

Warehouse Robot

group 7

Team Members

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Motivation

Warehouse management often involves mundane task of moving large pallets from one point of the warehouse to another. Given the risk of human involvement and repetitive nature of the task, automation using mobile robots can be very useful.

Description

Warehouse Robot

The robot itself is able to move around, picking stuff up and putting it down, all the while ensuring it stays on path and does not drive into an oncoming obstacle.

Central Server

The central server connects to all warehouse robots over MQTT and is able to issue commands, instructing coordinates of the pickup location of pallet and its drop off location.

Features

Warehouse Robot

- Communication with server over MQTT
- Translation forward, backward
- Turning left, right, u-turn
- Obstacle detection and avoidance
- Lifting platform
- Scanning QR codes for guidance

Central Server

- Communication with multiple robots over MQTT
- Plan robot path to pickup from specified location and drop at specific location
- Issue commands to go forward, turn left, lift platform etc. to individual robots
- Plan path of robots around warehouse of arbitrary shape

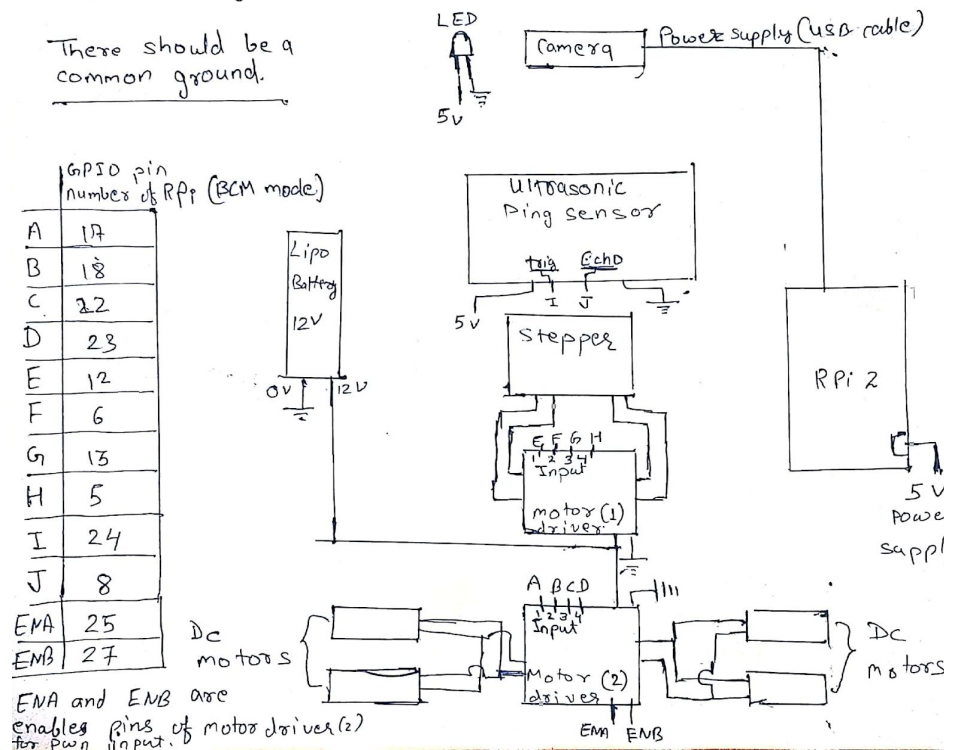
Working

Warehouse Robot

- Continually scan floor with webcam to detect QR codes
- Orient according to QR codes
- Continually check for oncoming obstacle using Ultrasonic ping sensor
- Move forward, backward, turn left, right using 4x DC motors and 1x motor driver
- Lift, drop platform using 1x stepper motor and 1x motor driver
- Send scanned QR code and current location to server using MQTT
- Raspberry Pi 2 controls everything on robot

Circuit diagram!

There should be a common ground.



Central Server

- Create warehouse map to do path planning on
- Accept pickup and dropoff locations and append to task queue
- Assign incomplete tasks to available robots
- Send relevant commands like go forward, drop platform etc to robot

Sensors / Actuators used

- 4x DC Motors
- 2x Motor driver (L298N)
- 1x Webcam (Logitech)
- 1x Ultrasonic ping sensor (HC-SR04)
- 1x Stepper motor
- 1x Raspberry Pi 2
- WiFi Module

All code available here

<https://github.com/ratherlongname/Warehouse-Bot>

Drawbacks

Drawbacks

- Precision required for exact positioning is difficult to achieve with traditional webcam
- Unable to provide portable power to RPi, need to connect it to a laptop

Future Work

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- More reliable and precise movement between QR codes, potentially using line-follower
 - Multiple robots to get maximum utilisation of warehouse space
 - Supported lifting platform to lift real loads
 - Smoother driving mechanism