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Image Processing Technique Based Color Image Object Tracker

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Abstract:
The variation in horizontal and vertical axis of tracked object generate control signal which is send to the controller wirelessly. The captured images of the object are processed using software MATLAB. Depending on the change in position of object, proper commands are given to the robot to track moving ball. This project is in aimed to design and develop a mobile robot which can track a moving ball. Here, we use the camera to capture image of the ball and these frames are processed to track the ball. The features of the ball such as the colour, shape, size can be monitored for tracking the ball. In our project we use the colour information of the ball to track the object. Better performance of the robot can be obtained if multiple features are monitored. The motion of the robot is controlled by a microcontroller based on the control signals received directly. The interest in robots that are able to act in unstructured environments is increasing. The control of a robot in such an unstructured environment has to rely on sense and perception. Using visual perception for this provides comprehensive possibilities with regards to safe manipulation of objects. This thesis presents a new approach for visual robot control (visual servoing). Existing approaches are extended in the way that depth and position information of objects is estimated during the movement of the robot. This is done by the visual tracking of an object throughout the trajectory. As a result, it becomes possible to manipulate objects in the environment of a robot with little previous knowledge. In addition, a force sensor is used for reliable manipulation in such unstructured environments.

Keywords: robot; tracking; range detection; image processing; MATLAB; motor drives; microcontroller; wireless

I. INTRODUCTION

The major weakness in surveillance rests on the involvement of human operators, who usually monitor a large number of inputs from cameras. As, these operators could be easily distracted due to boredom, fatigue, many unseen crime could be happen which are avoidable if proper surveillance is done. To overcome this potential problem, a mobile robot could be used. A robot would be able to travel throughout the regions to be monitored autonomously and continuously, making its own decisions while identifying for unwanted behaviours or activities, and respond accordingly such as generating alarms or sending alerts. Surveillance is for monitoring for behaviours or activities on people or objects from a distance. Security cameras are considered to be for most commonly used equipment for that purpose. The main applications of these cameras are such as, industrial process controlling and monitoring, traffic regulation and crime detection. As, they are fixed in particular position using mechanical support they provide only 360 degree movement to camera which limits the area of monitoring. Object tracking can be done by identifying and tracking some specific feature of the moving object such as colour that belongs to the moving object. Thus trajectories of moving object can be traced through this process over time. Object tracking using computer vision is a crucial component in achieving robotic surveillance. The main aim of the object tracking is to track the object based on the information obtained from video sequences. In our project, we determine the region on interest (ROI) of the moving target which is followed adaptive colour filter to extract the colour information and thus the object is tracked. The main contribution on this paper is that the introduction on a colour filtering method which is capable of adaptively identifying the most salient colour feature that belongs to for moving object and using this colour feature for tracking

II. LITERATURE SURVEY

Even though the background subtraction method provides the information of the object to be tracked, it cannot provide satisfactory result based on moving camera. If a moving camera is used, with example, a camera mounted on a mobile robot, background subtraction will face drawback that the background of image is constantly changing due to the camera movement. This will lead to false information on the object to be tracked and lead to false classification on moving object. This false classification will misguide the moving camera system to lose track of the target object. However, existing object tracking methods using mobile robots (moving cameras) usually depend on certain features that belong to tracked objects. Even though, the background subtraction based method can easily identify moving objects with a stationary camera, it cannot provide satisfactory results with a moving camera. This is because for background subtraction method extracts the object information by distinguishing the differences between moving objects and a “stationary” background. Above method is valid for object with unique colour in all conditions. A ball tracking uses method of background subtraction. Control signals are generated only after background subtraction. During generation of control signal the robot in stationary or locomotion. The median filter is use to eliminate noise. Control signals are generated by setting threshold value for image. This method could develop to track the face and for hand accurately using colour detection. Background is simply identified by observing the distance between object and the camera. If distance is small, then size of background with respect to object is small. Likewise if distance is large then major portions is background. This level on computation complexity has imposed difficulties in real-time applications. So use background subtraction rather than identify the background.

Suppose we observing variation within a room, then we can simply identify the variation in room by subtracting camera input with a reference image. Else we can subtract successive image taken by camera. For moving object we use background subtraction using MATLAB to track a moving ball. In which the original image is converted to gray. Then original image is subtracted with gray scale image. The background image is having same value. So resulting image background is seems to black and tracking ball seems to white.

III. PROPOSED SYSTEM

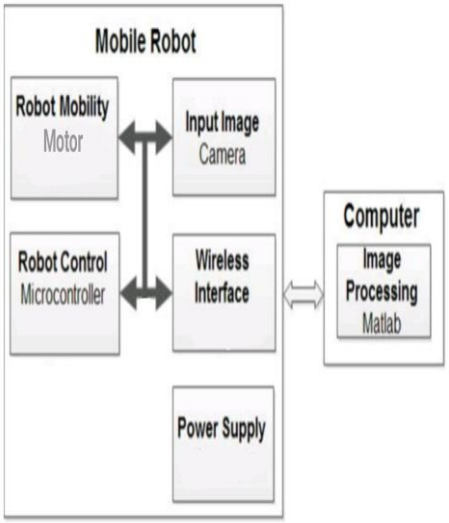

Figure .1. Proposed System Diagram

For proposed robot include both hardware and software part. Hardware part includes

a) Wireless module (wireless communication between robot and computer)
b) Arduino Microcontroller
c) Motor driver d) DC servo motors.

The software part includes MATLAB for image processing and MPLAB for embedded software development.
It is used to acquire colour 640X480 images.
Detection of the Object
The object detection process includes four major stages: extracting frames, extracting colour components, RGB to grey scale conversion.

The different stages are

1. Extracting frames: From the video alternate frames are extracted and are further processed. The camera used here is capable of taking 30 frames per second.
2. Extracting colour components: Each frame contains three basic colour matrices Red ,Green and depending on the colour of the object which is being tracked , we are extracting one colour matrices or a combination of matrices.
3. RGB to grey scale conversion: Each frame is converted to grey scale. It will reduce memory usage and increases the processing speed.
4. Elimination of small objects: This is to remove object below a certain pixel size which may otherwise cause malfunction. MATLAB provides special function for this operation.
5. Subtracting background: The grey scale matrices obtained in step RGB to grey scale conversion is subtracted from colour component matrices.

After performing the above operations, the position of the object will be appeared in white colour and background is in black colour. Thereby the object or ball is to be tracked is identified by the MATLAB. Object Tracking Once the object is identified next stage is the tracking. The identified object is assigned with a bounding box in MATLAB. Bounding box is a built in function in MATLAB which will return regional information of the specified region

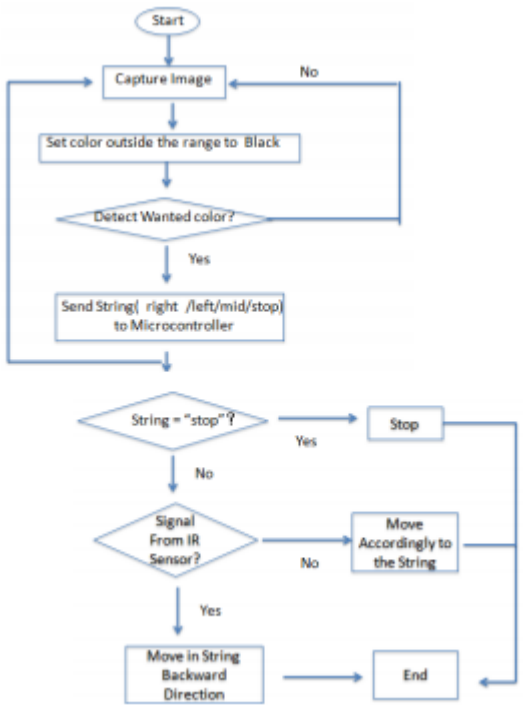

Figure. 2. Flow diagram

The flow diagrams in figure 3.33 show how the robot will react. This is programmed in the microcontroller. There is two factors influencing the reaction of the robot, first is the horizontal coordinate of the target, second is the signal condition of the infra red. After the robot is started, the robot will detect the wanted object. After the target is founded, it will calculate the position of the target and send a string to microcontroller. (For example, if the target on the right side, it will send the "right" string). To determines whether the robot moving in front or backward, it depends on the signal from infra red.

IV. RESULTS

Reflection from smooth ground plane can lead to false object identification. It is rectified by using any non- reflective surface. Reflecting surface of the tracked object which is avoided by eliminating plastic surface on tracked object. Variation on surrounding illumination which is tackled by providing constant illumination level

a) Reflection from smooth ground plane can lead to false object identification. It is rectified by using any non-reflective surface
b). Reflecting surface of the tracked object which is avoided by eliminating plastic surface on tracked object c) Variation on surrounding illumination which is tackled by providing constant illumination level.

Problem unsolved: a) Colour changing objects cannot be tracked. b) Malfunction occurs while tracking objects having same colour and size.

APPLICATIONS

Some of the applications of object tracking are: Automated video surveillieance. In these applications computer vision systems is designed to monitor the movements in an area, identify the moving objects and report any doubtful situation [3]. The system needs to discriminate between natural entities and humans, which requires a good object tracking system. Robot Vision: In robot navigation, the steering system needs to identify different obstacles in the path to avoid collision. If the obstacles themselves are other moving objects then it calls for a real-time object tracking system. Traffic Monitoring: In some countries highway traffic is continuously monitored using cameras. Any vehicle that breaks the traffic rules or is involved in other illegal act can be tracked down easily if the surveillance system

V. CONCLUSIONS

The proposed paper is designed, implemented and tested successfully. The response of system to different object movements was satisfactory. Still some advancement can be included to for system to improve performance. Obstacle avoidance mechanisms can be included. This can be done by sensing the back ground images and processing it properly. The mobile robot should have the abilities to follow a running human and avoid dynamically moving obstacles in an unstructured outdoor environment. In this paper an algorithm is proposed to track the real-time objects on the basis of region properties such as Centroid, Boundingbox, etc, using the colour property of the object as a feat. Still some advancement can be included to for system to improve performance. Obstacle avoidance mechanisms can be included. This can be done by sensing the back ground images and processing it properly. May the contents discussed in this paper can give valuable insight into this important research topic and encourage new research.

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