CECS 346Fall 2024

Project # 3

By

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This project uses embedded systems techniques to create a smart home automation system. The smart garage door controller performs automated and manual door operations, through LEDs that indicate door status: open, closed, or moving.

The stepper motor car presents motor control through the SysTick timer. The car follows a defined route, parks itself inside the garage, and waits for user input to continue its operation.

Introduction:

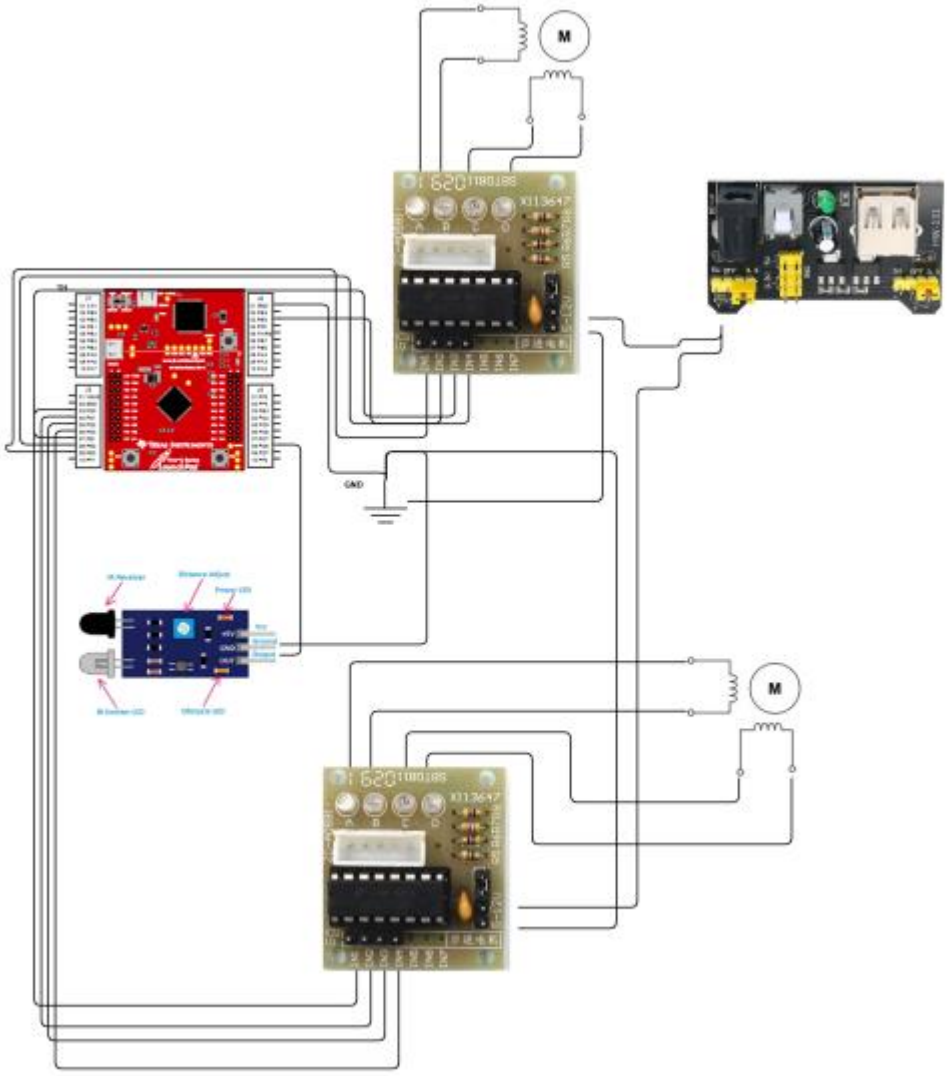
In this project, we will integrate a bunch of embedded systems concepts and hardware components to create a functional smart home system using a stepper motor car and an automated garage door controller. This project requires two LaunchPads, stepper motors with drivers, IR obstacle avoidance sensors, a robot car chassis, a power supply board, a voltage regulator, and supporting electronic components such as resistors, capacitors, and batteries.

Operations:

For the operation of the car, the car will start off with the push of switch1. After the car starts to move, it will move a full the stepper motor a full 720 and then make a 90 degree turn to the left. After it turns, it will continue moving forward until it senses the garage door and stop. From there the garage will detect the car coming and begin to open up. When the garage is the sensor on the car will no longer detect the garage door and begin to move forward and continue forward until it is fully inside the garage. When the car is fully parked we will press switch 2 to open the garage door and pressed switch 2 as well on the car so it can begin to back up. When it has back out of the garage it will make a right turn and drive away.

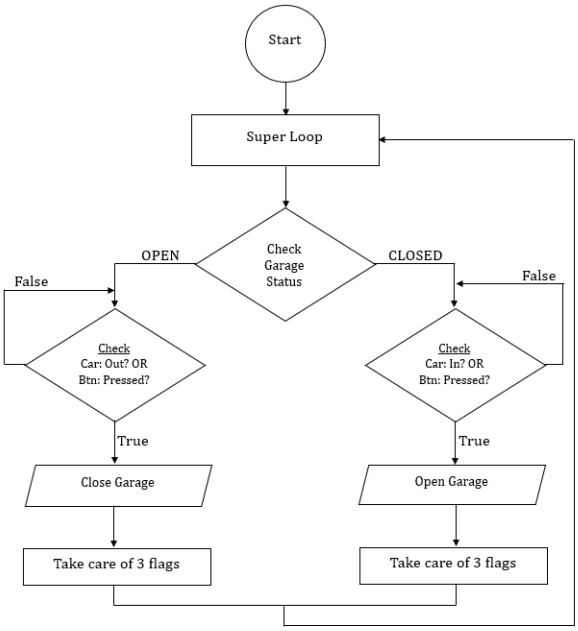
https://youtube.com/shorts/jAwRWOyArA0?si=PD_2RkbylqR9r-C_

Hardware Design:

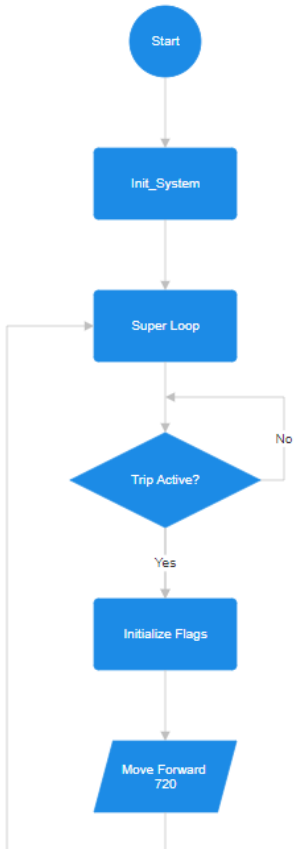


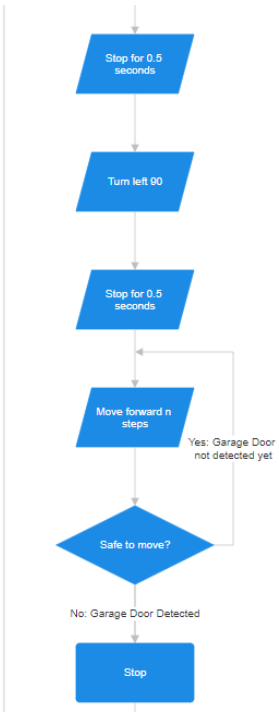
Software Design:

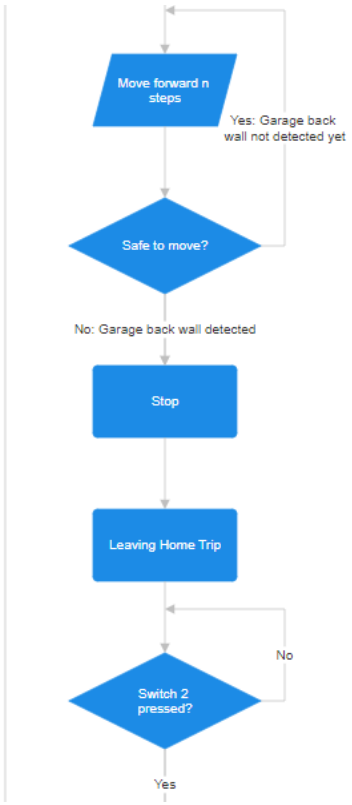
Garage Flowchart:

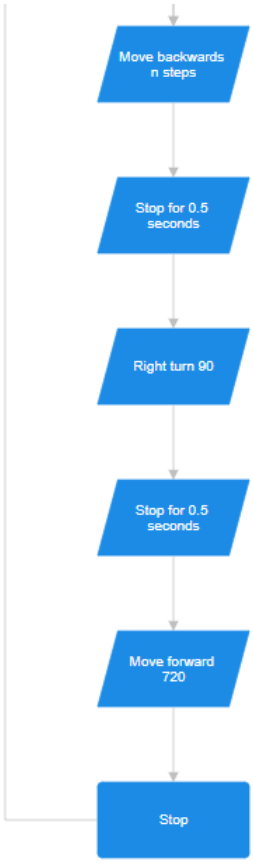


Car Leaving & Going Home Flowchart:

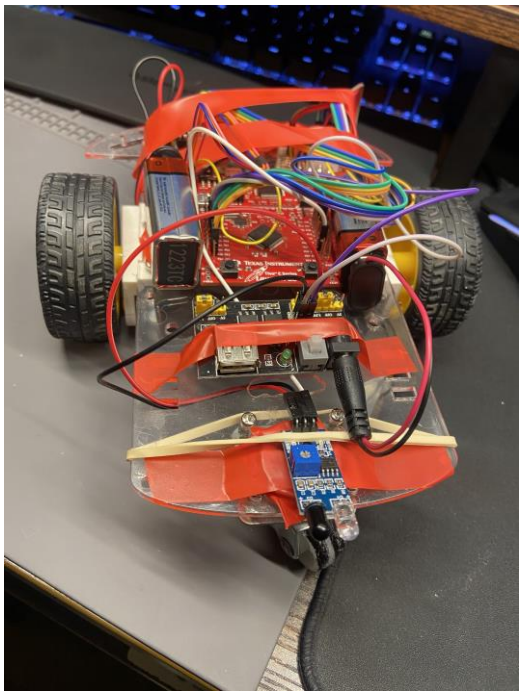

Start
Init_System
Super Loop
Trip Active?
No
Yes
Initialize Flags
Move Forward
720

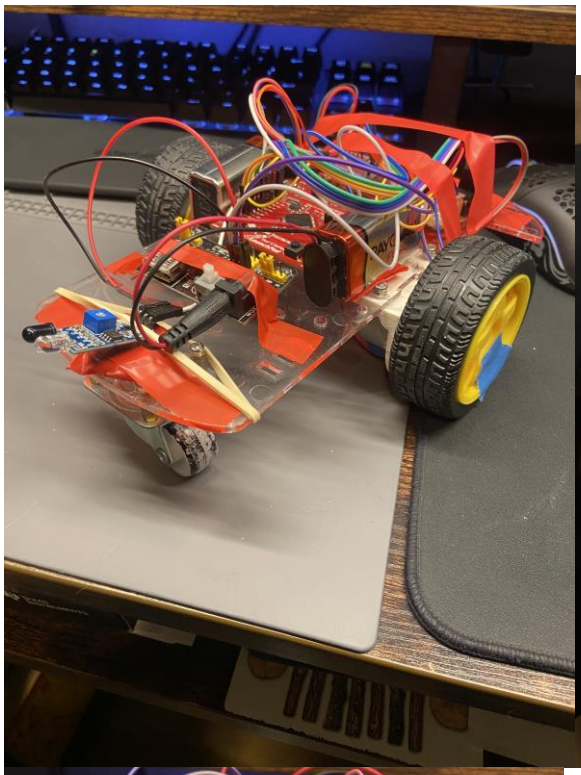

Stop for 0.5
seconds
Turn left 90
Stop for 0.5
seconds
Move forward n
steps
Yes: Garage Door
not detected yet
Safe to move?
No: Garage Door Detected
Stop

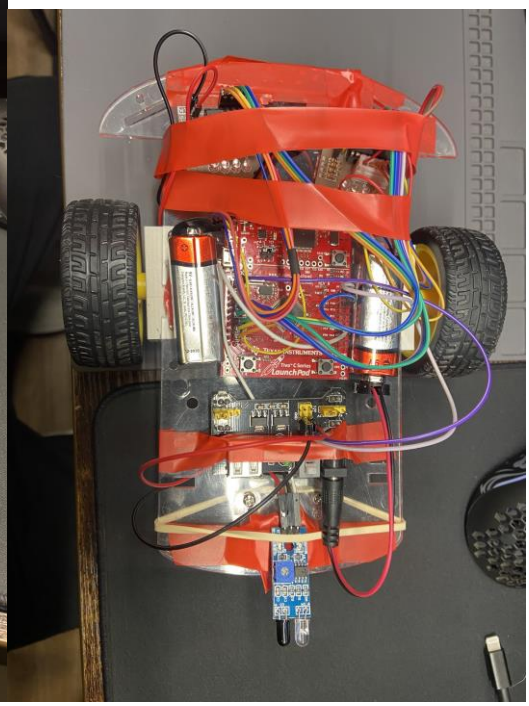

Move forward n steps
Yes: Garage back wall not detected yet
Safe to move?
No: Garage back wall detected
Stop
Leaving Home Trip
No
Switch 2 pressed?
Yes

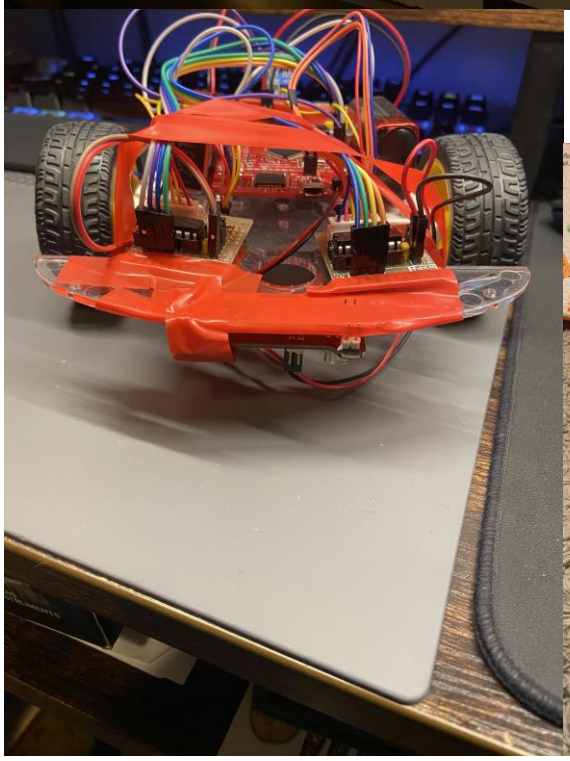

Move backwards n steps
Stop for 0.5 seconds
Right turn 90
Stop for 0.5 seconds
Move forward 720
Stop

Hardware Picture:










OXI CLEAN
MAX