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Java Based Object Recognition Application for Visually Impaired

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Abstract

It was difficult to detect items in real time and turn them into an auditory output. Many real-time object identification apps have been made possible by recent developments in computer vision. This essay explains a basic Android application. that would make it easier for those who are blind to comprehend their surroundings. Data about the surrounding area was recorded using the phone's camera.
where the object detection API of Tensor flow was used to perform real-time object recognition.
Android's text-to-speech feature was then used to turn the objects that were recognized into an audio output. Complex algorithm offline processing is now easy thanks to Tensor flow lite. It was discovered that the suggested system's overall accuracy was close to 90%.

Keywords- computer vision, machine learning, TensorFlow, TensorFlow Lite, object acknowledgment, and Android.

INTRODUCTION

The most vital sense in humans is sight, out of all of them. It enables an individual to evaluate and comprehend their immediate surroundings. In any case, almost 285 million. Some people struggle with their vision or are blind. according to the WHO data that was collected. Vision problems may lead to disruption in a person's regular activity. Determine everyday items, reading a text, and crossing a road are examples of a few illustrations of such issues. The suggested setup is a straight forward object detecting app for Android called "Digital eyes" to assist those who are blind. This submission attempts to use a smartphone to simulate the human eye camera that detects objects. The average person's life might be enhanced with contempt of the computer vision techniques that, in recent years, have seen many more widespread uses. Technology for object detection makes use of the contrasting characteristics edge, intensity, and form to identify the object in the input picture. Progress in object detecting algorithms has made it possible for us to integrate challenging algorithms into an Android program. The trained tensor flow models and the SSD algorithm are utilized in our Android application for object detection. Visual processing methods are currently applied to objects detecting domain for a range of uses. which include utilized for numerous purposes, including social media. The goal of this research is to help the blind identify objects utilizing speech feedback to derive characteristics from real-time video feeds. Several object detection techniques are compared, together with their tabular statistics, in section ii. Section Three describes the technology and the system description.

stack that the system uses. This paper's highlights the benefits and drawbacks of the system that this study proposes. the explanation of suggested system providing a technical understanding of the crucial elements of the system, then a conclusion and potential reach.

METHODOLOGY

Creating an Android project for object detection using TensorFlow Lite is a multi-step process. I'll provide a high-level methodology and flow for developing such a project.

1. Set Up Your Development Environment:

- Install Android Studio and the Android SDK.
- Download and set up TensorFlow Lite for Android, including the TensorFlow Lite model for object detection (usually a .tflite file).

2. Create a New Android Project:

- Start a new Android project in Android Studio.

3. Design the User Interface

- Define the user interface for your app, including any necessary buttons, image views, and custom views that you might need. A custom view may be required for rendering the camera preview and object detection results.

4. Permissions and Dependencies:

- Request necessary permissions for the camera and storage in your AndroidManifest.xml.
- Add dependencies for TensorFlow Lite and any other required libraries in your app's build.gradle file.

5. Implement Camera Preview:

- Use the Camera2 API or CameraX to set up the camera preview in your custom view.

6. Load the Object Detection Model:

- Load the pre-trained object detection model (.tflite file) using TensorFlow Lite. You can use the Interpreter class to load the model.

7. Capture and Process Frames:

- Continuously capture frames from the camera.
- Preprocess the frames if needed (e.g., resizing, normalization).
- Run the captured frames through the loaded model for object detection.

8. Draw Detection Results:

- Interpret the results from the model to identify objects in the frame.
- Overlay bounding boxes or other indicators on the camera preview to highlight detected objects.

9. Handle User Interaction:

- Implement any user interaction features, such as tapping on a detected object to get more information or trigger an action.

10. Optimize Performance:

- To maintain a smooth real-time experience, optimize the object detection process and UI rendering.

11.Testing and Debugging:

- Test your app on real Android devices and emulators to ensure it works as expected.
- Use debugging tools to identify and fix issues.

12. Deployment:

- Prepare your app for deployment to the Google Play Store or other distribution platforms.
- Consider optimizing the model for mobile deployment, such as model quantization for better performance on mobile devices.

13. Documentation and User Interface:

- Create user documentation or in-app instructions for users to understand how to use your object detection app.

This methodology provides a high-level overview of the steps involved in creating an object detection Android app using TensorFlow Lite. You'll need to delve into more detailed tutorials and documentation for each of these steps, as it can be quite complex, especially when dealing with camera input, custom views, and TensorFlow integration.

SYSTEM ARCHITECTURE

System description

- Object Detection- Using a limitative box and other computer vision and image processing techniques, object detection is a computer system that identifies the existence of things. kinds or categories of things found in a digital picture pictures and movies . Using visual object detection Users with impairments are able to comprehend their surroundings without any difficulties and continue to be self-sufficient
- An image containing one or more objects, such as a photograph, is the input.
- Input: one or more restricting boxes, such as those indicated by dots.
- Output: The output consists of one or more restricting boxes, each with a class designation and determined by parameters like width, height, and dot.

TensorFlow

- Using the open-source Tensorflow library framework, object detection and recognition were implemented. There is a pre-trained object detecting component to this.model, which makes more use of an SSD method for object detection effectively and precisely. This object detecting technique
- operates with the COCO mobile net SSD v1 model, which further comprises 80 object categories' worth of datasets, which are frequently encountered nearby.

Android Studio

- The android application was created using the Android SDK, allowing vision challenged users to effortlessly detect things and comprehend their the surroundings. The front end of the application and
- backend applications are developed using this platform. This website offers all the packages and libraries needed for putting this system in place.

Mobile device-based object recognition

- Numerous individuals have attempted to incorporate object identification on cellphones due to the constant advancements in smartphone technology . Because of cellphones, applications,It is possible to create user-friendly, portable, and extensively accessible, removing the requirement for specialized equipment in order to process. Nevertheless, due to a mobile phone's restricted processing capacity, several of these applications depend on a architecture of client-server . Google Glass is an application that needs an internet connection and are unable to update the application with new images Conference Web of ITM 40, 03001 (2021) 2021 ICACC. solutions that solely use local resources for visually impaired users processing based on a smartphone's computational capabilities similar to how an application was created for Android that handles every procedure.

Proposed system

- The device was being used with an Android software that functions as a real-time text reader and can identify a variety of things in a live video feed. An item recognition in the suggested system Google's Tensorflow object was employed in the development of an Android app.detecting API model that is applied with the SSD algorithm and a text reader function that operated in real time utilizing Google Play Services' mobile vision API and TTS engine which explains how text is

detected using the text recognizer class from a live video stream. SSD-based algorithm-based item Detection model applied to offline and real-time objects recognition.

System Outline

- The technology records incoming data as a live video feed using a mobile phone. The user has two options in the application for object detection and text reading. The device's camera The application launches instantly and starts to record the nearby items and writings. Sending data to the TensorFlow model for object detection in processing, and subsequently it determines the class of the objects found and gives back the output as spoken comments. When reading a text, it makes use of Mobile vision using Google Play Services API, which is composed of To detect texts from a real-time video feed, use the TextRecognizer class and submits it to the text-to-speech (TTS) engine on Google for translating text to speech and then speaking the found material due to the phone's.

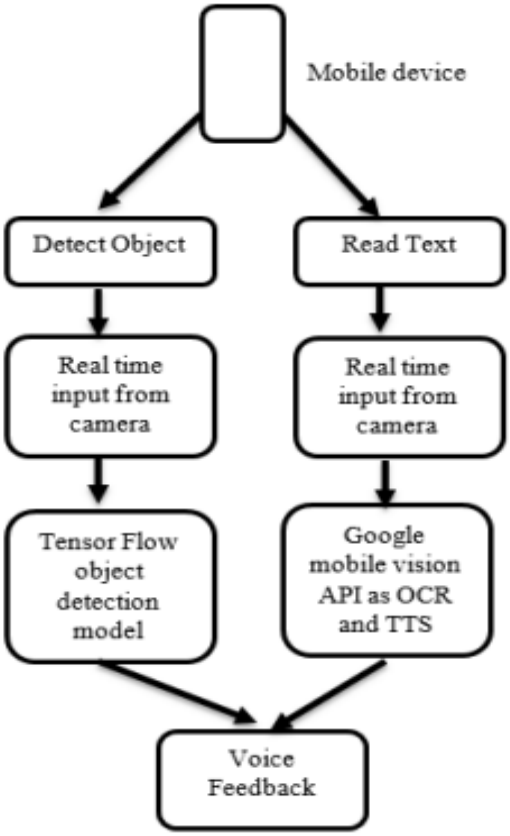


Fig :Flowchart of the proposed system

USER INTERFACE DESIGN

The user interface (UI) of a TensorFlow Android app for object detection should be simple and easy to use. It should allow users to take a picture or select an existing photo, and then run the object detection model on the image. The UI should also display the results of the object detection, such as the names and bounding boxes of any detected objects.

Here is a possible description of a UI for a TensorFlow Android app for object detection:

Main screen:

- A button to take a new picture or select an existing photo
- A button to run the object detection model
- A preview of the image that will be used for object detection
- A list of detected objects, with their names and bounding boxes displayed on the image

Object detection results screen:

- A larger version of the image, with the bounding boxes of detected objects highlighted
- A list of detected objects, with their names and confidence scores displayed
- A button to share the results with others

The UI should be designed to be intuitive and easy to use, even for users who are not familiar with TensorFlow or object detection. It should also be visually appealing and consistent with the overall design of the app.

Here are some additional tips for designing a good UI for a TensorFlow Android app for object detection:

- Use clear and concise labels for all buttons and other UI elements.
- Use large fonts and buttons to make the UI easy to use on mobile devices.
- Use high-contrast colors to make the UI easy to see in different lighting conditions.
- Provide visual feedback to users when they interact with the UI, such as changing the color of a button when it is pressed.
- Test the UI with users to get feedback and make sure that it is easy to use and understand.

Results and Future Scope

Instead of using a wireless server, cable serial communications were employed for security concerns. The data may be released onto the Internet if it is connected to a server. As of the aforementioned information includes a lot of private and camera-based observations, these disclosures potentially result in crucial user security concerns. Nevertheless, a connected wire can By keeping the data offline, you can secure it . Constantly It is anticipated that research will address server security issues reduce observational blind spots by connecting to the Internet of cameras to a safe network and expand the use of Internet of Things accuracy in identifying objects. This research is useful extensively to offer the blind comfort and privacy in quotidian life. By including a facial recognition function the program is trainable.


Read text example
(a)

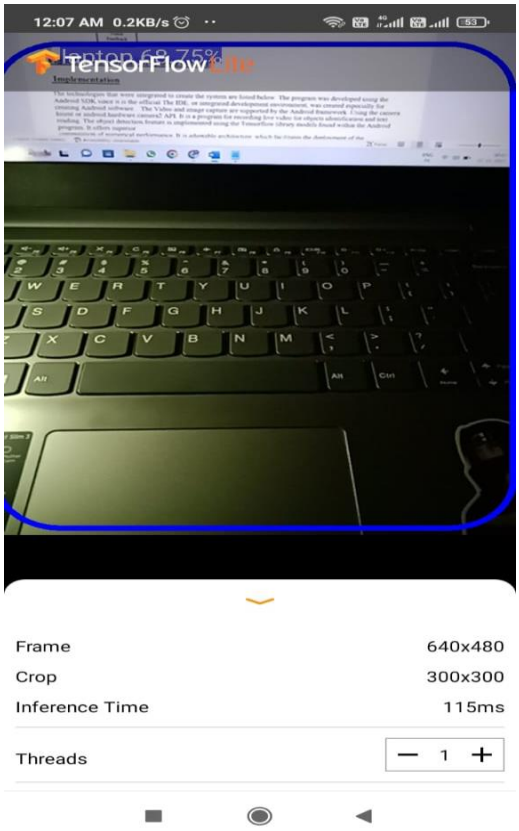
Detecting teddy bear
(b)

Detecting scissors
(c)

Detecting bottle
(d)


Detecting TV
(e)


Detecting a Laptop
(f)



CONCLUSION

In this paper, a model based on the SSD technique was used to develop an object detection application that operates utilizing the TensorFlow object detection API offline, while providing the highest level of accuracy. An item The goal of the detection API was object detection.The upcoming task includes increasing the effectiveness of the model through extensive image training, focusing on live stream image identification and capture, as well as teaching the For better outcomes, simulate a greater number of stages. That The voice synthesis component of the device offers convenience features for the poor vision. Using the Tensorflow Lite module, a mobile-friendly object recognition model that is simple to use by users with visual impairments.

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