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The Third Eye

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Abstract: Now a days it is a big problem for the visually impaired person to travel or walk alone in the road. They often faces the accidents or collides with the obstacles, so they have to take the help of the others or have to be dependent on the others to travel on the roads. Even when they goes to any new places it is very difficult for them to cooperate with the new environment and they have to take the help of the others. Though they uses the blind cane to walk they cannot know about the obstacles until they touch the obstacles so sometimes before taking any decision they faces accidents. Moreover they even cannot recognize what obstacle it is. So our main objective is to provide the information to the visually challenged people so that they can move independently on the roads without facing accidents and can recognize the objects so that knowing the object they can take the decision accordingly and can avoid the accidents. The device is basically a smart blind cane which consist of a wireless camera attached to the servo motor which will rotate in all the possible directions and will visualize the objects and provide an early information to the visually challenged person through the headphone or Bluetooth headset so that after getting the information about the object the person can take an immediate action to avoid the collision with the object.

Keywords: Open CV; intel edison; python IDE; object recognition.

1 INTRODUCTION

‘The Third Eye’ is a system developed with a motive to save the visually challenged person from facing accidents while travelling on the road alone and to recognize the object that is around him. The system is developed by incorporating 2 major part.

- Hardware
- Software

1.1 Hardware

The hardware of the system mainly consist of the blind cane. The blind cane consist of the following parts :

S.no	HARDWARE		
	Name	Specifcattion	Quantity
1	Wireless camera	C270	1
2.	Intel Edison	Atom processor	1
3.	Battery	9v	2
4.	Bluetooth module	HC05	1

S.no	HARDWARE		
	Name	Specification	Quantity
5.	Servo motor	1.8kgf-cm	1
6.	Ultrasonic sensor	HC-SR04	1

1.1.1 Blind Cane

The blind cane is basically a smart blind stick which will compose the first major part of the system. The blind cane consist of a servo motor attached with the camera which will revolve in all the possible directions and will transmit the information to the visually impaired person. The cane consist of a processor which will convert the image after processing to the voice and will transmit it through the headphone to the visually impaired person. All the devices attached with the cane will get the charge from a series of 9V rechargeable battery so that it can store the charge eventually and the cane can be carried outside too.

1.1.2 Wireless C270 Camera

The wireless c270 camera is used to capture the image from the surroundings and send it to the visually challenged after processing through the headset. The camera is relatively of 1280 x 720 pixel.

1.1.3 Intel Edison

This processor is the most important component of the system. It does all the main function of the device starting from the object detection, recognition and conversion of the image to voice messages. The wireless c270 camera captures the image of the surroundings and send it to the processor which then operate on it to detect the image and recognize it and convert the image text to the voice which then transmit to the visually challenged person through the headset.

1.2 SOFTWARE

The software is mainly divided into two units. The first unit comprises of the object detection while the later comprise of the processing unit which deals with the object recognition.

1.2.1 Object Detection System

The object detection system processor is the core component of the system. The processor receives signal from the c270 camera operating in the 1 GHz frequency range. The processor processes the image received to detect the object. Here we have used a simple algorithm known as Haar Cascade algorithm to detect the object.

1.2.2 Object Recognition System

The detected object is then recognized by the Haar Cascade algorithm. In this process we have to pre-train the objects that we want to recognize. For the training purpose 20 positive images of the object is to be given and 10 negative images.

2 ARCHITECTURE

The device includes a servo motor attached to a camera, Intel Edison processor, a headset or a Bluetooth module. A battery backup is use to charge and power the device thoroughly. It is developed using DIP (digital image processing) technology. Intel® Edison Kit provides a pin out and standard connectors such as a micro USB connected to a UART, a USB OTG port that can be switched between a second micro USB device connector, a standard size USB host Type-A connector, a USD card holder, and a DC power.

- A camera is used to capture around the surrounding images with the help of servomotor attached to it.
- A processor’s architecture refers to the way in which its memory is controlled. The main functioning is done with open cv. It is open source computer vision in which library function of programming mainly aimed at real-time computer vision. Here it is used for facial recognition, object identification, gesture recognition, motion tracking, human computer interaction. It works on PYTHON, JAVA etc. it runs on a variety of platform such as LINUX, WINDOWS etc, a human machine interaction is done though it.
- After processing through open cv the information is directed to the Bluetooth module.

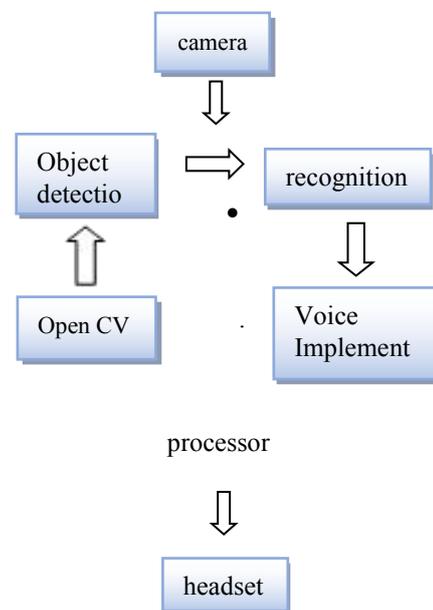
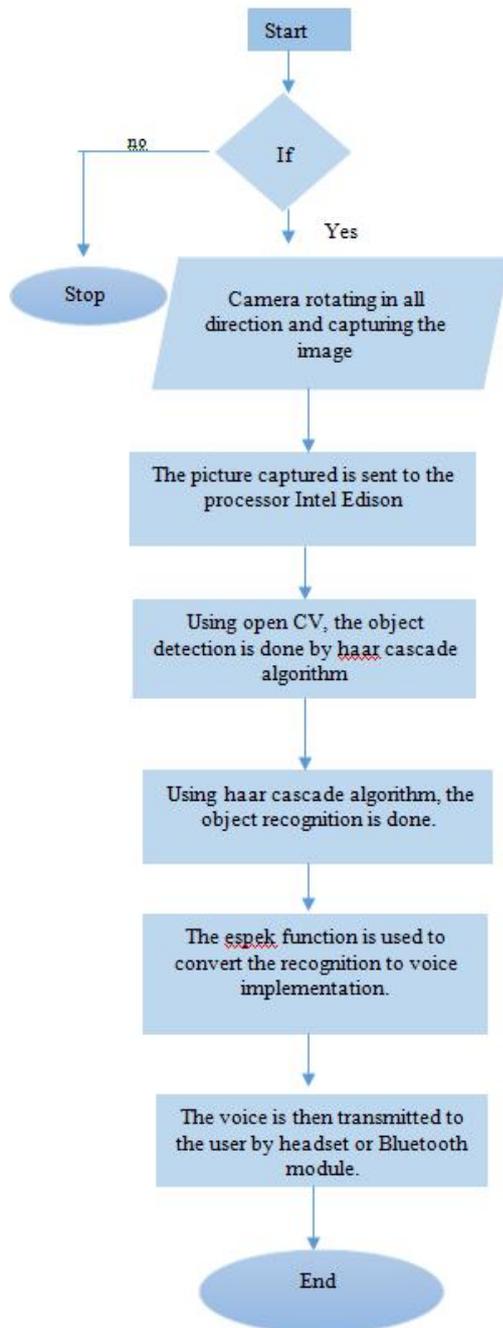


Fig. architecture of the system.

3 ALGORITHM

The program starts when the user has set the device to active alert mode which the camera attached to the stick is capturing images of the objects from all the directions. The images are then processed in processor using certain algorithms like haar cascade algorithm and the objects are detected and recognized. The result is then converted to voice form using espek function and transmitted to the visually impaired person through headset or Bluetooth module. When the visually challenged people use the device, the device will work in the following algorithm.



4 REVIEW OF THE OPERATION

The main part of the system is the Intel Edison processor which control all the other components of the system. The camera attached to the system rotates in all the possible directions and when any object is detected within a certain set range say about 100 cm then it will capture the image and send it to the processor. The processor immediately operates on it and using certain algorithm it detect [1] and recognize the object. When the camera detect any obstacle within the set range it capture the image and send it to the Atom processor, the Open CV converts it to the grey image and using certain algorithm such as the Haar Cascade algorithm and the comparing with the pre-trained images stored in the processor memory it recognize the object and then convert it to voice using the espek function and transmit it to the user using the headphone or the Bluetooth headset. In [2] the author said that it is extremely important to apply various preprocessing techniques to standardize the image that you supply to a face recognition system. Most of the face detection and recognition algorithm are extremely sensitive to various issues like light, consistent position of the pixel, consistent size, rotation angle and position of lights. This is why it is very important to use a good image processing filter before applying face recognition. So to recognize an object we have to train at least 20 positive image of the object and 10 negative image of the object to make it more accuracy.

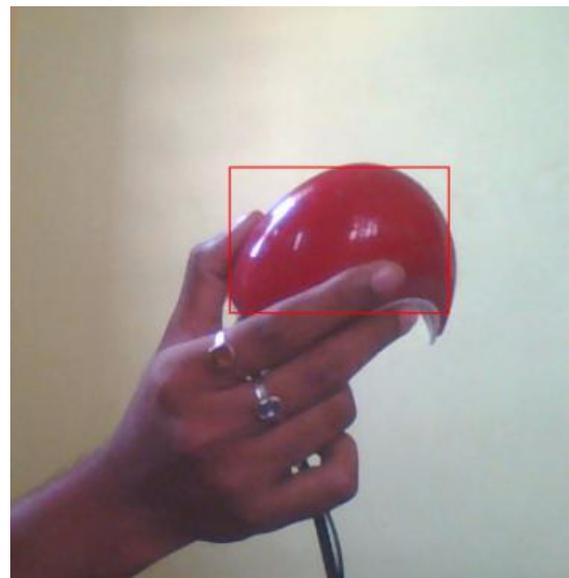


Fig. object recognition.

The device will also consist of a ultrasonic sensor for the detection of the distance of the obstacle from the user. The ultrasonic sensor will measure the distance of the obstacle.

5 RESULT OF THE WORK

The object detection system process is the main component of the device. The C270 camera detect the images from the surrounding and send it to the processor. We have used the EIDS processor which processes the image and detect the object. We have used a simple algorithm completely based on the image color and image size to detect the object [3]. This algorithm uses image processing library [4] Aforge.NET [5]. The algorithm utilizes two classes like Euclidean class and the blob class.

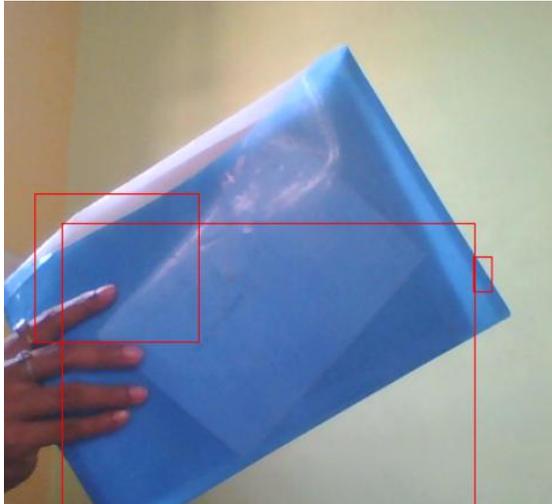


Fig. After detection of the color using aforge.

Then we have shifted to the Intel Edison using the Open CV library and the python IDE. The images that are captured from the surrounding are processed using certain algorithms like Haar Cascade algorithm. The Haar cascade algorithm

detect the light difference and then detect the objects [4].

6 CONCLUSION

The paper has described a device that will solve the problems of the visually challenged person. By using the device the visually person can easily move in the road alone and can avoid the collisions and accidents. And by using this device the visually challenged person can easily recognize the object and can also take quick actions after getting the information regarding the distance of the obstacles.

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