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Real Time Smart Bind Stick using Artificial Intelligence

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Abstract: ***The need for growing a low-fee assistive gadget for the visually impaired and blind humans has improved with steady increase in their population worldwide. Blind Stick reduces the human effort and gives better know-how of the surrounding. Furthermore it also gives an opportunity for visually impaired people to transport from one area to any other without being assisted by using others. The device also can be used in old age homes where vintage age people have difficulty in their day after day activities due to reduced vision. With this paper, the intention to useful resource human beings in wants to "see" the surroundings. Since the sector of artificial intelligence is doing awesome progress now and functions like object detection is getting less difficult and computationally feasible, these features are implemented in the paper. The paper makes a specialty of object detection and type on pictures that are captured by the device mounted on a stick whose statistics can then be relayed to the person in approach of sound or speech.***

Keywords: Ultrasonic sensor, Artificial intelligent Yolo, Oject Detection, Text to speak Tensorflow, Raspbery pi, Blind stick.

I. INTRODUCTION

These days we can increase number of equipment's which can help peoples live. The use of technology for people without eye isof among essential and demanding areas for researchers.

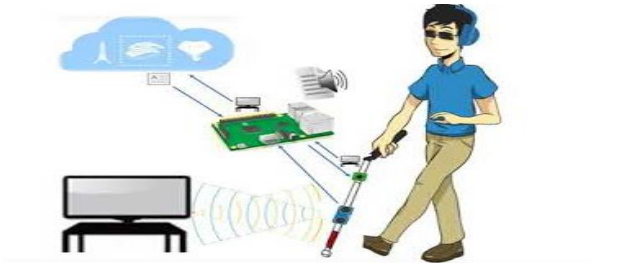

Figure:1 Smart blind stick model

It is very difficult for blind people to roam around freely in the unknown places .It is need and responsibility of the researchers to develop such equipment for blind people to walk around any region with the aid of smartstick that is built and most emerging technologies such as Artificial Intelligence and Machine learning.This era of smart technologies such as Artificial intelligence and machine learning embedded with suitable hardware has life of blind people easy and safer.

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my work in this proposed paper is to develop a e Eye or smart blind stick using artificial intelligence and Machine learning that camera detect the hurdles around the blind person when walking . Using this stick makes the path free of objects are for blind person. Obstacles are detected on the path and information about these detectedobjectsare conveyed to blind person via audio device. Blind sticks that are developed earlier do not provide accurate information about the class of objects and how far the object is from the blind person. Main goal of the work is to provide the blind person with accurate information about the object that on the way. Exact class of object Viz bike, cardog, chair etc and the distance to these objects are informed in speech format to blind person

Our visually impaired people follow the yellow lines on the sidewalks with a wand or stick. However, this solution cannot prevent to disrespect. There are people who visually impaired that miss the lane because of the parked cars on it. As a result, they are being lost. Our aim is to give a support while alerting if there is an object on the sidewalk and to eliminate this obstacle as much as possible.

In this paper, we are going to discuss what will be done with this technology. In this way, it will be easier to see the pros and cons of our project. Moreover, we will mention the work done and planned works with this technology. People with visually impaired have difficulty in taking directions or finding the way when they go from one location to another. One of our goals is to find a solution to this problem. There are some projects that are using image processing. However, because of its cost, it seems too difficult for us to reach their points. Our aim is to produce as much solution as we can produce at low cost. Another problem with this issue is the lack of understanding of pedestrian crossings and traffic signs. Therefore, people with visually impaired have a lot of difficulty in crossing a road.

II. RELATED WORKS

A. OrCam:

In modern-day technology, we can easily say that OrCam is one of the best technologies that have ever developed. This product that makes the life easier for people consists of two components: A camera inside frame of glasses and a microprocessor. Additionally, this frame can be used with any kind of eyeglass. Another benefit of it is that it can work with the devices which are used by hearing impaired people. However, this product is mostly practical for visually impaired people. It provides a feature so that these people can identify and learn the objects and writings just by using their fingertips.

Also, this product can identify which light is active on traffic lights. Additionally,
OrCam can learn and save the information of who is using it and reminds you when you come across with it in different environment. Thus, life can be made easier for visually impaired people. This product not only helps us to identify the objects but also find them. This product is submitted with a set of data to the customers. In addition to these, this product has a high capacity of learning so that it can remind you for the things that you forget. A scientist from Israel has worked on this device in 2010 and still researches are being made on it.

B. Obstacle Distance Detection System for Sight-Disabled People:

In this project, necessary parameters which are taken by two USB cameras are calculated in MATLAB platform. Thus, system aims to warn the visually-impaired people with gathered results and calculated distances. There are three steps while this process is executed. First step is calibration step to make the system works correctly. If calibration cannot be made correctly, parameters cannot be calculated properly, and correct distance map cannot be obtained. Second step is stereo matching. In this step, distance map is obtained according to the images that are gathered from cameras. Thus, necessary distances can be measured. In the last step, there is an electronic hardware that contains a microcontroller. Thus, communication is obtained with hardware and informing a visually-impaired person is provided.
This project is developed by Nerin KANAY and UmutEngin AYTEN in Yıldız Technical University and they mainly aim to inhibit the accidents that visually-impaired people cannot take precautions.

C. Seeing Al:

Seeing AI which is the most functional product in the implemented projects guides the visually-impaired people on what is going on around them. This application is introduced in Microsoft Build Conference, but it has not released yet, researchers are still working on it. Application was designed as a cross-platform application so that it can work on both smart phones and smart glasses. Thus, expenditure on this application can be decreased on customer side. For example, user can hold his/her phone like s/he is taking a photograph or clicking on his/her glasses to give an examination order to the application so that it can examine and report to the user about the environment. Thus, application tells everything including the people's gestures to the visually-impaired person. This application which is prone to be developed can be practical in different working areas.

III. PROPOSED METHOD:

Artificial Intelligent:

AI(Artificial intelligent) is a areaof research which emphasizes on innovating automated machines that act and react exactly like human.some activities included here are recognizing voice learning and planning ,analytical problem solving. The proposed system includes and imbibes subjects such as Machine learning Deep learning, artificial intelligence, convolution neural network and IOT.

A. YOLO Object Detector:

YOLO is based Convolution Neural network which identifies the objects. There are primary object locaters that we can get.

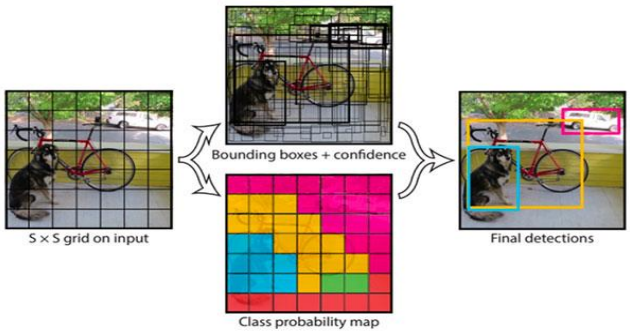

Figure:2 Yolo Object detector illustration

RCNN and their variants, including the original RCNNFast RCNN and Faster RCNN.

- One shot Object detect
- Yolo

RCNNs are early ConvolutionNeural Network and that detect accurately objects on the way.

B. YOLO working

YOLO operates in two phases first it identifies the region in the images to be classified.Second it classify this region of interest using convolution neural network. For every region in the image it estimates probabilities and bounding boxes. Based on the confidence in each of the bounding boxes the algorithm and correlating the probabilities of these boxes the exact class of image is classified.

C. Distance:

The ultrasonic sensor HCSR04 is used to calculate the gap of the nearest object. The sensor has four pins: VCC, Ground, Echo and Trigger. VCC is attached to Pin 5, Ground to Pin 7, Echo to Pin 18 and Trigger to Pin 17. It emits a 45000 Hz ultrasound which bounces back if there may be an object in its path. Considering the time among the emissions of the wave and receiving of the wave, the distance between the person and the nearest item may be calculated very as it should be and it may be relayed to the consumer.

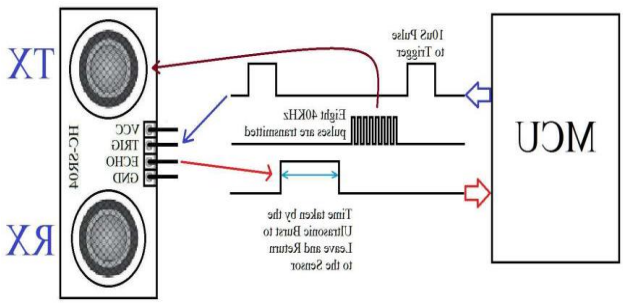

Figure:3 Ultrasonic Sensor

The sensor can detect objects in range of 2cm300 cm. The distance is calculated by the formula given below.

17200 * time=distance of sensor

D. Implementation:

I have proposed a method in this paper for Blind Man stick which can act as secondary eye for them. The stick contains multiple hardware components as follows:

- Raspberry Pi
- Camera
- HC-SR04 sensor
- Earphones
- Battery

With the help of camera it will capture the image of surrounding and using YOLO algorithm it will classify the multiple object present in captured image and distance of object will be calculated by HC - SR04 sensor and all information will be provided to by earphone to user.

Architecture:

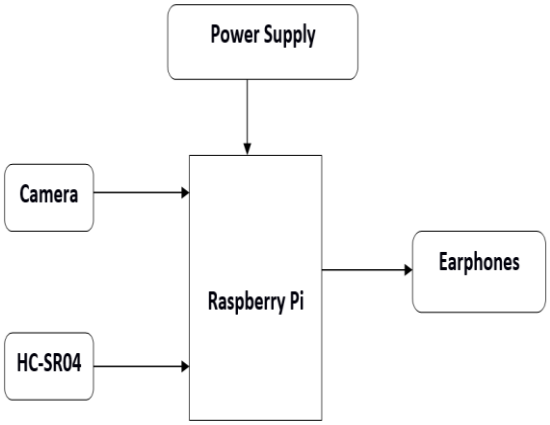

Figure:4 Architecture

Algorithm:

Step1: Input Image
Step2: Sensor Reading
Step3: Input details processed by Raspberry Pi
Step4: Object detail feed by earphone

Work Flow:

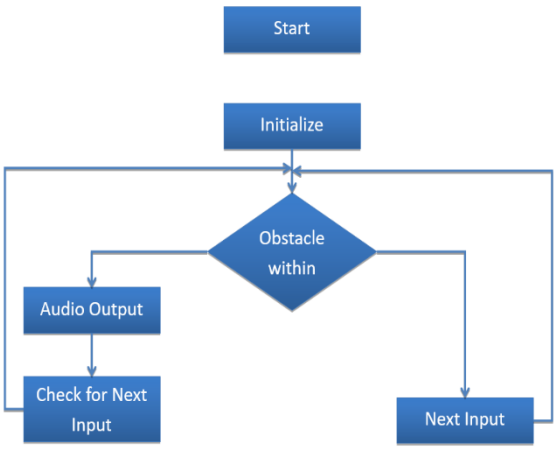

Figure:5 Flow chart of system

To change the output type of the object classifier from json to textual content, alternate a few lines within the predict.Py in dark flow to output a textual content file with labels and matter. To get count of the gadgets detected, dictionaries are used to shop them as key-fee pairs where name is the important thing and the count is the price. This dictionary is then written onto textual content files. The text documents are study by way of the textual content to speech line by line where every line carries one key-value pair.

To capture images and predict continuously, the prediction is run thru a loop which goes on till stop i.e. while an escape series is invoked. Once it's far invoked, it comes out of the loop and stops the program.

IV. RESULTS

A. General Approach

The results from the classifier are as per the following. The general approach here isimage captured by camera present on the stick are stored in digital format in the form of pixels. YOLO algorithm after reading the image information as input , as seen from the **figure 12** different classes of objects in a single image Viz dog, bicycle and car are classified by the CNN present as part of YOLO, these classes of objects based on the their accuracy of presence are stored in RaspberryPi's internal memory in text format which is the output of YOLO. This text is converted to audio by the RaspberryPi and given to audio output as speech to blind person. Ultrasonic sensor present on the stick calculates the distance between blind stick and object this information of the distance is also conveyed to the blind person.

B. Yolo Object detection output:

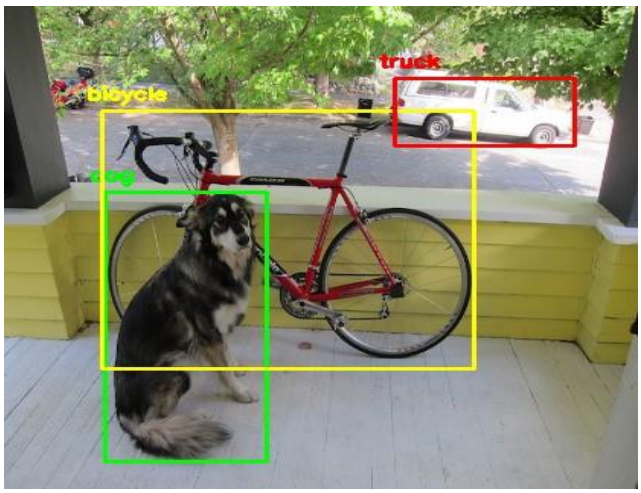

Figure:6 Yolo object detector output

C. Actual Outputs obtained

Output has two kinds of results

1) **Results on console**

When camera captures image forwards it to Rasp berry pi, where YOLO algorithm based on its trained examples classifies the image and is displayed on the console and distance of the object classified from the blind person is also displayed on the screen.

This kind of result is mainly used during development phase for testing of the stick and to train the stick with more and more objects so that the performance of the stick is increased.

Input

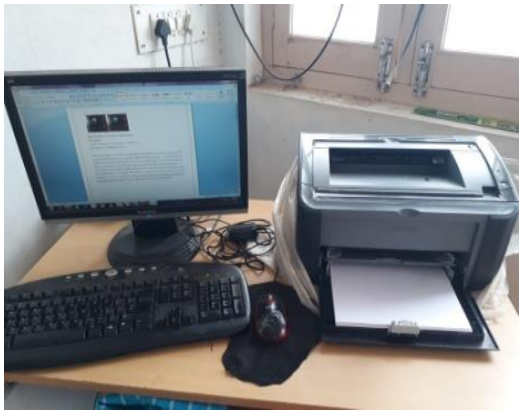

Figure: 7 Input to the Camera

Output

Figure: 8 output of Object detector

Text Output: {Console 1, Keyboard 1, Printer 1}
Distance: 120 centimeters

Analyzing the **Figure 7** above this is the image captured by Camera present on the blind stick and this image is given to YOLO algorithm for classification .YOLO based on its trained objects divides single into classes of objects namely console, keyboard and printer and the algorithm also detects number of such objects in each class in our output every object is one in number. the classified objects are displayed on the screen.**Figure 8** is the output that is displayed on the console after classifying

2) **Audio output to blind person**

When a blind person is on pathways walking to some location, if any objects are on the path of blind person then camera captures image and forwards it to Rasp berry pi, where YOLO algorithm based on its trained examples classifies the image and corresponding name of image Viz Person, Vehicle, Bike, water etc which are in text form are converted to speech form by Rasp berry pi and this speech is heard by the blind person through head phone. Also the distance between the object classified and the blind person which is calculated by Ultrasonic sensor is heard by the blind person where he/she is alerted with what exactly object is and how far the object is for his next action to protect him/her self avoiding any problems.

Blind stick is developed using either wood or iron material as per the requirements of sizes and the circuit board containing Raspberry pi, Pi Camera and Ultrasonic Sensor as shown in figure9

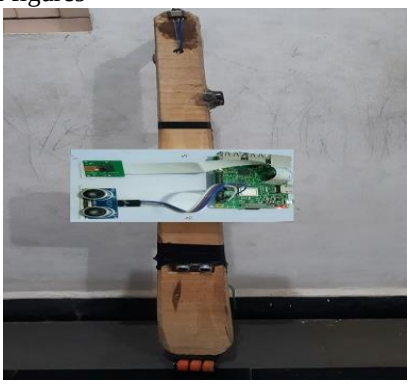

Figure 9: Blind stick with mounted artificial intelligent setup

Following are the Actual results obtaine on the road using the above setup

1)

Figure 10: "Person and Bike" are being classified by YOLO and heard by blind person

Speech output : { Person 1 bike 1, Distance 4 Mtrs }

When walking on the road if image of a person on a bike is detected within preset distance 500cm camera captures and sends image to Raspberry pi and YOLO classified the input image and produced text output and same is converted to speech as "**person 1 bike 1"** which informs the blind person that there is one person and one bike and is at distance 4 meters ,which is heard by the blind person as shown in **figure10.**

2)

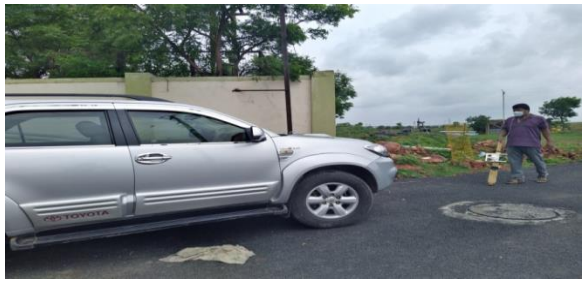

Figure 11: "Car" is being classified by YOLO and heard by blind person

Speech output : { Car 1, Distance 4 Mtrs}

When walking on the road if image of car is detected within preset distance 500 cm camera captures and sends image to Raspberry pi and YOLO classified the input image and produced text output and same is converted to speech as "**Car 1"** which informs the blind person that there is one car and is at distance 4 meters ,which is heard by the blind person as shown in **figure11.**

3)

Figure 12: "Tree" is being classified by YOLO and heard by blind person.

Speech output : { Tree 1, Distance 4 Mtrs}

When walking on the road if image of tree is detected within preset distance 500 cm camera captures and sends image to Raspberry pi and YOLO classified the input image and produced text output and same is converted to speech as "**Tree 1"** which informs the blind person that there is one tree and is at distance 4 meters ,which is heard by the blind person as shown in **figure12.**

V. CONCLUSION

The project aspires to make the world a happy environmental for people who are crippled or make some extreme memories seeing. From the outcomes noticeable above, any blind person can purchase this product with very low cost involved, effective and simple way. There are wide styles of things that the gadget can distinguish. Subsequently it might be utilized for standard games to upgrade their experience and make a superior region for them. Later on, face images of any person can be trained and might be included, all together that if there are any familiar faces, they can be perceived. This project also can be implemented by training the module about the words and any books that are before the module the reading of the book in audio form can be made to listen to blind person. With expanding concentrates in implanted frameworks, additional calculation in a little scope can be anticipated inside what's to come. This can extraordinarily impact the execution of AI capacities like thing discovery, face notoriety and so forth.

FUTURE SCOPE

- It can be additionally improved by means of utilizing VLSI innovation to plan the PCBunit. This makes the contraption further progressively minimal. Likewise, utilization of dynamic RFID labels will transmit the area realities precisely to the PCB unit,whilst the brilliant stick is in its range. The RFID sensor doesn't need to analyze it expressly.
- The worldwide situation of the individual is acquired the use of the overall situating gadget (GPS), and their current day capacity and guiding to their goal may be given to the client by means of voice.

REFERENCES

1. Shinohara,"Designing assistive technology for blind users" In Proceedings of the 8th International ACM SIGACCESS conference on Computers and accessibility, ACM, 293–294, 2006.
2. Benjamin J. M., Ali N. A., Schepis A. F., "A Laser Cane for the Blind" Proceedings of the San Diego Biomedical Symposium, Vol. 12, 53-57.
3. Johann B., Iwan U., "The Guide Cane A Computerized Travel Aid for the Active Guidance of Blind Pedestrians" Proceedings of the IEEE International Conference on Robotics and Automation, Albuquerque, NM, 1283-1288, 1997.
4. Madad Shah, Sayed H. Abbas, Shahzad A. MalikBlind Navigation via a DGPSbasedHandheld Unit" Australian Journal of Basic and Applied Sciences: 1449-1458, 2010.
5. 'KulyukinVGharpure C, and Nicholson J: Toward RobotAssistedNavigationof Grocery Stores by the Visually Impaired," IEEE International Conference onIntelligent Robots and Systems, Edmonton, CA.
6. Helal Moore S. E., and Ramachandran B."Drishti: An Integrated Navigation System forthe Visually Impaired and Disabled," International Symposium on Wearable Computers, Zurich, Switzerland, 149-156,2001.
7. Sung Jae Kang, Young Ho Kim, and In Hyuk MoonDevelopment of an Intelligent Guide-Stick for the Blind IEEE International Conference on Robotics &Automation, Seoul, Korea, May 21-26, 2001.
8. Shantanu GangwarSmart stick for Blind, New Delhi Sept. 26.
9. Selene chew, The Smart White Cane for Blind" National University of Singapore (NUS)2012.
10. Benjmin and team members Smart Stick at Bionic Instruments Company Researches 2011.
11. Central Michigan University, The Smart Cane" 2009.