) Code Plan:

```
if (shouldMove and MoveZ < 0): //moving forward
          if (interrupt):
                  Sensors = get serial()
                  Obs1 = sensors & 0x1
                  Obs2 = sensors & 0x10
                  Obs3 = sensors & 0x100
                  Obs4 = sensors & 0x1000
                  if (Obs1 and Obs2 and Obs3 and Obs4):
                        stop
                  Elif if (Obs 2 or Obs3):
                     If (Obs2 && Obs1):
                         turn_right(15)
                     Elif (Obs2):
                        turn_right(30)
                    If (Obs3 && Obs4):
                         turn_left(15)
                     Elif (Obs3):
                        turn leftt(30)
If (shouldMove and MoveZ > 0): //moving backward
     if (interrupt):
                  Sensors = get serial()
                  Obs5 = sensors & 0x10000
                  If (Obs5):
                     stop()
```

- Cart to wait when picking up from aisle
  - o In addition to green circle on back, add red circles to sides of arms
  - If red circle detected (by similar means as current image processing algorithm) & isn't changing past a threshold in MoveX (left-right movement) → stop cart
- Incorporate logic for sharp turns (out of aisles)
  - $\circ$  Original plan  $\rightarrow$  array of circles and base off of their angles
    - No longer going with this → roomba cannot move forward and turn at the same time
  - New Plan → use red circles
    - When a person turns sharply (90 degrees), the red circles on the arm will be seen
    - Based on the side in which the red circle leaves the frame, program can tell which way human turned

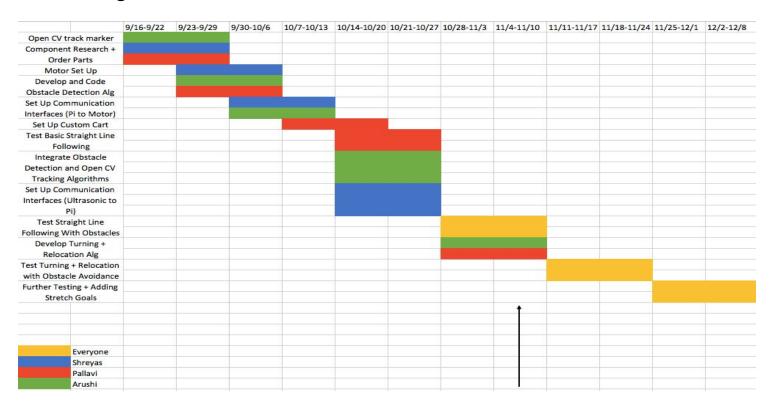
Pallavi Bannai Shreyas Gatuku Arushi Patel

- Cart-i B continues to where human was last seen & start taking a 360 in the direction in which the human is predicted to be until it finds the green circle again
- (Pseudo) Code Plan:

## **Initial Project Proposal Schedule:**

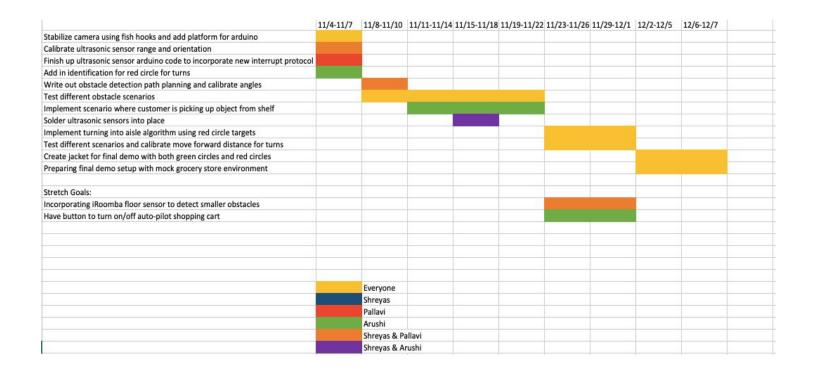
Milestone	9/16- 9/22	9/23- 9/29	9/30 - 10/6	10/7 -10/13	10/14 -10/20	10/21 -10/27	10/28 -11/3	11/4 -11/1 0	11/11 -11/1 7	11/18 -11/24
OpenCV Tagged Object Recognition										
Develop Object Detection Algorithm										
Set Up Cart & Motors										
Implement Object Detection Algorithm on Pi										
UART on FPGA side										
UART on Pi side										
Port Object Detection Algorithm to FPGA										
Testing & Iterating on Design										

## **Design Doc Schedule:**



**Revised Post-Midpoint Schedule:** 

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# **Path Planning Diagram:**

