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OBSTACLE DETECTION FOR BLINDPEOPLE

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ABSTRACT

Blind people do lead a normal life with their own style of doing things. But they definitely face troubles due to inaccessible infrastructure and social challenges. To overcome this, we developed an application which helps in the process of detecting objects which may create obstacles. The main objective of this project is to develop a system that can assist blind people in object detection using the YOLO algorithm and Raspberry Pi. The system will use a camera module attached to the Raspberry Pi to capture images, which will be analyzed in real-time using the YOLO algorithm for the detection of objects. The YOLO algorithm will be trained on a datasets of images that contain objects, including people, animals, and objects that a blind person would want to avoid. The datasets will be collected from different angles and lighting conditions to ensure that the algorithm can detect objects in a variety of situations. Once an object is detected, the system will communicate the information to the blind person using audio as an output. For example, the device could make a voice note when an object is detected, allowing the person to navigate around it. The highlights of this project are several object detection algorithms detect only a single object even if there are multiple objects in the frame. Overall, this project has the potential to greatly improve the quality of life for visually impaired individuals.

1. INTROUCTION

The current project object detection for blind people is used by the blind people in a situation where they need to walk on roads etc. Firstly, when we run the algorithm the camera of the device will be activated and then the camera will start recording the video. Now as the main aim is to detect the objects in the surroundings the video is now divided into frames at every instance of time. In simple words the entire video will be divided into a photo at every instance of time. Now with the help of object detection algorithm in this case YOLO algorithm each and every frame from the video will be read with the help of a while looping statement. In the next step, the objects that were present in the frame will be detected. Now, with the help of the trained model the detected object will be classified as whether the detected object is a car or a bike etc.

In the case of several object detection algorithms only a single object from the frame is detected even if there are multiple objects present in that frame at every instance of time. But as we used YOLO algorithm for the detection of objects in this project, the main specialty of the project comes out here. As discussed earlier that the YOLO algorithm is capable of detecting multiple objects present in the frame in a single run of the program. In this project output will be given in the form of a voice alert. So even if the multiple objects are detected in the frame voice alert will be

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given to only one object based on its priority in the class file followed by the next object. If there are multiple objects present in the frame a single object will be detected based on the priority this is now explained with the help of an example. Assume that a blind person is walking on a road and the application detected multiple objects for example, if multiple objects like a car and a human are detected now the voice alert will be given to the object based on the position of the object in the declared array.

2. LITERATURE SURVEY

2.1 Reference Paper Link

https://drive.google.com/file/d/1kS0dSJ827JQ2dSz4M5B0vP8Urnh1gLgo/view?usp=drivesdk

2.2 Research paper taken as reference:

• Firstly, a camera sensor is connected to the raspberry pi with the help of its USB port.

• Now the camera records the video and provides the video to RPI.

• In the second step, tensor flow must be installed into the RPI.

• In the next step, the installed RPI takes the recorded video as input and detects the objects and classifies them with the RCNN algorithm.

• In the final step, head phones are connected to RPI through which we receive the speech output.

2.3 Difference between the reference project and the implemented project:

Objective	Reference Project	Current project
Capturing Video	Camera sensor along with raspberry pi	Camera sensor along with open cv
Detecting the object	Tensor flow	YOLO algorithm
Audio output	Headphones along with raspberry pi	Speaker along with open cv
Voice alert in crowded area	NA	Objects will be detected with open cv and YOLO algorithm if the output is > limit alert will be generated

Table-1: Table showing the differences between reference and current project

3. SYSTEM DESIGN

3.1 SYSTEM ARCHITECTURE:-

Blind person wears the wearable device like glasses, that connected with camera. The camera captures the real-world scene and feeds video stream in the Raspberry Pi. The YOLO algorithm processes the video stream and identifies objects present in the scene. The identified objects are then converted into a human-readable format, forming the basis for the speech synthesis process. The pyttsx3 library is used to convert the textual information audible speech. The synthesized speech is relayed to the user via speakers or headphones connected to the Raspberry Pi.

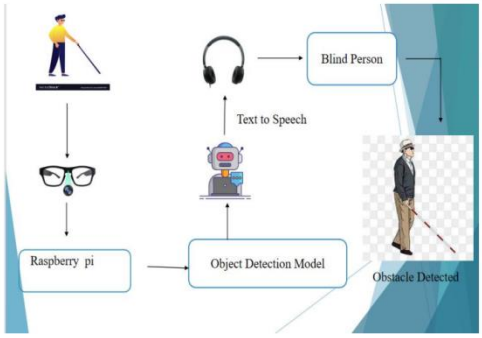

Fig-1:- System Architecture

Activity Diagram:-

In UML, the activity diagram is used to demonstrate the flow of control within the

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system rather than the implementation. It models the concurrent and sequential activities. The activity diagram helps in envisioning the workflow from one activity to another. It put emphasis on the condition of flow and the order in which it occurs. The flow can be sequential, branched, or concurrent, and to deal with such kinds of flows, the activity diagram has come up with a fork, join, etc. It is also termed as an object-oriented flowchart. It encompasses activities composed of a set of actions or operations that are applied to model the behavioral diagram.

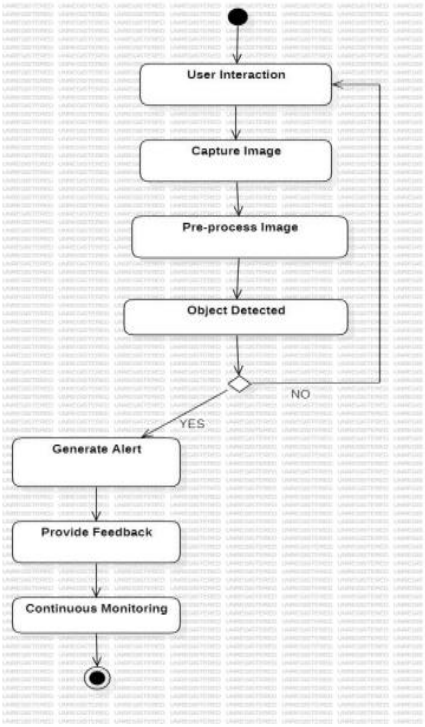

Fig-2:- Activity Diagram

4. OUTPUT SCREENS

Below picture describes the detection of multiple persons and voice over the user like 0% Person, Right Person and Left Person.

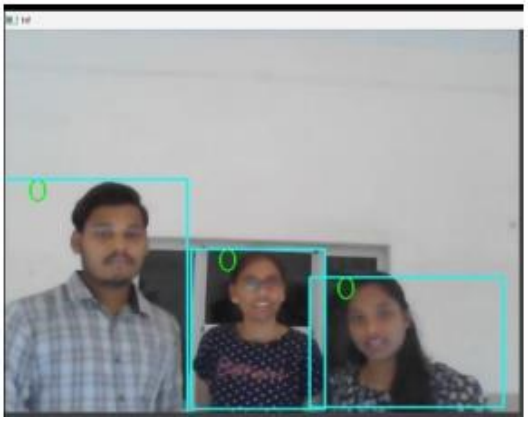

Fig-3:- Detection of Multiple Objects

Below picture describes the Detection of Chair and alert the user through the voice to navigate the surroundings.

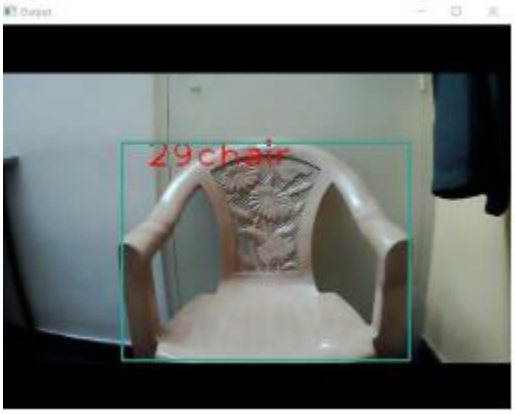

Fig-4:- Detection of chair

Below one describes the Detection of Bicycle and alert the user.

Fig-5:- Detection of Bicycle

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Below picture describes the Detection of Laptop and voice over the user like0%Laptop.

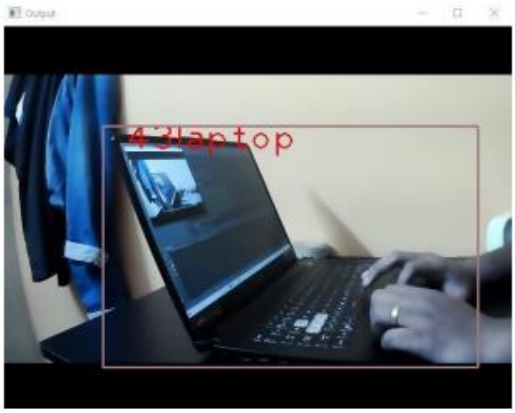

Fig-6:- Detection of Laptop

5. CONCLUSION

Firstly, the video will be captured with the help of Open CV. Now video will be captured in the form of frames at a particular instant of time. The frames will be read in the form of three channel array. By using a while loop frame will be captured and read continuously. Bilateral filter is used to reduce the noise and smooth-en the edges of the image. In the next step, yolo algorithm will be loaded with weight and configuration files. Now yolo algorithm detects the objects in every frame and stores the min a list. With the help of the trained model the detected object will be classified. Now using pyttsx3text can be converted into voice alert. YOLO algorithm is used in this project because like any other object detection algorithm, YOLO algorithm can detect multiple objects in the frame at the same time. Obstacle detection systems for blind people play a crucial role in enhancing their mobility, independence, and safety. The existing research and technological advancements in this field have provided valuable solutions for detecting and navigating obstacles. The integration of augmented reality and virtual reality technologies can create immersive experiences that enhance spatial understanding and navigation for blind individuals.

6. FUTURE ENHANCEMENT

One potential area for future scope of the proposed system for obstacle detection for blind people using YOLO Algorithm is the development of a mobile application that can be easily downloaded and used on smart phones.

• The Mobile application could also include additional features such as voice navigation, real time map updates and emergency contact notifications, making it a comprehensive and user friendly tool for blind people to navigate their surroundings safely and independently.

• The field of obstacle detection for blind people holds significant potential for futurea dvancements.

Advanced Sensor Technologies: Developing and integrating advanced sensor technologies such as LIDAR (Light Detection and Ranging), ultrasonic sensors, and radar systems can enhance the accuracy and range of obstacle detection. These technologies can provide more detailed information about the environment and help blind individuals navigate safely.

Artificial Intelligence and Machine Learning: Applying artificial intelligence (AI) and machine learning (ML) techniques can improve the accuracy and efficiency of obstacle detection systems. ML algorithms can learn from a large datasets of obstacles and help classify and detect various types of obstacles, making the system more adaptive and robust.

Wearable and Mobile Solutions: Future developments can focus on compact and wearable devices that can provide real-time obstacle detection feedback to blind individuals. These devices can be integrated into clothing, accessories (such as smart canes), or even as standalone wearable devices. Mobile applications can also utilize smartphone capabilities, such as cameras and sensors, to assist with obstacle detection and navigation.

Navigation and Way-finding: Integrating obstacle detection systems with navigation and way-finding technologies can provide more comprehensive assistance to blind individuals. This includes features such as GPS-based navigation, indoor localization systems, auditory feedback, and route planning to help blind users navigate complex environments effectively

Augmented Reality (AR) and Virtual Reality (VR): AR and VR technologies can be utilized to create virtual representations of the surrounding environment, over laid with real-time obstacle detection information. This can enhance the spatial understanding of blind individuals, providing them with a more immersive and interactive experience while navigating through obstacles.

Collaborative Systems: Future obstacle detection systems can leverage crowd-sourced data and collaborate with other connected devices and users. By sharing obstacle information among a network of users, blind individuals can receive real-time updates about the environment, including temporary obstacles or changes in the surroundings.

7. REFERENCE

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