



e-ISSN: 2319-8753 | p-ISSN: 2320-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 10, Issue 3, March 2021

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 7.512

9940 572 462

6381 907 438

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Open CV based Object tracking Robot using Image processing with Raspberry Pi

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ABSTRACT: Computer Vision is the ability of computer to see. Open CV is a multiplatform software system and supports different programming language interfaces. Open CV based robots are intelligent robots that takes visual data, process on it and provide appropriate output. A Robot is based on open CV and designed on Raspberry Pi which is used for object detection and tracking depend on the object's color, size and shape. A robot can detect only one object a time. Robotic vision deals with image processing. In this project robot can detect the object and rotate as left/right direction and then moves forward and backwards depend on object's movement. We use Python coding to identify the object with Open CV and ultrasonic sensor to maintain the distance between object and robot to avoid an obstacle. Pi camera located on robot chassis is used to capture the image.

KEYWORDS: Text detection, In painting, Morphological operations, Connected component labelling.

I. INTRODUCTION

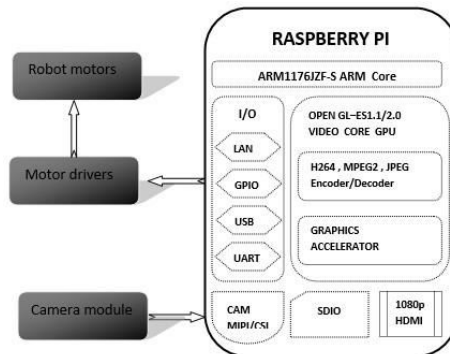
In recent days, Capturing images with high quality and good size is so easy because of rapid improvement in quality of capturing devices with less costly but superior technology. Object detection and tracking is one of the challenging tasks in computer vision. Mainly there are three basic steps in video analysis - Detection of the object of interest from moving object, tracking of that interested objects in consecutive frames and analysis of object tracks to understand their behavior. In order to detect the object first take the necessary and relevant steps together, information from the many computer vision applications. This project can be used for surveillance purpose in many security applications. Images or videos are continuously captured by Pi camera which is located on robot chassis and it is connected to raspberry pi with the help of this we can detect and track the specified object. The project code is written in Python language for object detection using Open CV library i.e. Open source computer vision is programming function mainly aimed at real time computer vision. As soon as the robot reaches near the object, a Buzzer beeps to indicate that object is detected then robot turns to the left direction and start searching the next object.

II. EXISTING SYSTEM

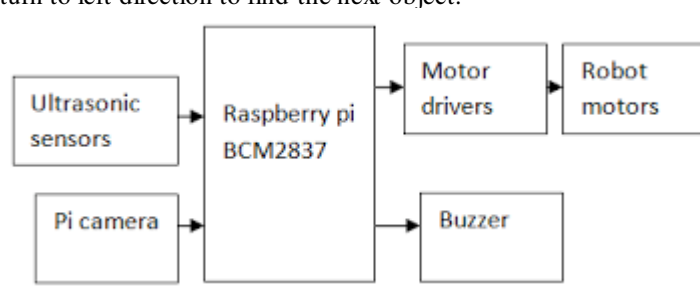
In the existing system object detection is done with the help of sensors. Multiple object detector sensor was available but right sensor is difficult to identify because each having own features for object detection it can use proximity sensor, ultrasonic sensor, capacitive sensor, photo electric and inductive sensors. For tracking purpose proximity or image sensor. The sensor identification is not simple task for every kind of operation; individual sensor is used so selection of sensors is done by following conditions namely accuracy, resolution, range control interface, environmental conditions and cost. These are measure factors to be considered

III. PROJECT DESCRIPTION

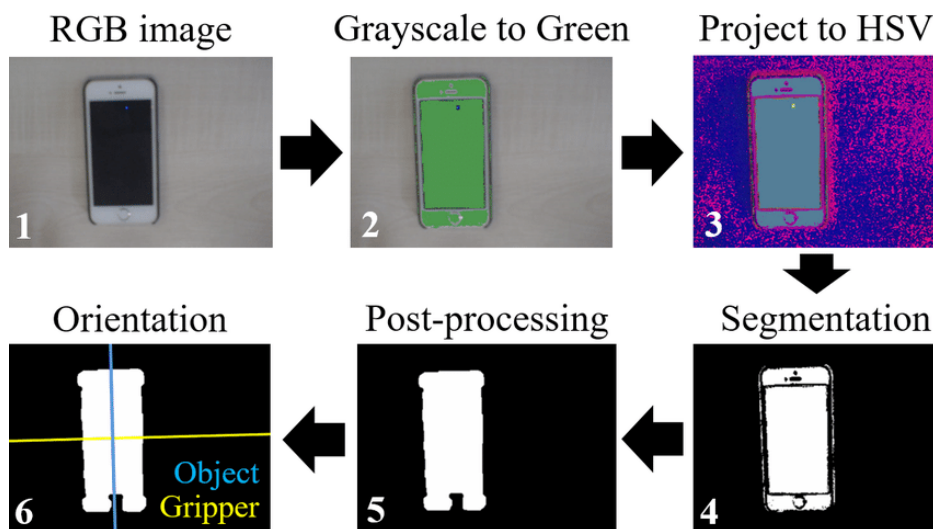
Hardware Design Fig 1. Block diagram A chassis is used as a base on which raspberry pi kit, pi camera, motor driver which can control two motors, battery and power bank to provide power supply are mounted. We choose the raspberry pi as the main board for our project because it has enough



processing power to deal with image processing software's and deliver in real time results. It also has the advantage of the GPIO pins which can control the motors based on the result of the processing. Finally, it is a low power computer that can work for hours with a common battery. The images or video are continuously captured by pi camera which is placed on the front side of the robot chassis and connected to raspberry pi with the help of RMC connector. The extracted image taken out from the pi camera sends to the raspberry pi kit and followed to execution of python coding. In the python coding the signals are generated, these signals coming from the execution of kit and sent to the robot. Three ultrasonic sensors are used on front, left and right side. When robot reaches near to the object it beeps the buzzer and wait for a while. Then turn to left direction to find the next object.



IV. SOFTWARE DESIGN



1. Capture video or image: The pi camera which is connected to raspberry pi captures the video which will be converted into frames.
2. Color conversion: The captured frame is RGB, to identify the object RGB image is converted into HSV color space. Where H means Hue (Color), S means Saturation (Greyness), V means Value (Brightness).
3. Thresholding: After color conversion the image ios converted into binary image by selecting a proper threshold value.

4. Find Contours: Contours give good results with black background and white object using dilation and erosion. The dilation and erosion operation are very similar, the difference between them is that while the dilation computes the maximum pixel value during convolution, the erosion computes the minimum pixel value. The image is convolved with a kernel, which can be of any size or shape. The kernel has a specific anchor point usually at its center.

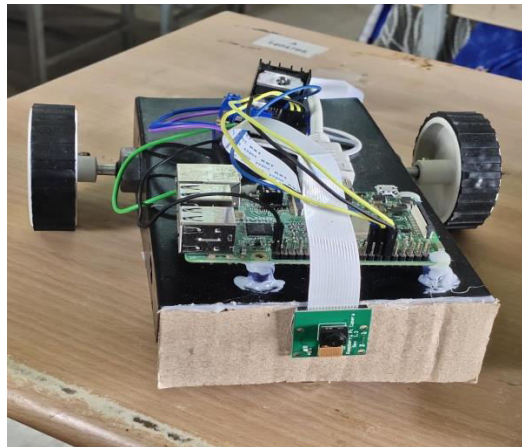
5. In a dilated operation, the bright region of the image will be dilated and dark reduced and in a eroded operation, the dark will be increased and bright eroded. The next function of the open CV used in this project is morphology EX. This function performs morphological transformations in the image and in this case applies two effects sequentially. First, the image goes through an erosion effects, removing small object and possible artifacts. Second, the dilation effect which dilates the remaining pixels to enhanced the size of real objects in the image. This combination of erode and dilate functions is called opening. In Range is used to detect if the robot is in front of any obstacles. Values of white and grey to the floor are defined and the percentage of nonwhite elements in the image is detected. If this value is almost 80% then this means that the robot might be in front of an obstacle and must turn around left direction.

V. METHODOLOGY

“Nowadays motion tracking widely used for some field, especially autonomous field. The motion tracking also has been used for securities. At the Oversea for example United States of America use the motion tracking in army usage. This project purpose is to do the motion tracking using the OpenCV software. The motion tracking is the camera will detect and track the object movement. This project will include the research for the related previous work as a reference to done the motion tracking method. The related previous work will cover in the literature review, the method used are research based on the scopes of this project. This scopes project is only cover the color based, optical flow and feature extraction image processing technique. The methodology chooses for this motion tracking use is edge detection under the optical flow technique and the color based will used the segmentation technique. The methodology chooses is based on the research has been done and the techniques is efficiencies and many of the work done by using this techniques.”

VI. CONCLUSION

The concept used in this project makes use of raspberry pi kit along with pi camera using image processing to track the color object effectively. The output response of robot for different object movement was accurate and satisfactory. The application of object detection and tracking is in farming, military, civil, security and for commercial use specially for surveillance purpose. Further modification we can do that is to develop robotic pick and place arm which can detect object with night vision camera at low cost.



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