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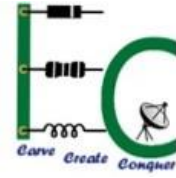
MYSURU-570008

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

STACK PROJECT [EC0202] –V Semester

Synopsis On

BALL TRACKING ROBOT

<u>**Under the guidance of:**</u>

Ms. Sonia Garg

Assistant Professor (FTC)

<u>**Submitted By:**</u>

Rohit N Shreenivas : 4NI15EC089

Pushkar Nagarad : 4NI15EC081

Nehal Pawaskar : 4NI15EC071

Siddarth Khandelwal : 4NI15EC106

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INTRODUCTION TO OUR PROJECT:

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 made this project in order to build a basic ball tracking car. Here, my bot uses camera to take frames and do image processing to track down the ball. The features of the ball such as color, shape, size can be used.

But my objective was to make a basic prototype for such a bot which can sense color and shape and follow it. My robot tries to find a color which is hard coded, if it finds a ball of that color it follows it.

I have chosen raspberry pi as 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.

For controlling the motors, I have used an H-Bridge to switch from clockwise to counter-clockwise or to stop the motors. This I have integrated via code when direction and speed has to be controlled in different obstacle situations.

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 manage the frame drops then also if the ball goes out of scope of the camera, it will go into a limbo state, in that case, then I have made my bot take a 360 degree view of it's environment till the ball comes back in the scope of the camera and then start moving in it's direction.

For the image analysis, I am taking each frame and then masking it with the color 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 center of the rectangle. I have attached the algorithm (pseudo-code) of the image analysis part and demonstrated this part in the video also.

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

COMPONENTS DESCRIPTION:

- **Raspberry Pi**: The **Raspberry Pi** is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python.

- **Raspberry Pi Camera Module:** Here it is basically used to capture the images of the objects and is integrated to work with the Pi for Image Processing.

- **Ultrasonic Sensor:** An **Ultrasonic sensor** is a device that can measure the distance to an object by using sound waves. It measures distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back.

- **Motor Drivers:** A **motor driver** is a little current amplifier; the function of **motor drivers** is to take a low-current control signal and then turn it into a higher-current signal that can drive a **motor**.

BLOCK DIAGRAM:
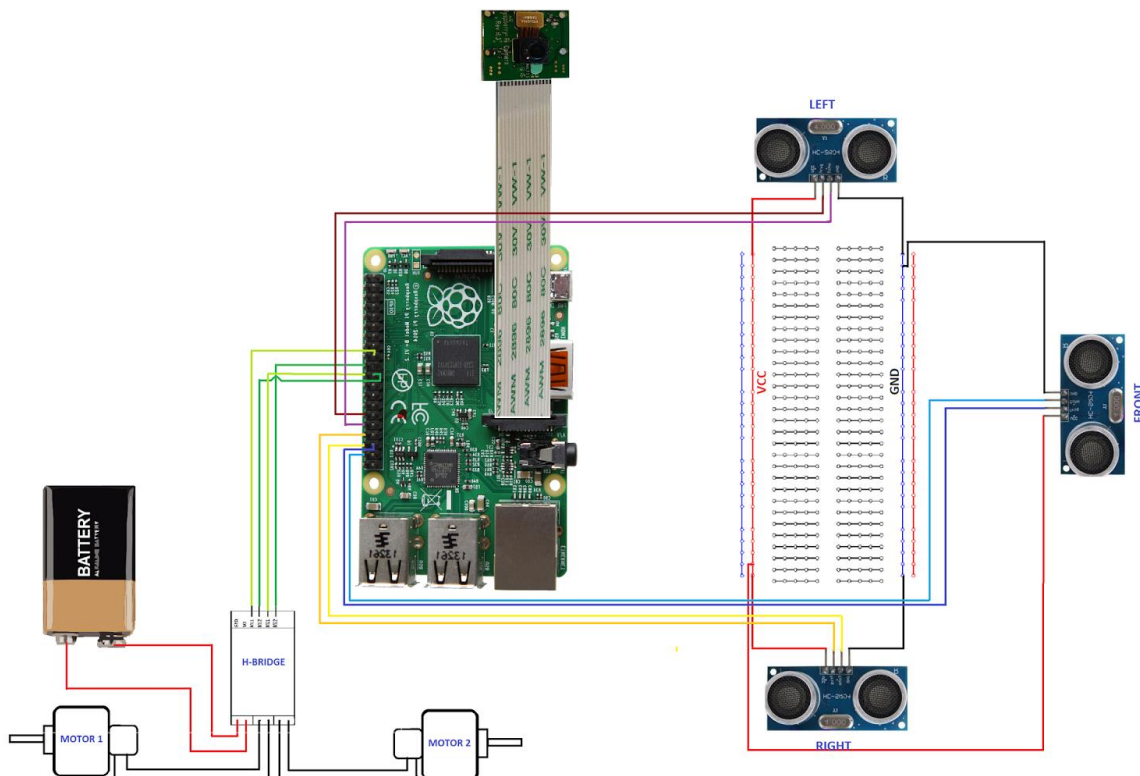
HARDWARE REQUIREMENTS:

- Raspberry Pi 2 Model B
- Raspberry Pi Camera module
- Arduino Ultrasonic Sensor
- Dual H-Bridge motor drivers L298
- DC motor
- Breadboard
- Connectors/ Wires

SOFTWARE REQUIREMENTS:

- Open CV Software
- Python

APPLICATIONS:

This technology is widely used in surveillance and security areas. The major Applications are:

- Anti-theft areas
- Banks and Jewellery
- Defense Systems
- Government buildings

FUTURE SCOPE:

Our project can be extended to sense human heat, by using heat sensor.

Only image analysis part can be used for home automated security systems, automated CCTV's which can sense motion and click pictures and sent it over wireless system.

Project Coordinator   **Guide**

Mr. Anjanappa C