

Object Tracking Robot by Using Raspberry Pi with Open Computer Vision (CV)

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Abstract: To identify and tracking the real time object is important concept in computer vision. In order to detect the object first take the necessary and relevant step to gather information from the many computer vision applications. This idea is used for surveillance purpose, monitor the army base, traffic monitoring and human machine interaction. In this project robots can detect the object and rotate as left and right position and then move forward and backwards depends upon the object movement. It maintains the constant distance between the object and the robot. In the hardware setup we use the arm 11 raspberry pi camera to attach the robot for detection of object. Camera is attached to the servos for pan and tilt. We use linuxos with python coding to identify the object with open CV.

Key words: Camera module • Motor drivers • Raspberry pi kit • Robot motors • Sd-card

INTRODUCTION

Raspberry pi is the single board computer or mini-computer. It is a small scale computer because size is slightly bigger than the credit card. This device is enough to run the games, word processing like office, photo editor and more process can be worked with similar magnitude. It is an education tools to be used for those who learn more about programming. It is not substitute for Linux mac or windows os. Pi based on system of chip with arm processor. The RAM is here used all about 256-512. Here boot media we can used as SD card which cannot be included in the device, accesses the continuous amount of data as possible [1].

Literature Survey: This is the fifth part of a series of papers that provide a comprehensive survey of techniques for tracking maneuvering targets without addressing the so-called measurement-originuncertainty. Part I and Part II deal with target motion models. Part III covers measurement models and associated techniques. Part IV is concerned with tracking techniques that are basedon decisions regarding target maneuvers. This part surveys themultiple-model methods-the use of multiple models (and filters) simultaneously-which is the prevailing approach to maneuveringtarget tracking in recent years. The survey is presented in a structured way, centered around three generations of algorithms: autonomous,

cooperating and variable structure. It emphasizes the underpinning of each algorithm and covers various issues in algorithm design, application and performance.

Existing System: In existing system object detection was done with the help of s sensor. Multiple object detection sensor was available but right s sensor is the difficult to identify because each having own features. F for object detection we can use proximity sensor, ultrasonic sensor, c capacitive sensor. Photo electric or inductive. For tracking purpose p proximity or image sensor. The sensor identification is not a simple t task for every kind of operation individual sensor is used so sensors selection of sensor is done by following condition namely accuracy, resolution, range control interference, environmental condition and cost these are major factors to be considered [2].

Drawbacks: 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 [2].

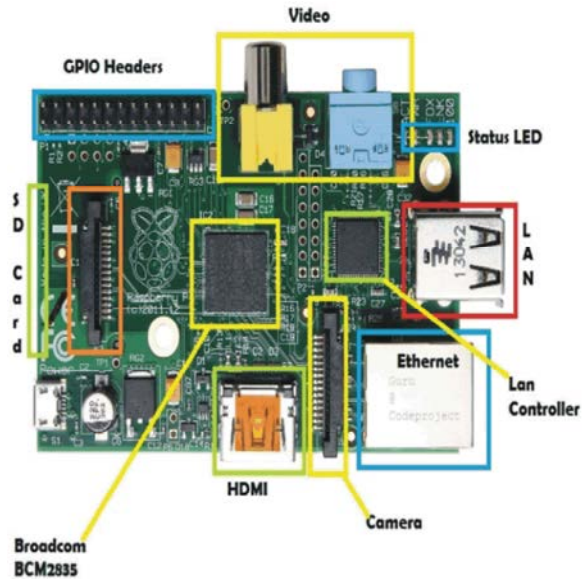


Fig. 1: Raspberry pi kit structure

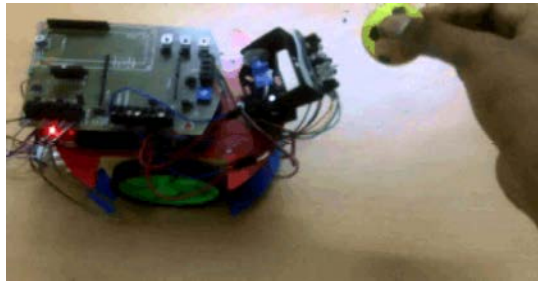


Fig. 2: Kit structure of existing system

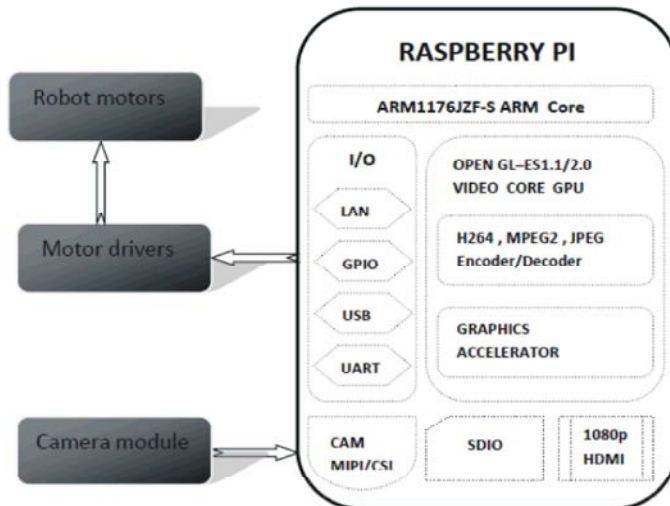


Fig. 3: Block Diagram of Raspberry PI

Proposed System: 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.

Advantages: This method is used for tracking the multiple objects which have different structure, sizes and different colors. Avoiding technology employed several infrared rays (IR) sensors and supersonic waves' sensors together and then measures the range in real time between the objects and the robot.

Working: 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 [3-19].

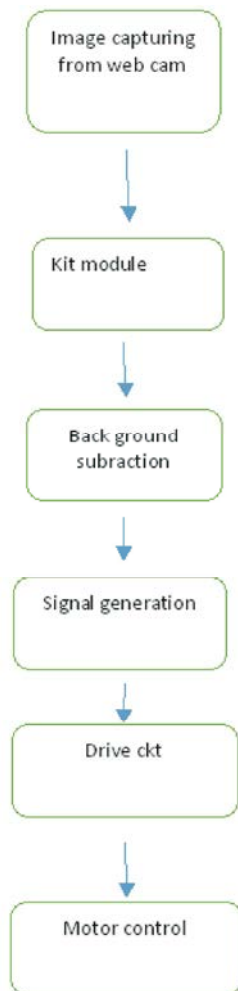


Fig. 4: Block diagram of working model

Initialization: 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 are wanting to utilize. The raspberry pi underpins Linux, ARM and 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. The raspberry pi underpins max 64 GB SD card. Before you begin your raspberry pi, you are going to need to associate a presentation, console, mouse like as a PC. It bolsters three distinctive O/Ps like HDMI video, composite video and DSI video, where the DSI video needs some particular equipment. When you purchase a raspberry pi board it might sold with or without a SD card. It is an essential determination in raspberry pi board. Since, it keeps its working framework, archives and projects. On the off chance that your raspberry pi did not accompany a SD card, then the min size you ought to get is 4GB.

Background Subtraction: Foundation subtraction is a computational vision procedure of separating closer view objects in a specific scene. A frontal area article can be depicted as an object of consideration which helps in lessening the measure of information to be handled and also give essential data to the assignment under thought. Frequently, the closer view item can be considered as a reasonably moving article in a scene. We should underline the word cognizant here on the grounds that if a man is strolling before moving leaves, the individual structures the forefront object while leaves however having movement connected with them are considered foundation because of its dreary conduct. Sometimes, separation of the moving question additionally shapes a premise for it to be viewed as a foundation, e.g. if in a scene one individual is near the camera while there is a man far away in foundation, for this situation the close-by individual is considered as closer view while the individual far away is disregarded because of its little size and the absence of data that it gives. Distinguishing moving articles from a video grouping is a major and basic undertaking in numerous PC vision applications. A typical methodology is to perform foundation subtraction, which distinguishes moving articles from the bit of video edge

that varies from the foundation model. Foundation subtraction is a class of strategies for portioning out objects of enthusiasm for a scene for applications, for example, observation.

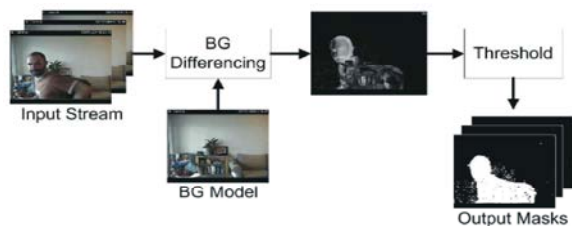


Fig. 4: Back Ground Subtraction

The above figure it shows that how the background images can be get from the input images. In the first place, it must be hearty against changes in enlightenment. Second, it ought to abstain from identifying non-stationary foundation protests and shadows cast by moving items. A decent foundation model ought to additionally respond rapidly to changes in foundation and adjust to oblige changes happening out of sight, for example, moving of a stationary seat starting with one place then onto the next. It ought to likewise have a decent forefront location rate and the preparing time for foundation subtraction ought to be continuous.

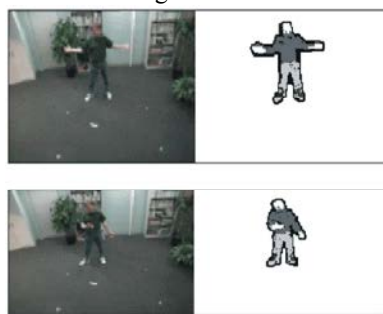


Fig. 5: Static and dynamic picture analysis

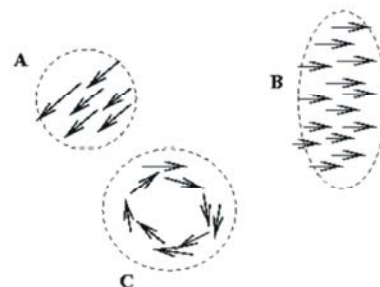
The reason for our work is to get a continuous framework which functions admirably in indoor workspace sort of environment and is autonomous of camera situations, reflection, enlightenment, shadows, opening of entryways and other comparable situations which prompt blunders in frontal area extraction. The framework ought to be vigorous to whatever it is given in its field of vision and ought to have the capacity to adapt to every one of the elements adding to incorrect results. Much work has been done towards getting the most ideal foundation model which works continuously. Most primitive of these calculations would be to utilize a static casing with no

frontal area object as a base foundation model and utilize a straightforward limit based edge subtraction to acquire the closer view. This is not suited for genuine circumstances where ordinarily there is a great deal of development through messed regions, objects covering in the visual field, shadows, lighting changes, impacts of moving components in the scene (e.g. influencing trees), moderate moving questions and protests being presented or expelled from the scene.

Shot Boundary Detection: The premise of any shot limit location technique in a video arrangement comprises in distinguishing visual discontinuities along the time space. Amid this identification process, it is required to remove visual elements that measure the level of closeness between edges in a given shot. This measure, signified as $g(n, n+k)$, is identified with the distinction or irregularity between outline n and $n+k$ where $k \geq 1$. There exist diverse techniques for registering the estimation of $g(n, n+k)$ in a video succession, being one of the least difficult the supreme contrast between edges.



Motion Segmentation: The motion of the video gets from the moving objects. Recognition is a procedure of affirming the position of an article with respect to its environment'. This post talks about the ideas included and the execution of Motion Detection in a video utilizing Open CV and C++, as actualized in the specimen code in OpenCV tests envelope, "motempl.c". here are a few methods for executing movement discovery utilizing Open CV. A standout amongst the best techniques is by utilizing 'Movement Templates'. This strategy was designed in the MIT Media Lab by Bobick and Davis. This strategy is exceptionally valuable in discovery movement in a video. The essential component of this strategy is that movement can be recognized even in little locales of an edge.



Robot Setup: The main factor is movement of robot with appropriate direction, first we have to calculate the coordinates. In case any problem while calculating the coordinates point robot gets malfunction it will not able to tracking the object is difficult. Here the open cv does the co-ordinates calculation same like as matlab. The robot calculate the center spot and color object move from left and right wheel also moves. Here the motor we can use dc motor this motor moves forward and backward direction depends of object movement.

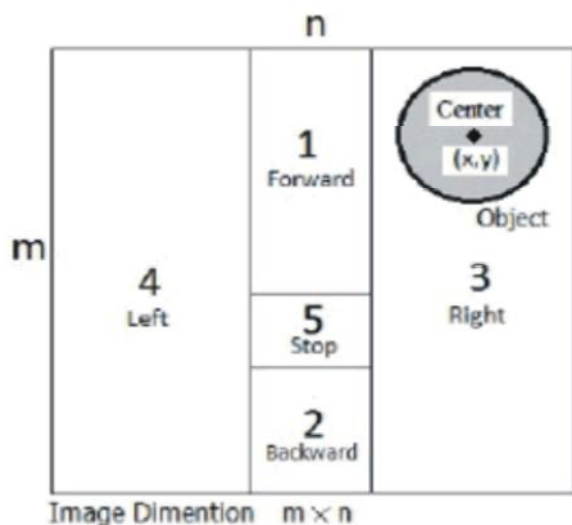


Fig. 7: Different segments of image plane

The robot movement table was shown in Fig. below.

Table : Movements of the robot

No	Status	Command	Left Wheel	Right wheel
(1)	Center in segment 1	Forward	Forward	Forward
(2)	Center in segment 2	Backward	Backward	Backward
(3)	Center in segment 3	Right	Forward	Backward
(4)	Center in segment 4	Left	Backward	Forward
(5)	Center in segment 5	Stop	Stop	Stop

The robot moves forward the two wheels moves forward direction and then robot moves from segment 2 that means backward direction two wheels are move backward likewise remaining wheels can move rest of segments. The robots internal arrangements are shown in fig below. The two dc motor are connected to the two wheels i.e left and right side of the robot these motor can play the major role in robot movement and steering. Free running wheel is connected robot front wheel.

CONCLUSION

The concept we used in this paper make use of raspberry pi kit along with web camera to track the colour object effectively. The robot movement here used along dc motor for accurate measurements. It is not only used for colour object because operating system we used here in the kit to access all facilities which was we use in computer like games, music, video etc., further modification we can do that use of raspberry pi remote to operate the manual supply like tv, so wired system can be reduced.

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