Ball Tracking Robot

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The major drawback in today's surveillance rests on the involvement of human operators which can easily be distracted, so we need a system which can autonomously monitor regions continuously, making decisions while identifying unwanted or obnoxious things and respond accordingly. Object tracking using computer vision is crucial in achieving automated surveillance.

I. OBJECTIVE

This project is a basic ball tracking car. Here, the bot uses camera to take frames and do image processing to track down the ball. The features of the ball such as colour, shape, size can be used for tracking. The bot tries to find a colour which is hard coded, if it finds a ball of that colour, it follows it. Raspberry pi has been chosen as the micro-controller for this project as it gives great flexibility to use Raspberry Pi camera module and allows to code in Python, which is very user friendly and OpenCV library, for image analysis. An H-Bridge is used to control the motors. For example, switch from clockwise to counter clockwise or to stop the motors.

II. COMPONENTS USED

Raspberry Pi 3

Raspberry Pi Camera Module

Ultrasonic Sensors

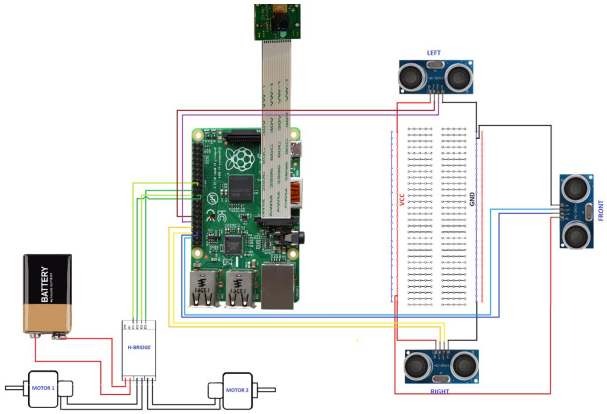
Dual H-Bridge Motor Drivers L298

DC Motors

Breadboard

Wires

III. CIRCUIT DIAGRAM



IV. WORKING

DC motors are used to run the car. To control the dc motors, dual H-bridge drivers are used

When the bot detects a red-coloured object in its frame, it starts moving forward. When the distance between the ultrasonic sensor at the centre and the object is less than 10 cm, it starts to align itself in the direction of the object.

To align the car in the direction of the target object, the distance from the ultrasonic sensors placed at the centre, right and left are calculated. When the distance btw the object and the ultrasonic sensor at the centre is less than a certain value, the bot declares the object is found by lighting an LED.

Crucial thing while detecting images frame by frame was to avoid any frame drops as then the bot can go into a limbo state if the bot is unable to predict direction of ball after few frame drops. Even if it manages the frame drops then also if the ball goes out of scope of the camera, it will go into a limbo state, in which case, the bot takes a 360 degree turn, scanning its environment till the ball comes back in the scope of the camera and then start moving in its direction.

For the image analysis, I am taking each frame and then masking it with the colour needed. Then for noise reduction, I am eroding the noise and dilating the major blobs. Then I find all the contours and find the largest among them and bound it in a rectangle. And show the rectangle on the main image and find the coordinates of the centre of the rectangle.

Finally, my bot tries to bring the coordinates of the ball to the centre of its imaginary coordinate axis. This is how my robo works.

V. ACKNOWLEDGMENT

The completion of this project could nothave been possible without the asssistance of a lot of individuals contributing to this project. However, we would like to express our deep appreciation and indebteness to the assistant professors and the Tas for their endless support and understanding during the project duration. We would also like to thank vishwanadh sir for his support and assistance without which the project would had been impossible.