Object Tracking Robot Using Image Processing

Under the supervision of Dr. Ramashray Dwivedi

Team Members :

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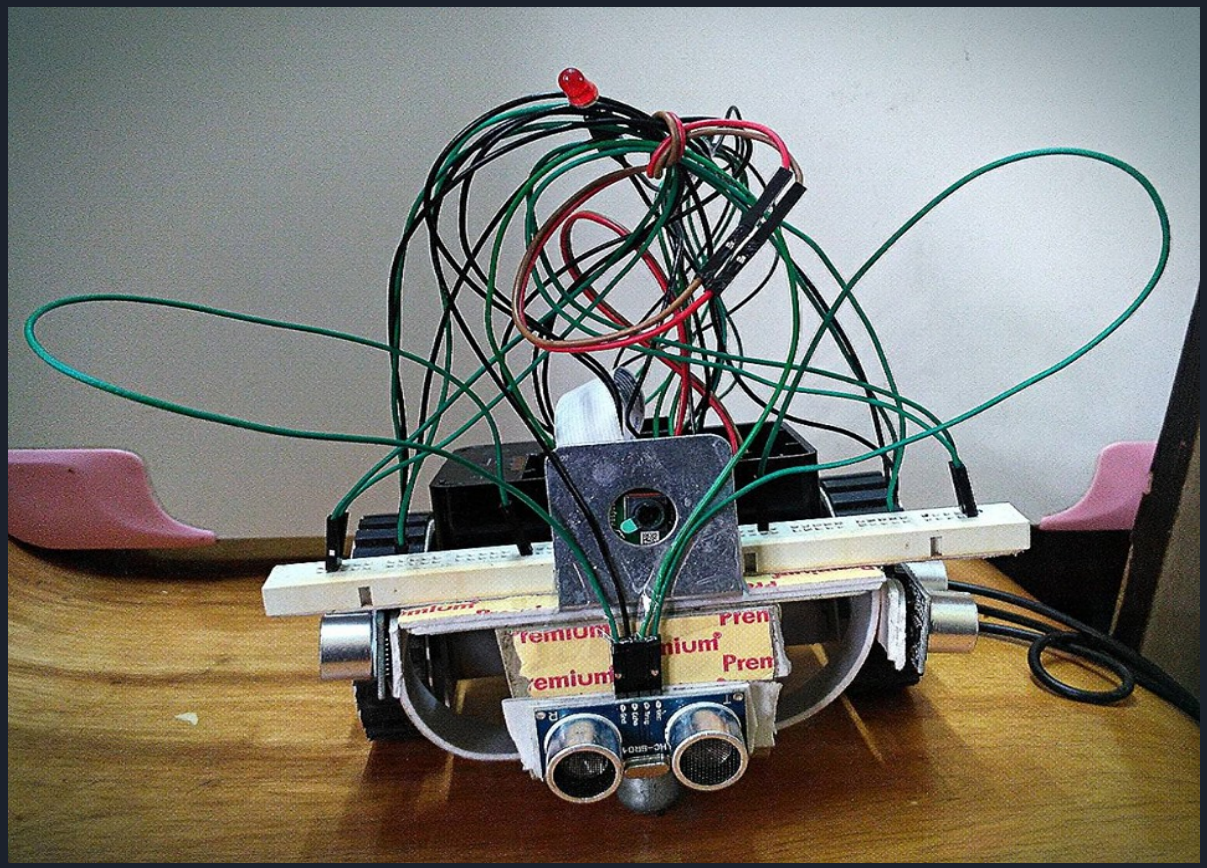
OBJECTIVE

In our exploratory project, we have developed a small robotic bot capable of tracking an object of the desired color of our choice through image processing (as specified in the code).



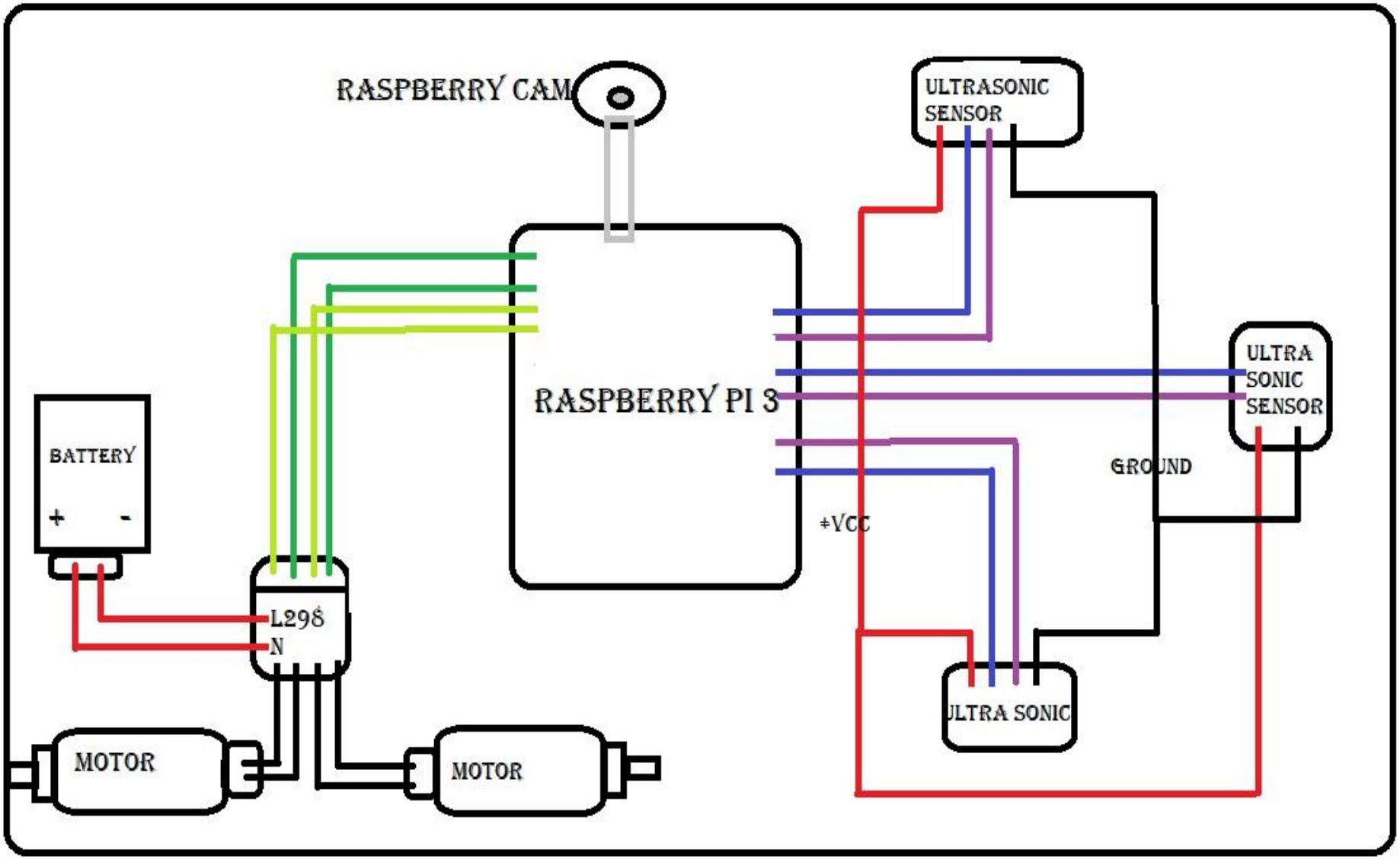
Components required for the project

- Raspberry Pi 3 model B
- Raspberry Pi Camera Module V2 – 8 Megapixel,1080p
- HC-SR04 Ultrasonic Distance Measuring Sensor Module
- H-Bridge L298n Motor Driver Module
- 100 rpm, 12 Volts DC Motor
- Breadboard
- Connecting Jumper Wires
- 2 Amp, 5 Volts Adapter
- 2 Amps, 12 Volts Adapter
- Super Jumbo Bot Chassis
- Plastic Bot Wheels
- 9V DC battery
- Castor Wheel
- OpenCV
- Python
- Raspbian Operating System

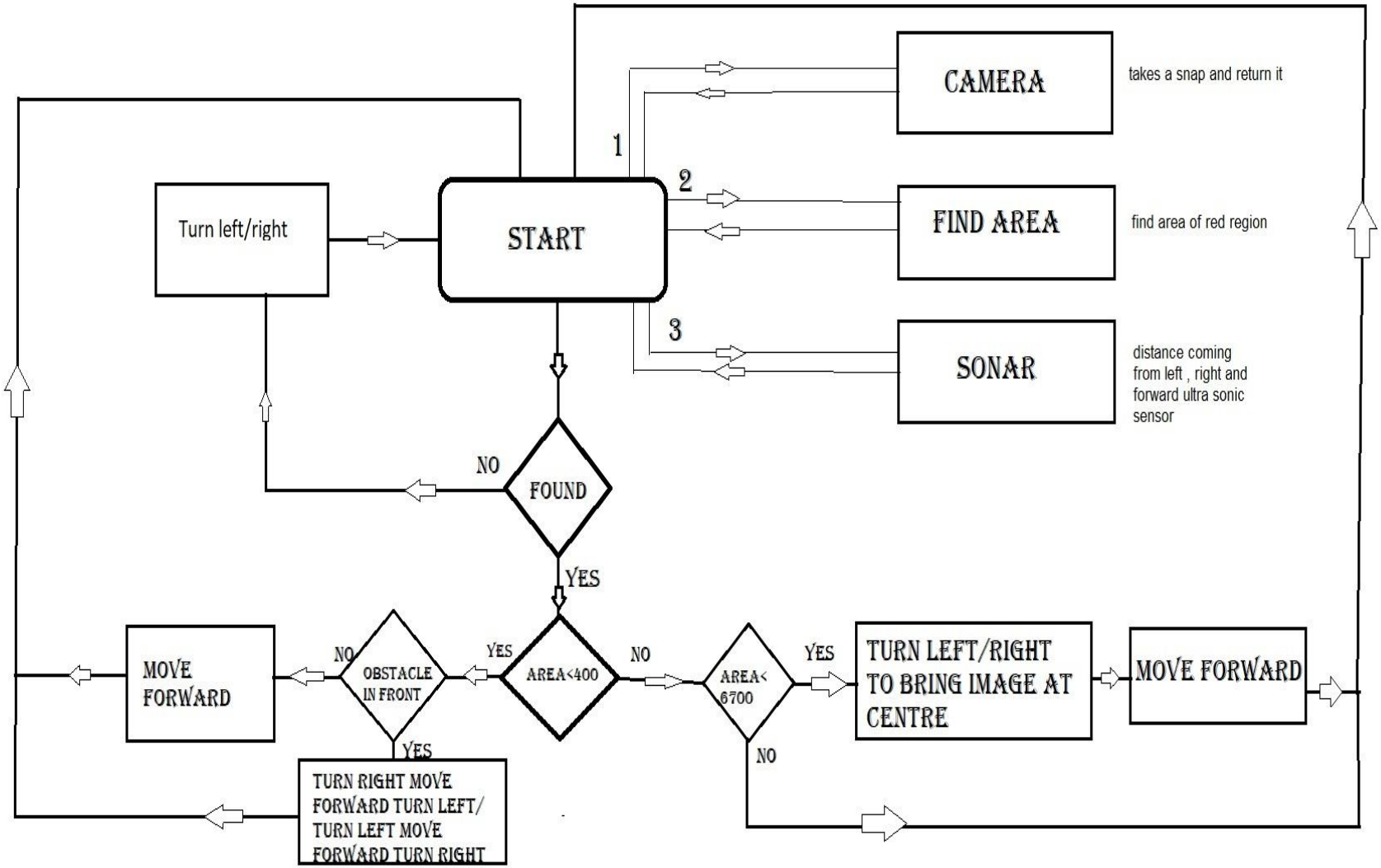
Pseudo Concept

1. As we give power supply,bot starts rotating in 360 degree till it finds a red ball.
2. Bot uses camera to take frames and do image processing to track down the ball.
3. It then moves in the direction in which the ball was tracked.
4. It goes up to the ball up to a certain minimum distance and stops there.
5. If we displace the object the whole process starts again.

Circuitry


RASPBERRY CAM
ULTRASONIC SENSOR
RASPBERRY PI 3
ULTRA SONIC SENSOR
BATTERY
+
-
GROUND
+VCC
L298 N
ULTRA SONIC
MOTOR
MOTOR

Flowchart of working of robot



Possible applications

- Can be used in emergency situations or hostile environments for finding humans autonomously and pointing out their locations quickly for proper retrieval of these people in short time.
- Could be used as an garbage and unwanted objects in an house collector and detector appliance.
- It can be used for finding unusual or out of the place objects in busy environments and alert the proper authorities for handling of these situations to avoid possible hazardous situations.
- It could be used as an intruder detector system in a constrained environment like a house or a small field.

Problems faced during robot development

- Time was spent on considering which library or platform to use for image processing ,then we choose OpenCV due to its vast and efficient algorithm implementation in its library.
- We faced a lot of problem in giving proper supply to each module and their respective components.As , most of the time, the supply given to these modules became less than the values required to run them.
- We had problems with properly adjusting all the components on the bot chassis due to problem of space and need to make it compact.
- A lot of time was spent on writing and debugging the python code to ensure its proper working.

Conclusion

Throughout the building and making of this project.We had dealt with a lot of different aspects of robot making, image processing and mechanical and electronics engineering. We learned different image analysis and filtering techniques and their vectorized algorithmic implementation. Learned proper bot chassis usage and importance of alignment and proper positioning of modules in a bot to make a balanced and compact robot. Learned about writing proper code with comments and different debugging techniques in python environment.

Overall a lot of practical knowledge was gained by us during the project development while working as a team.

Project Demo