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Review: Autonomous Object Detection and Tracking using Raspberry Pi

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Abstract:
We present the design and implementation of a real-time vision-based approach to detect and track features in a structured environment using an autonomous robot. . Object detection and tracking are important and challenging tasks in many computer vision applications such as surveillance, vehicle navigation and autonomous robot navigation. Object detection involves locating objects in the frame of a video sequence. Every tracking method requires an object detection mechanism either in every frame or when the object first appears in the video. Object tracking is the process of locating an object or multiple objects over time using a camera. The high powered computers, the availability of high quality and inexpensive video cameras and the increasing need for automated video analysis has generated a great deal of interest in object tracking algorithms. There are three key steps in video analysis, detection interesting moving objects, tracking of such objects from each and every frame to frame, and analysis of object tracks to recognize their behavior. Therefore, the use of object tracking is pertinent in the tasks of, motion based recognition. Automatic detection, tracking, and counting of an application.

Keywords: At mega 32 MC, LM35 Temperature Sensor, Infra-Red LED Receiver, L293D Motor Driver, DC motor 6 v,16x2 LCD Display.

I. INTRODUCTION

The aim of this project will be design and development of a real-time system to detect and track objects in video streams used in traffic surveillance, security cameras, etc. The goal of object detection is to detect all instances of objects from a known class, such as people, cars or faces in an image. Typically only a small number of instances of the object are present in the image, but there is a very large number of possible locations and scales at which they can occur and that need to somehow be explored. Each detection is reported with some form of pose information. This could be as simple as the location of the object, a location and scale, or the extent of the object defined in terms of a bounding box. In other situations the pose information is more detailed and contains the parameters of a linear or non-linear transformation. For example a face detector may compute the locations of the eyes, nose and mouth, in addition to the bounding box of the face.

Figure.1. Autonomous Object Detection and Tracking device

It plays a vital role to select a proper feature in tracking. So feature selection is closely related to the object representation.

II. LITERATURE SURVEY

1. P. Angelov, P. Sadeghi-Tehran, R. Ramezani," A Real-time Approach to Autonomous Novelty Detection and Object Tracking" in Video Streams, International Journal of Intelligent Systems, ISSN 0884-8173, 2010, invited paper[7]
The project mainly focuses on the basis to implement the object detection and tracking based on its color, which is a visual based project i.e., the input to the project will be the video/image data which is continuously captured with the help of a webcam which is interfaced to the Raspberry Pi. It will detect the object and it tracks that object by moving the camera in the direction of the detected object.

2. "Implementation of Line Tracking Algorithm using Raspberry Pi "Conference Paper · December 2014Samreen Amir, Bhawani Shankar Chowdhry. , International Journal of Intelligent Systems, ISSN 0884-8173, 2014, invited paper[5].
The proposed system performed according to its expectation. The Raspberry pi offers better size but less speed. Accuracy of both systems was similar even if the FPS rate is very different. Our algorithm can be implemented to almost any marine environment given the task for which it is designed for.

3. Global Journal of Advanced Engineering Technologies, Special Issue (CTCNSF-2014) ISSN (Online): 2277-6370 & ISSN (Print): 2394-0921 "OBJECT DETECTION AND TRACKING USINGIMAGE PROCESSING" Vijayalaxmi, K.Anjali,B.Srujana, P.Rohith Kumar. [4] The basic detection

process consist of scanning the image lattice and at each location s testing whether Xs+W is classi_ed as object or background. This is typically done at multiple resoltions of the image pyramid to detect objects at multiple scales, and is clearly a very intensive computation. There are a number of methods to make it more ancient.

4. Indian Journal of Science and Technology, Vol 9(45), DOI: 10.17485/ijst/2016/v9i45/106346, December 2015 "A Hybrid Approach for Real-Time Object Detection and Tracking'' Pushkar Protik Goswami and Dushyant Kumar Singh. [8]

In these days it is necessary to maintain continuous surveillance of underwater transmission lines or oil pipelines. For such purpose, we require an underwater vehicle rover capable of tracking these wires or pipelines and detect the fault if it occurs. For this purpose we havedesigned an intelligent quad leg rover. Image processing as a key deployed for tracking and tracing the fault or damage.

5. Indian Journal of Science and Technology april - may Jun 2016 '' VISION BASED OBJECT DETECTION AND TRACKING USING MULTIROTOR UNMANNED AERIAL VEHICLE '' Sarthak Kaingade, Vikrant More, Dhiraj Dhule, Pradeep Gaidhani, Nitin Gupta.[1]

In this paper previous work on object detection and tracking using UAV's can be classified into various areas. Some researchers have focused on implementation of the 'Follow Me' mode, in which, the UAV follows a person. Person has ground control station computer which transmits its GPS location to the flying UAV.

6. In ternational Journal of Engineering Trends and Technology (IJETT) – Volume 35 Number 4- May 2016 ISSN: 2231-5381 http://www.ijettjournal. "Object Tracking Robot on Raspberry Pi using Opencv" Pradeep Kumar.G.H Assistant Professor, Department of CSE, KSIT Rupa Gurram SweathaSuresh.B. Sneha.B.R. Sushmitha[2]

In this proposed system we can use the background subtraction by using the fixed camera by generating the foreground mask. It compares the frame with normal one with background images or model which has contain the static part of the scene, everything is considered as the background part of images in general. In these back ground subtraction can be done with the raspberry pi camera.

7. International Journal of Trend in Research and Development, Volume 3(3), ISSN: 2394-9333 www.ijtrd.com IJTRD May - Jun 2016 Available Online@www.ijtrd.com 31 '' Object Tracking Robot by Using Raspberry PI with open Computer Vision (CV)'' M. Karthikeyan, M.Kudalingam, P.Natrajan, K.Palaniappan and A.MadhanPrabhu.[9]
In this project at the end of the automatic mode, robot tracks, analyses the colour of the picked object and drops the object into the respective coloured container. At the end of manual mode, robot moves and does the task as desired by the user according to the commands given through the application.

III. PROBLEM STATEMENT:

It give high density results on rough surface, in low surface path like foam and cloth having low density emit sound waves from the sensor .Some false response from sounds in atmosphere. Sensor detection for minimum acceptable distance but infrared sensor detects for long distance but it is applicable for the indoor station or low atmosphere light condition. Ultrasonic sensor used

for robot it was affected by the environment condition. By sliding and shading appearance tracking and detection is very difficult. Images of objects from a particular class are highly variable. One source of variation is the actual imaging process. Changes in illumination, changes in camera position as well as digitization artifacts, all produce signi_cant variations in image appearance, even in a static scene. The second source of variation is due to the intrinsic appearance variability of objects within a class, even assuming no variation in the imaging process. For example, people have die rent shapes and wear a variety of clothes, while the handwritten digit 7 can be written with or without a line through the middle, with di_erent slants, stroke widths, etc. The challenge is to develop detection algorithms that are invariant with respect to these variations and are computationally ancient.

IV.PROPOSED APPROACH:
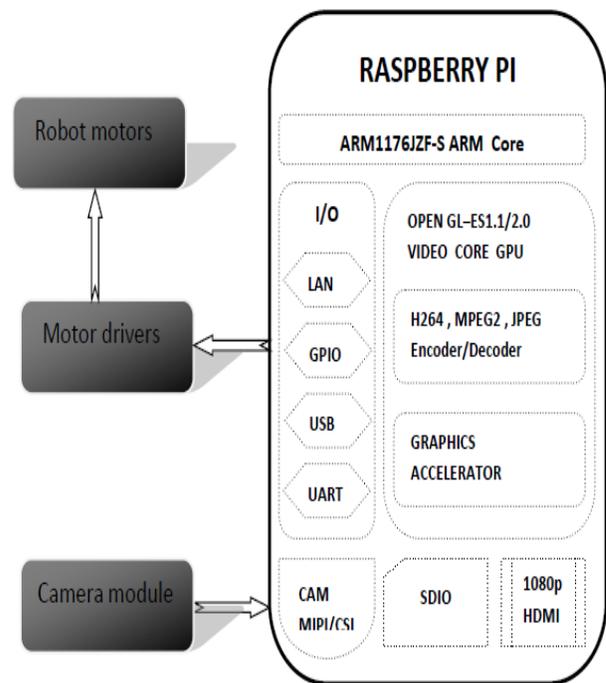
Figure.2. Block Diagram of Raspberry Pi

In proposed system we can use the background subtraction by using the fixed camera by generating the foreground mask. It compares the frame with normal one with background images or model which has contain the static part of the scene, everything is considered as the background part of images in general. In these back ground subtraction can be done with the raspberry pi camera.

V. METHODOLOGY:

The image was taken by the camera which was placed in the top head of the raspberry pi kit, the camera equipment was connected via usb port. The capturing image from the web cam connected executed in the linuxos software. The extracted image taken out from the web camera sends to the raspberry pi kit and followed to execution of python coding. In the python coding the signal are generated, these generated signals coming from the execution of kit and sent to robot. By combination of sixth sense

robotic kit and raspberry pi followed the color object robot effectively. By tracking the ball we can monitor in pc itself. The board comes furnished with a SD card. This space licenses us to embed a SD card and that can utilize it as our gadgets. The SD card is a fundamental stockpiling gadget for raspberry pi board like a hard plate of a PC. The bootable Linux working framework is stacked onto the card, you want to utilize. The raspberry pi underpins Linux, ARM, Mac working frameworks. You can choose one OS; you should compose it to a SD card utilizing a Disk supervisor application. You can likewise utilize other capacity system, as USB outside hard drive or USB drive. There are a various brands of SD cards are accessible in the business sector in various sizes.

VI. TOOLS FOR DEVELOPMENT:

A. HARDWARE SPECIFICATION:
1. Raspberry Pi 3 Model B
2. IR Reciever (acting as IR sensor)
3. ATmega32
4. L293D Motor Driver IC
5. DC motor 6 V
6. 16x2 LCD Display
7. Webcam

B. SOFTWARE SPECIFICATION:
1. LINUX
2. Basic Motion Detection and Tracking with Opencv.
3. Secure Shell

VII. EXPECTED OUTPUT:

Autonomously Tracking and detecting of object is use for motion detection of various objects on a given video or an image. The applications of object detection and tracking is farming, military, transportation, civil, security and for commercial use.Though a lot of progress has been made since the conception of the field of Computer Vision more than five decades ago, as always, there is scope for further improvement.

VIII. REFERENCES:

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