RESEARCH ARTICLE OPEN ACCESS

Mobile Controlled Robot For Surveillance Application

Anjali Parate , Apurva Parad, Anurag Shinde, Jasmin Untawale
Electronics and Telecommunication Department
Yeshwantrao Chavan College of Engineering
Nagpur,Maharashtra, India- 441110
parateanjali@gmail.com
apurvaparad@gmail.com
anurag.p.shinde@gmail.com
unt.jas@gmail.com

ABSTRACT
This paper introduces a surveillance robot controlled by a mobile phone. A surveillance system is used to monitor the actions or movements of some specific objects. This system can be used for observation of the ongoing events around us.
The aim of this project is to track some specific objects selected by the user and send a notification on the user's mobile phone. The idea is to develop an application to track the objects using the image processing concepts and provide accurate results in spite of the illumination problems.
Here we have used the arduino mega 2560 for interfacing with the android application. We can use this system in commercial applications like an automatic shopping robot, load carrying robot in industries to help the workers in carrying tools and providing automatic assistance.
Keywords **-** android, arduino, image processing, object track, Surveillance

I. INTRODUCTION

The domain of image processing provides unique functionalities, since it only considers an image as a valuable entity. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. One of its applications is for object tracking and motion tracking. There are different concepts relating to the image processing such as pattern detection, object detection, object tracking, motion tracking, etc. Research in each field has its own focus.

Now a day's mobile devices are integrated with our everyday life. The security and remote surveillance system is increasingly prominent feature on the mobile phone. The field of tracking objects with camera is well established. Siti Sarah Md Sallah et

al.[1], W.J. Kuo et al.[2] proposed idea is- a road sign detection and recognition algorithm for an embedded application. The algorithm is based on the Hough transform method to detect lines by comparing variables with template library which is already developed in order to identify and determine the shape of the road sign. Thomas Zimmerman [3] has developed "Shopping Buddy", tracking cart with IR beacons. Soh Nishimura et al. [4] developed an autonomous carrying system based on color detection which can be used to perform daily jobs. The autonomous system can be applied to a shopping cart used in retail shop, an luggage carrying cart used at airports, in chairs, tables etc. Instead of using such a huge setup for tracking or surveillance application we can reduce the size and processing time and make our application more efficient.

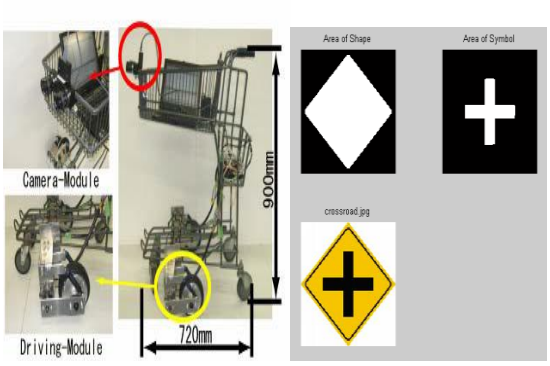

Figure 1 (a) Shopping Buddy (b) Road Sign Detection

Our paper 'Mobile controlled robot for surveillance application' discusses the base idea of image

processing algorithm which uses thresholding for detection of object. This detection is done on the basis of colors.

We have developed an application in Android [5] for detection of object depending on its color. According to the users' choice we can track objects of any color. By selecting the object on the screen we store its co ordinates and as per the movement of the object we can track it. We interface the hardware part with the android mobile phone and create an embedded system using Arduino [6]. We establish a communication between the system and end user after the object is detected.

II. IMAGE PROCESSING

Our paper explains the two major parts in our application

- Algorithm development using the concept of image processing
- Hardware implementation

In our application, the basic idea of motion tracking is used. Motion tracking is basically a concept in which a motion of an object is tracked. This can be useful for detecting the presence of any motion or for the complex motion capture used in video editing. Motion tracking can also be used as an alternative to radar to follow distant objects, such as missiles, satellites, and space debris, while also providing a high resolution image.

Another concept is of image thresholding, a procedure that eliminates shades of gray from regions of a video picture above or below particular gray levels, replacing them instead with solid white or black. In computer vision, image segmentation is the process of partitioning a digital image into multiple segments. The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics.

III. BLOCK DIAGRAM

In figure 2, the block diagram is shown in which the embedded system consisting the main elements are:

1. Android Phone : For processing the video frames.

2. Arduino: For sending commands to the hardware system.

3. L293D : To give input to the motors

4. Tracker Robot: It is the hardware system to track the detected object.

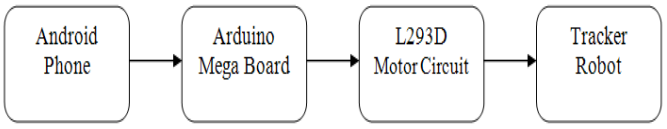

Figure 2

A. Interfacing of Arduino and L293D:

The arduino is interfaced with L293D circuit as shown in figure 3.The arduino sends high and low signals to L293D circuitry to run the motors.

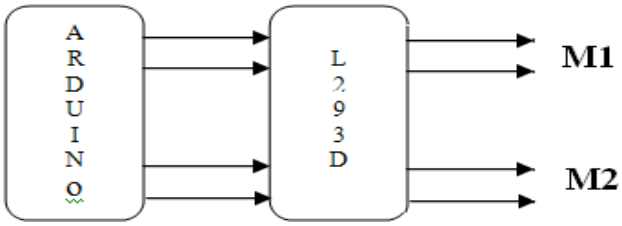

Figure 3: Interefacing

B. Methodology:

The algorithm for the above proposed system is as explained below:

1. Establish a USB connection of arduino and android phone.

2. Take input from the camera

3. Real Time processing on frame seen in preview window of camera

4. Detecting Objects position (x,y) in image frame.Store the co-ordinates of selected point.

5. Creating color palette of range of shades i.e to Form the color palette of the selected color

The color palette created as follows:

Selectmin= Intensity value – 10

If Selectmin <0 , then Selectmin=0;

Selectmax=Intensity value +10

If Selectmax>255,then Selectmax=255

6. Scan complete image and form the thresholded image and display it.

Thresholding is done as follows:

If Selectmin<=p(x,y)<=Selectmax

p(x,y)=p(x,y);

else

p(x,y)=0;

7. On the basis of direction of motion display the motion as right left or forward and send commands to arduino for each specific condidtion.

8. Send a sms to the user when motion detected.

9. Arduino receives commands through the application

10. It controls the motor through l293d and the robot tracks the object.

IV. RESULT & CONCLUSION

The main aim of this paper is to show a method which is used to monitor continuously a particular object and if any motion is detected, it identifies the direction of motion and notifies the embedded system as well as the user.

To detect the motion the change in coordinates of the object is observed and based on the new coordinate's direction the object is traced. When a specific color is chosen, a color palette is formed and based on this palette binary thresholding is performed and a threshold image is displayed.

The commands are sent to the arduino to run the motors for motion tracking of the Robot.

Figure 4: GUI of the application

In figure 4, The GUI is shown. The thresholded image is shown in the top left corner and a color pallete besides it.Co ordinates of the object are also displayed.The position of object is displayed at the bottom.

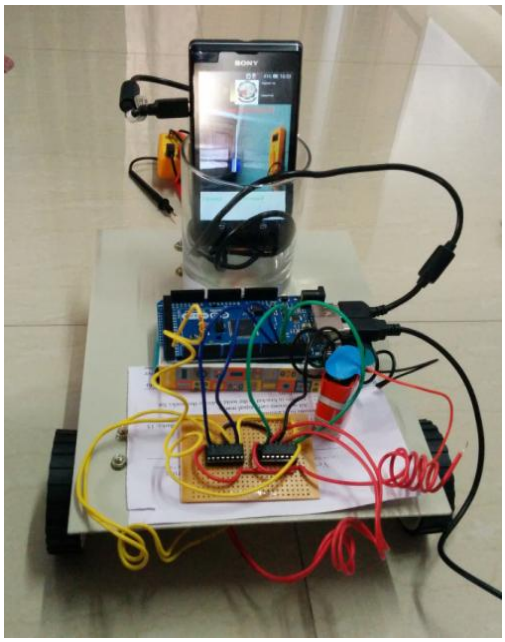

Figure 5: Set-up for Mobile controlled Robot for surveillance system.

ACKNOWLEDGEMENT

We are thankful to our project guide Ms. Y.K. Dubey, Professor, Electronics and Telecommunications, YCCE for her continuous guidance and support for this project.

REFERENCES

Journal Papers:

[1] Siti Sarah Md Sallah, Fawnizu Azmadi Hussin, Mohd Zuki Yusoff, "Shape-based Road Sign Detection and Recognition for Embedded Application Using MATLAB", Electrical & Electronic Engineering Department,Universiti Teknologi PetronasBandar Seri Iskandar, 31750, Tronoh, Perak, Malaysia

[2] W.J. Kuo, C.C. Lin, "Two-stage Road Sign Detection and Recognition," in Multimedia and Expo, *IEEE International Conference*, pp. 1427-1430, 2007.

[3] Thomas G. Zimmerman, "Tracking Shopping Carts Using Mobile Cameras Viewing Ceiling-Mounted Retro-Reflective Bar Codes", IBM Almaden Research Center 650 Harry Road San Jose, California 95120 tzim@almaden.ibm.com.

[4] Soh Nishimura, Keita Itou, Takashi Kikuchi,Hiroshi Takemura, Hiroshi Mizoguchi,"A Study of Robotizing Daily Items For an Autonomous Carrying System-Development of person following shopping cart robot-", Department of Mechanical Engineering, Tokyo University of Science.

[5] www.developer.android.com

[6] www.arduino.cc