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Traffic Light Detection System for Visually Impaired Person with Voice System

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ABSTRACT: This project's main focus is to give a better and much more efficient solution for a well-known problem. The project chooses to tackle a problem, which concerns the visually impaired community's road crossing; and to be more precise: Pedestrian Traffic Light Recognition. A blind person will have a camera on his head which will capture the image and video of the traffic signal. The input of the system is a continuous traffic video sequence or image of a traffic light, which will first be separated into individual image frames for further processing. By using an image processing system, the system will calculate the time mentioned on the traffic signal. Blind persons will receive an audio clip regarding the seconds remaining for dispatching the signal.

I. INTRODUCTION

The World Health Organization gives statistics that there are 285 million visually impaired people, out of which 39 million are totally blind. They are facing a lot of difficulties in their day-to-day life. There are many systems like white cane and guide dogs to assist the visually impaired people. About 90 per cent of visually impaired people are living in low-income settings and so the guidance system should be designed in such a way that incurs low cost. Many guidance systems are proposed in the past to ease the mobility of visually impaired people. A variety of techniques are there which a blind person frequently uses such as white cane or walking stick for navigation. But still the blind people cannot cross the traffic signal on their own and depend on others to cross the road and traffic signal. So, on taking this into consideration we decided to design a product which would help the blind people specifically cross the road as in. This project involves helping the blind to recognize traffic signals to cross traffic signals without depending on others. In this project, we will study three important models,

1. Traffic light detection
2. Cross watch System
3. Audible Pedestrian Signals

In today's world, independent walk is the main issue for the visually impaired people. People who are completely blind or have low vision often have problems in self-navigation outside the well-known environment. People who are blind or visually impaired can travel and cross streets using a human guide, using a long white cane to identify and avoid obstacles, using a dog guide, using special optical or electronic aids, or using no additional aid. The main barriers for blind people are detecting crosswalk (zebra crossing) and detecting traffic light colors. Blind and impaired people face many dangers as pedestrians in a big city. Many electronic mobility assistant systems are developed based on converting sonar information into an audible signal for the visually impaired persons to interpret. Mobility aids such as walking sticks and canes can provide support or are used to help deaf-blind people to find their way around the well-known environment. As well as the white cane that blind people use to navigate their surroundings and let people know they are blind. There is also a red and white cane to show that someone is deaf-blind. In general, there are two types of traffic lights: Suspended traffic light and supported traffic light. Suspended traffic light is much easier to detect because the background area is almost static and generally includes a sky area. Crosswalk is an alternative pattern of black and white stripes. Rest of the paper is organized as follows: In section, we present the literature survey. In Section, we represent some issues about detecting crosswalk and traffic light.

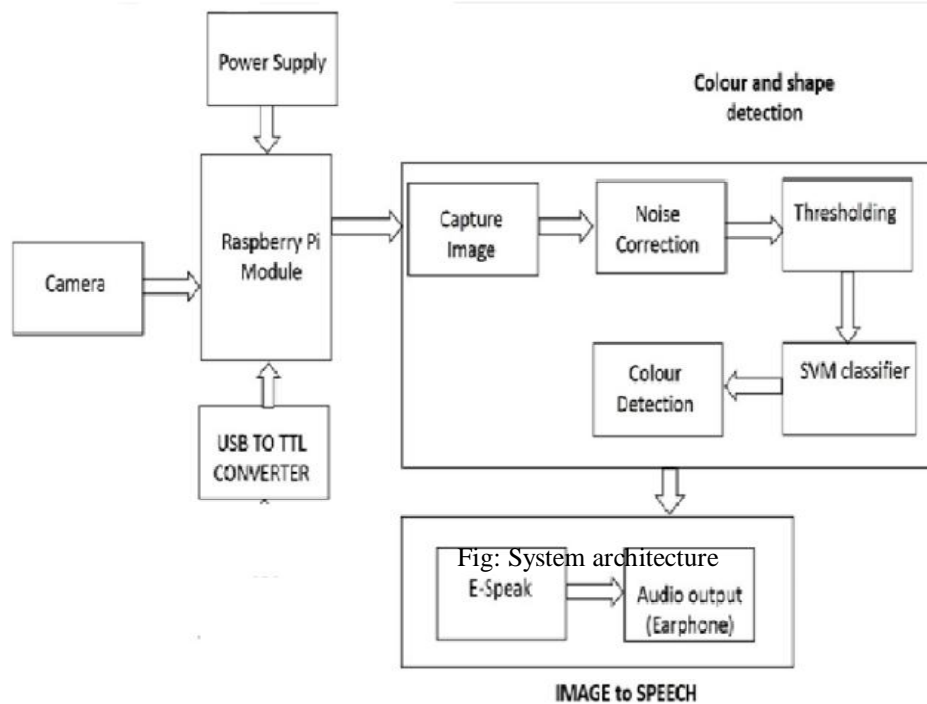
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WORK DONE System Architecture



I. INTRODUCTION TO COMPUTER VISION

With the advancement of Artificial Intelligence, Computer vision came into the picture in late 1960s. Its whole purpose was to increase the intellect of the artificial mechanism available by installing the cameras into them and describe whatever they saw just like humans' visual system. Thus, Computer vision should be able to detect actual daily-life 3D objects through 2D pictures. Every picture tells us a story, something present now or what has been going on at a particular time.

II. INTRODUCTION TO OPEN CV

Open CV is Open Computer Vision Library. It was initially launched in 1999 by Intel. With more updates, it has been modified since then to aim for the real-time computer vision. This library has been written under programming languages like C and C+. It can be easily run on operating systems Windows and Linux. This library can be easily interface with programming languages like Python, MATLAB, Ruby and others as well. Along with Numpy and Python image processing (shape & color detection) can be performed at ease .



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III. STEPS INVOLVED IN SHAPE & COLOR

DETECTION IN PYTHON 2.7

Let's begin with a given sample image in either .jpg or .png format and apply object detection in it.

3.1 Install Python-Open CV

To implement this project, the following packages of Python 2.7 have to be downloaded and installed: Python 2.7.x, NumPy and Matplotlib. According to the default location, Python will be installed to C drive. Open Python IDLE, import all the packages and start working.

3.2. Read an Image

First, a sample image in which processing is to be applied is to be read. It's done using a pre-defined Python function: CV2.imread. The sample image should be available in current folder or the full location of the image is to be mentioned as an argument. For reading an image, we can use functions like imread_color, imread_grayscale, imread_unchanged. Etc.

3.3 Traits Description

- Knowing traits
- Contour detection (Okay, Shapes are good features? But how do we find them)
- Shape detection
- Color detection (Study pixels to find out colors).

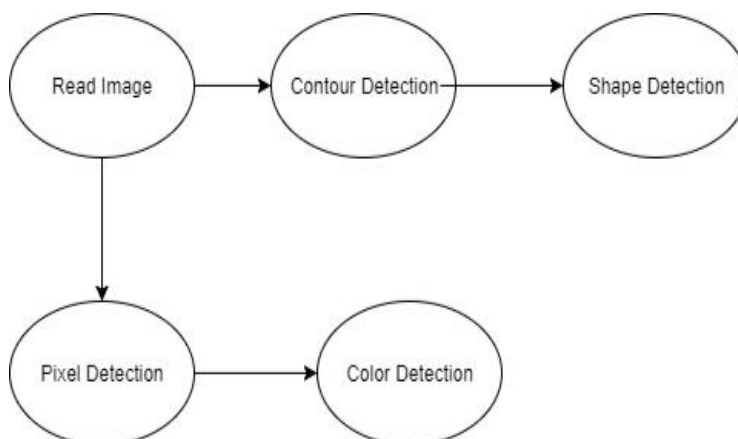


Fig. Flowchart for Shape & Color Detection

IV. PYTHON VS OTHER PROGRAMMING

LANGUAGES FOR COMPUTER VISION Object detection is a domain-specific variation of the machine learning prediction problem. Open CV is itself made in C and C++. But it can be easily implemented with various programming languages and environments like Python, MATLAB, Java, R. etc.

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Advantages for using Python as fundamental language for Object Detection are:

- Open Source.
- User friendly Data structures.
- Productivity & Speed.
- Simple and elegant Object-oriented programming.

More choices in graphics packages and toolsets.

IV. RESULT AND DISCUSSION

4.1 Experimental Result of traffic light detection

Fig.6 (a-d) showing the results we accomplish using the above algorithm. We exam our algorithm on steals photo both in day and night time.



Fig.6 (a): Green traffic light day time

The result shown in using the above algorithm. We exam our algorithm on steals photo and video, both in day and night time. One can see, we were able to get good and reliable result however we straggle to get the same quality result just before night time, at twilight.



Fig.6 (b): Red and Green traffic light day tim



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One can see, we were able to get good and reliable results. However we struggle to get same quality results just before night time, at twilight. Most false results were related to red light detection.

SOFTWARE AND HARDWARES

1. Raspberry PI

The raspberry Pi is a progression of credit card-measured single-board PCs created in England, United Kingdom by the Raspberry Pi Foundation with the purpose to advance the educating of fundamental software engineering in schools and creating nations. The first Raspberry Pi and Raspberry Pi2 are produced in a few board setups through authorized assembling understanding switch network element 14,RS components and Egoman. The equipment is the same over all makers.



2. Raspbian

Raspbian is a Debian-based computer operating system for Raspberry Pi, developed by a small team of developers. It is not affiliated with the Raspberry Pi Foundation, but the foundation provides a Raspbian image which is listed as an officially supported operating system. Raspbian is maintained by Mike Thompson and Peter Green et al. which completed the initial build in June 2012. The operating system is still under active development.

3. Python

Python is an interpreted, interactive, object-oriented programming language. It is often compared to Tcl, Perl, Scheme or Java. It is a scripting language like php or asp for developing applications. Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built-in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together. Python's simple, easy-to-learn syntax emphasizes readability and therefore reduces the cost of program maintenance. Python supports modules and packages, which encourages program modularity and code reuse. The Python interpreter and the extensive standard library are available in source or binary form without charge for all major platforms, and can be freely distributed. The programming language is that language which is used to write the programs in to the computer and which can be easily understandable by the computer.

4. Sudo

You will not normally log into to the computer as root, but can instead use the sudo command to provide access as the super user. If you log into your Raspberry Pi as the pi user then you are logging in as a normal user. You can run commands as the root user by using the sudo command before the program you want to run.



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V. CONCLUSION

We studied different methods of crosswalk and traffic light detection, it is very help full to autonomous vehicle system and blind people. All the methods detect traffic light and crosswalk from scene image and from video frame. Hidden Markov model and template matching approaches have good detection accuracy. But template matching is time consuming process. Another method is colour segmentation, which is widely used for traffic light detection. In colour segmentation method, saturation problem has been not occurred. In Hough transform, the computational time more that make it unsuitable for real time application.

VI. FUTURE SCOPE

To make this algorithm effective and truly useful for every day use, a better running time is required, (Less time consuming functions). In addition a solution for twilight time is required. This project can be expanded for other road cross themes, such as Zebra Crossing detection. We did deal with this issue a little bit. Like to pole detection we assumed that find the zebra crossing pattern will help us recognize more effectively the traffic light.

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