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Title of the project: **AI Moderation of Chatbot In The Indoor To Guide Visually Impaired People Navigation**

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Introduction:

Navigation is very important for everyone’s life. For navigation vision plays an important role for the movement from one place to another. For visually impaired people it is difficult to navigate unfamiliar places, even relatively easy to navigate well-known environments, still any obstacles they find it very much difficult. The aim of our work is to develop an independent navigation system for visually impaired people without any difficulties in terms of safe and efficient movement. Many studies were done to detect the object indoor and outdoor for visually impaired people mainly with two methods for finding the feasible path one with Wireless signals Strength and another is based on the image classification. To detect the object, we will be using YOLOv5 with Distance and Safety conditions to predict the best path. A vision-based navigation system using the smartphone system is designed in a manner where the smartphone camera is enabled to capture the images in front of the user which is then compared with the prestored images. This model can help needy visually impaired persons in their daily life to do their regular tasks without taking help of any home mates. We can avoid additional component cost and setup cost with available smartphone sensors. Navigation becomes easy for visually impaired people with this voice enabled system.

Recently, the technology of assisting the navigation of visually impaired persons with computer vision has been greatly developed. Indoor object detection presents a computer vision task that deals with the detection of a specific indoor environment. Much research was conducted to detect the object indoors and outdoors for visually impaired people. Based on the literature, existing technologies are classified into five different categories: Visual imagery systems, Non-visual data systems, Map-based systems, Systems with 3D Sound, and Smartphone-based solutions. Visual based navigation uses computer vision algorithms to extract the visual from the indoor and outdoor environment. Non-visual data systems which do not use vision algorithms to navigate instead uses sensors like beacons, ultrasonic and IR sensors to navigate. Visually impaired people use different types of tactile tools like map-based systems to navigate based on their audio output. Systems with 3D sound were developed based on audio and haptic feedback on wearable sensor devices to assist in the navigation of visually impaired people. Mobility based navigation systems provide the navigation to visually impaired people based on the instructions and feedback on the wrong direction is detected in smartphone platforms.

The Design of the navigation systems for visually impaired people should satisfy the following parameters

- Right choice of object detection methods in real time.
- Portable and user-friendly navigation system
- Cost and size of the navigation system

Objectives:

- To Construct a model for Type of object detection using YOLOv5 with Distance and Safety conditions to predict the best path.
- Develop Android mobile application for voice-based navigation system in the Indoor Environment for the Visually Impaired People.

Methodology:

Objective 1: Constructed a model for Types of Object detection using YOLOv5 with Distance and safety conditions to predict the best path. Deep convolutional neural network for indoor object detection to assist the navigation of people with visual impairments in indoor areas.

The dataset was obtained from OpenCV Kaggle dataset. The dataset contained 1500 images with 150 from each of the 10 indoor object classes. We annotated the images using LabelIMG tool. We have assigned eighty percent to training and twenty percent of the images to testing. the confidence value is maintained at 0.001. The YOLOv5 model was trained using Pytorch framework.

Objective 2: Developed an Android mobile application for voice-based navigation system in the indoor environment for visually impaired people.

Android mobile application which will process the input and assist the visually impaired people to navigate with the processed output data. An image picker section was created in android studio. The above deep learning model was further converted into TFlite format and integrated to the application to facilitate object detection. The smartphone camera is enabled to capture the images in front of the user. To promote the hassle-free movement for the visually impaired through a voice-based navigation.

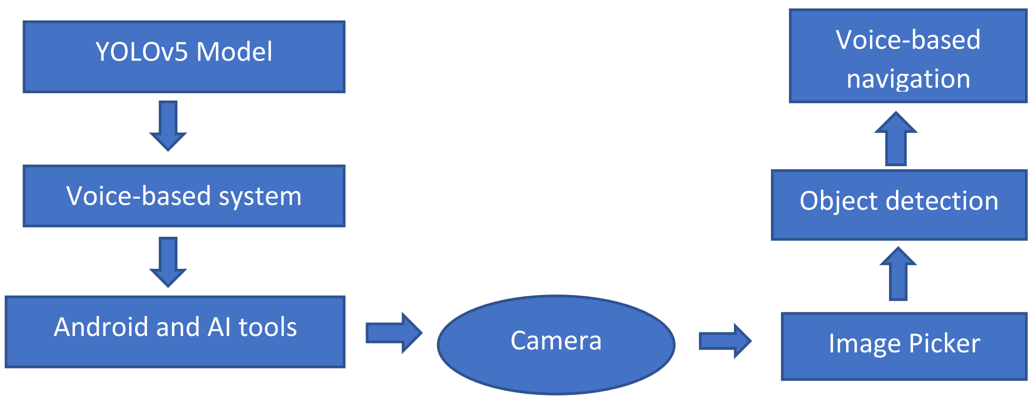

Fig.1 Working Model of the Proposed Work

Innovation:

A Chatbot application was implemented which enables the visually impaired to feel the surrounding up to certain extent using Artificial Intelligence and Machine Learning Technology. A chatbot provides friendly interaction and further makes it easy to interact with the application. It also eliminates the need to physically interact with the device.

This is because, we are directly interacting with the application using voice command. Therefore, this application enables visually challenged people to improve their lifestyle.

Results:

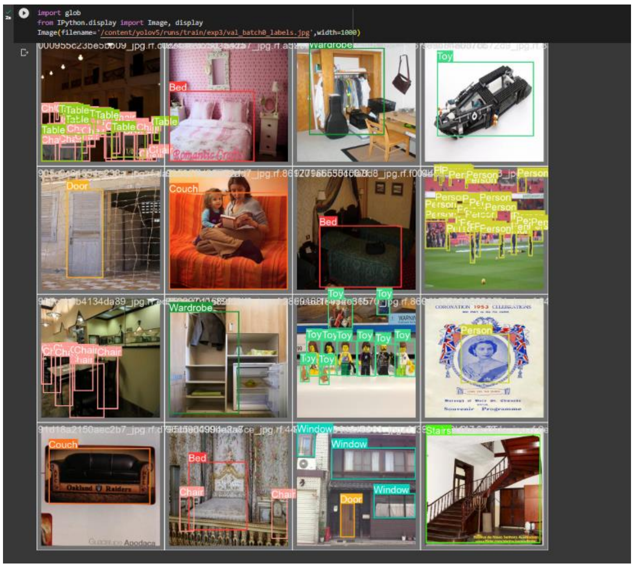

Fig.2 Object Detection

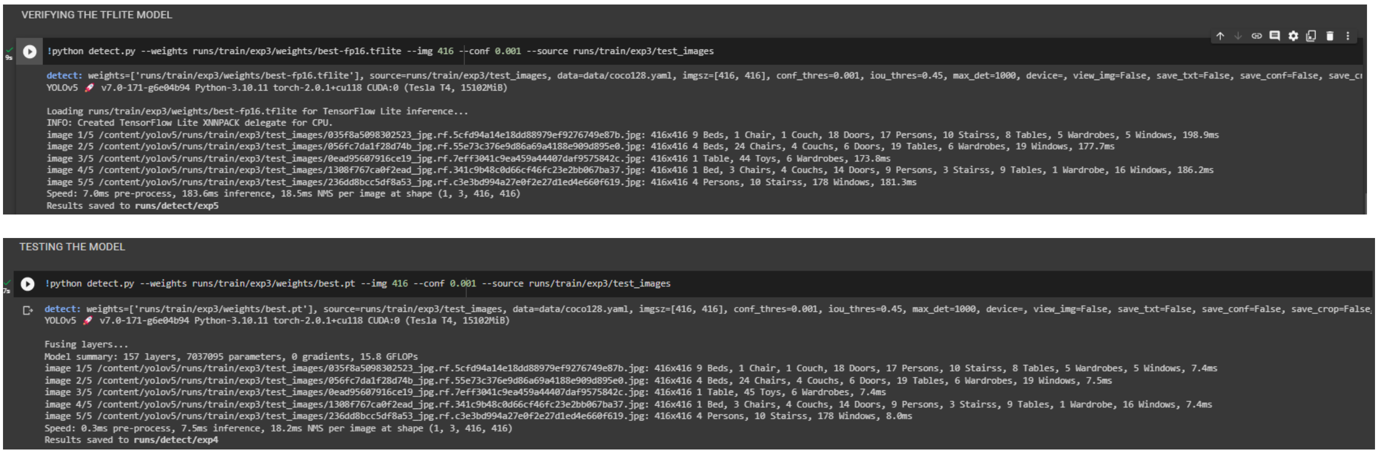

Fig.3 TFlite testing and training model

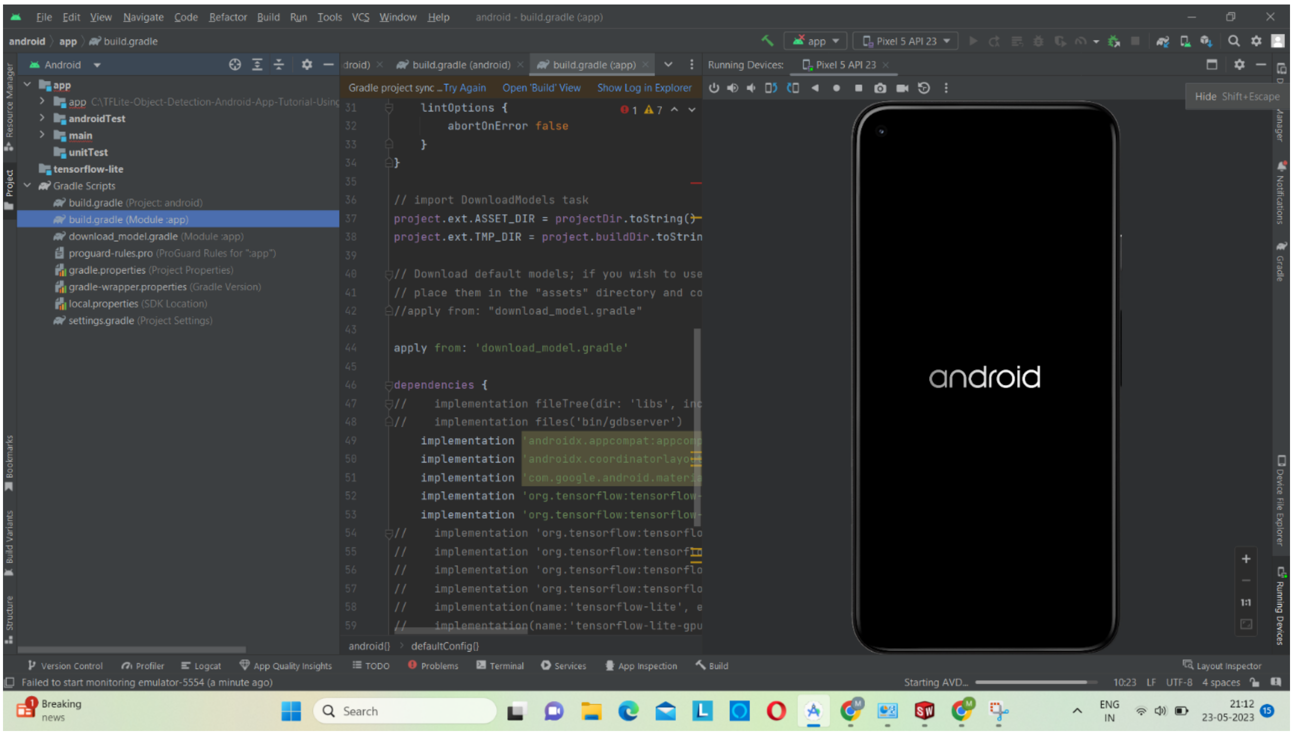

Fig.4 Android Application

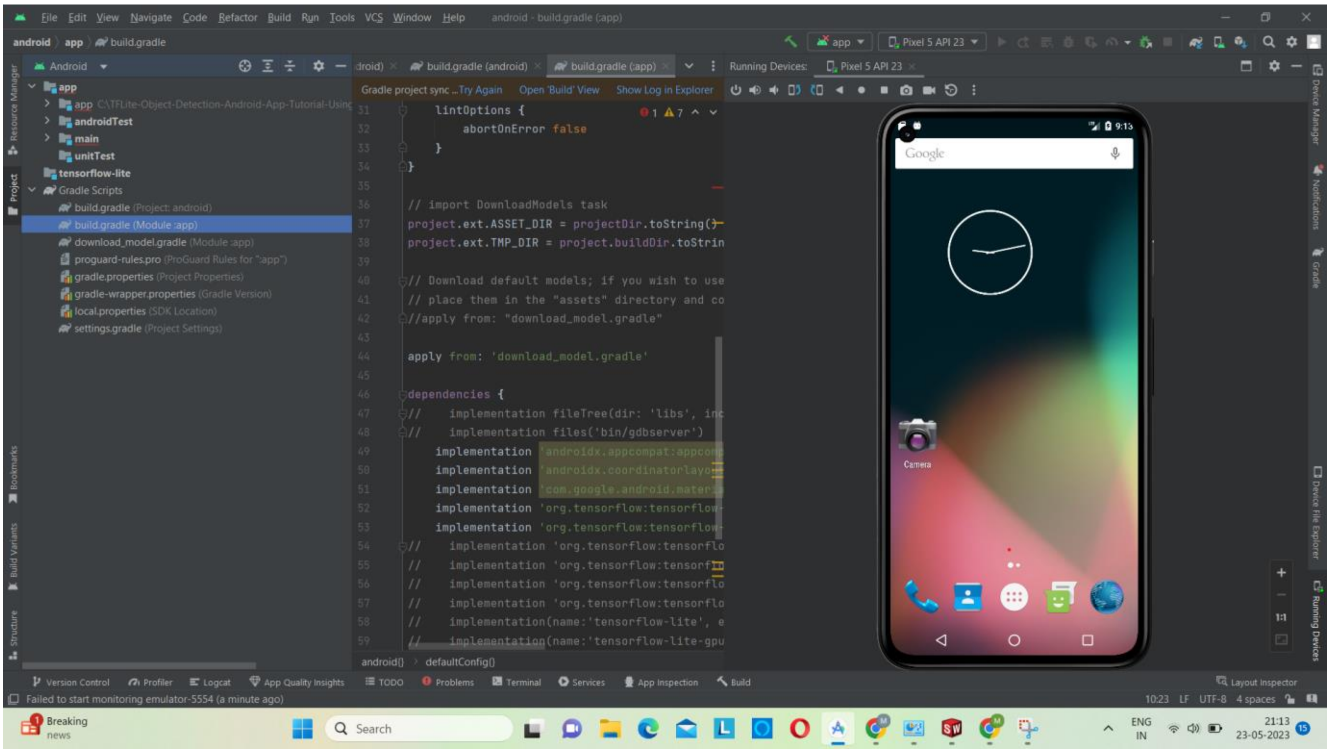

Fig 5. Android Application with enabled camera

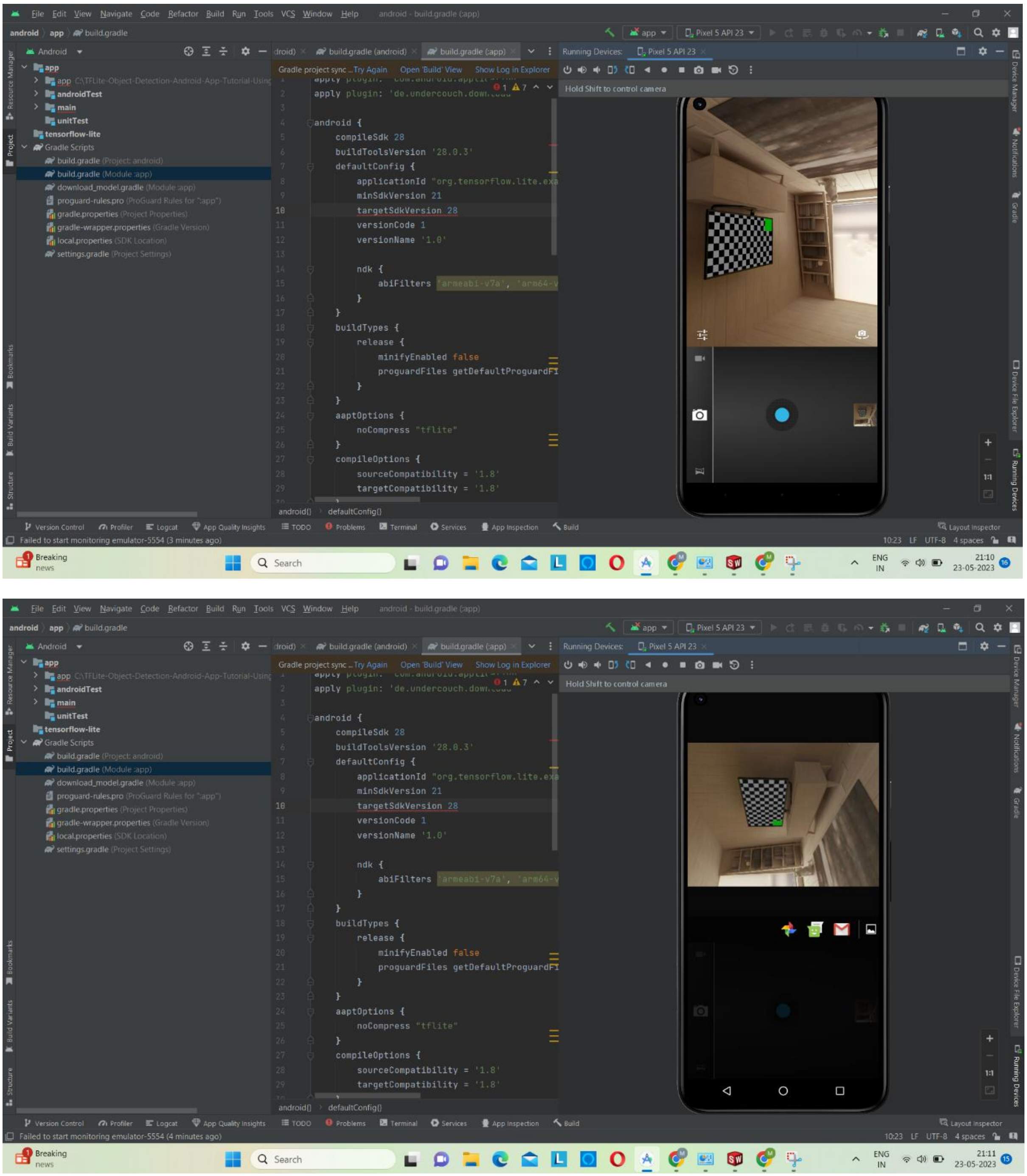

Fig.6 Capture the image and object detection

Conclusions:

A vision-based navigation using the smartphone system is designed in a manner where the smartphone camera is enabled to capture the images in front of the user. The captured images will be compared with the pre-stored images to check whether the captured images contain any obstacles. We have developed a mobile application which will process the input and assist the visually impaired people to navigate with the processed output data using the voice-based navigation system. This model can help needy visually impaired people in their daily life to their regular tasks independently.

Scope for future work:

We can include a Pedestrian Dead Reckoning (PDR) based system which introduces the multi-sensor fusion approaches and multiple positioning technology integrations.

In PDR-based navigation systems, data from the accelerometer and gyroscope is fused using the Kalman filter. Most of the above research was done on image analysis and type of object detection where we classify "safe and non-safe" objects to touch and walk.

We can also setup Virtual Indoor Environment in a building block using the K means algorithm.

The Global positioning system (GPS) tracks a desired location and displays it on map. However, GPS may not work properly for indoor positioning. So, to determine an accurate indoor positioning, based on smart devices, a scheme is proposed called iLocation. Most of the research was done on wireless signal strength-based position and image classification with its coordinates. We can combine both to create a virtual indoor environment using the K-means algorithm.

We can have a computer vision-based localization and scene recognizing system in one of the following ways:

- Indoor position using 3D signature of places for feature detection with Novel K-locations algorithm.
- Localization using texts in boards and banners using Canny edge detector with tesser-act and ABBY fine reader OCRs.
- Floor detection method can be implemented with Super pixel segmentation and Hough line transform with Indoor positioning in large indoor areas using CNN and SIFT features.