Counselling Code : VBIT

VIGNANA BHARATHI Institute of Technology

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CURRENCY DETECTOR APP FOR VISUALLY IMPAIRED

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Abstract

- The main problem faced by people with visual disabilities is the inability to recognize paper currencies due to the similarity of paper texture and size between the different categories. These people face a lot of difficulty in their monetary transactions. This application can help the visually impaired recognize money.
- In this application, blind people can speak and give a command to open the camera and the camera will click the picture of the note and tell the user by speech medium how much rupee note it is.
- This system uses speech-to-text to convert command given by blind people, Speech recognition is the interdisciplinary subfield of computational linguistics that develops methodologies and technologies that enables the recognition and translation of spoken language into text.
- For the result purpose, this system has text to speech concept which helps to read the value of notes and then converts the text value into speech. Android allows converting your text into voice.
- Not only you can convert it but it also allows you to speak text in a variety of different languages.

OBJECTIVE

Visually Impaired are those people who have vision impairment or vision loss. Problems faced by visually impaired in performing daily activities are in great number. They also face a lot of difficulties in monetary transactions. They are unable to recognize the paper currencies due to similarity of paper texture and size between different categories. This money detector app helps visually impaired patients to recognize and detect money. Using this application blind people can speak and give command to open camera of a smartphone and camera will click picture of the note and tell the user by speech how much the money note is. This Android project uses speech to text conversion to convert the command given by the blind patient. Speech Recognition is a technology that allows users to provide spoken input into the systems. This android application uses text to speech concept to read the value of note to the user and then it converts the text value into speech. For currency detection, this application uses Azure custom vision API using Machine learning classification technique to detect currency based on images or paper using mobile camera.

Introduction

- Research work in the domain of image processing is evolving rapidly specifically in the banking sector. Along with the evolving technologies and the growth of the banking sector, the requirement to precisely and efficiently detect currency and its denomination is also growing in parallel.
- So, the necessity of a robust and efficient currency recognition system in applications like Cash Machines (ATMs), different vending machines, beverage and food dispensers, and helping the blind or visually impaired (in order to correctly differentiate between different denominations).
- The World Health Organization (WHO) had a survey of around 285 million people. The statistics showed that among the population under consideration, while surveyed, 39 were visually impaired (i.e. blind or people having low vision).
- So, a desperate need of designing a system that will help these people in recognizing the currency; that shows up. Therefore, in order to help the visually disabled.

Software Requirements

Operating System: Windows 7,8,10,11 or Mac OS
Technologies: Java, teachable machine learning, Tflite, mobilenetV2, android studio, Gradle

Hardware Requirements

Hardware : intel i5 10 gen+ processor or Mac m1
RAM : 16GB
Hard Disk : 500 Gb

Literature survey

Sungwook et al. defined an efficient and fast algorithm for differentiating multiple national bank currencies depending on size information and correlation matching of multiple templates. As different bank currencies have different sizes so this information was regarded to be a vital feature. This method was tested using 55 currencies of 30 different classes from five countries like EUR, KRW, RUB, and USD. So, the results of this method are 100%.

Prashant Dhar and colleagues presented a paper currency detection system. It is based upon combined features of LBP and SURF. Detection is done on the basis of training the system over different currencies. SVM classifier is trained and used for prediction. This system focuses only on the Bangladeshi taka (the currency of Bangladesh). In addition to currency detection, this system can also provide an output of the count of total cash in the image. The overall accuracy of this method is 92.6%.

Julien Rabin and colleagues thoroughly studied and analyzed the details of the SURF algorithm for local, compact and invariant representation of natural images, this method (SURF) achieves a performance comparable to other new and modern algorithms used in image matching. Its usage is therefore of great interest for computer vision. Hence, the effectiveness and robustness of their algorithm were proved by the results of their experiments.

Existing System

In the existing system, an image processing-based currency recognition system uses four different algorithms (SIFT, FAST, ORB and SURF).

These algorithms are used in feature extraction and matching, The project specifically focuses on Indian Currency notes. After studying algorithms, it is observed that each algorithm has its advantages and disadvantages. As the existing system is mathematically complicated and computationally heavy, we have proposed a new system to overcome the following drawbacks

Drawbacks

- The application requires an active internet connection
- It is a scanner-based application where the user needs to provide a complete currency note in order to get desired output
- It is quite slow and not effective for low-power devices
- The system produced an accuracy 71% for paper currency by using (SIFT) algorithm.

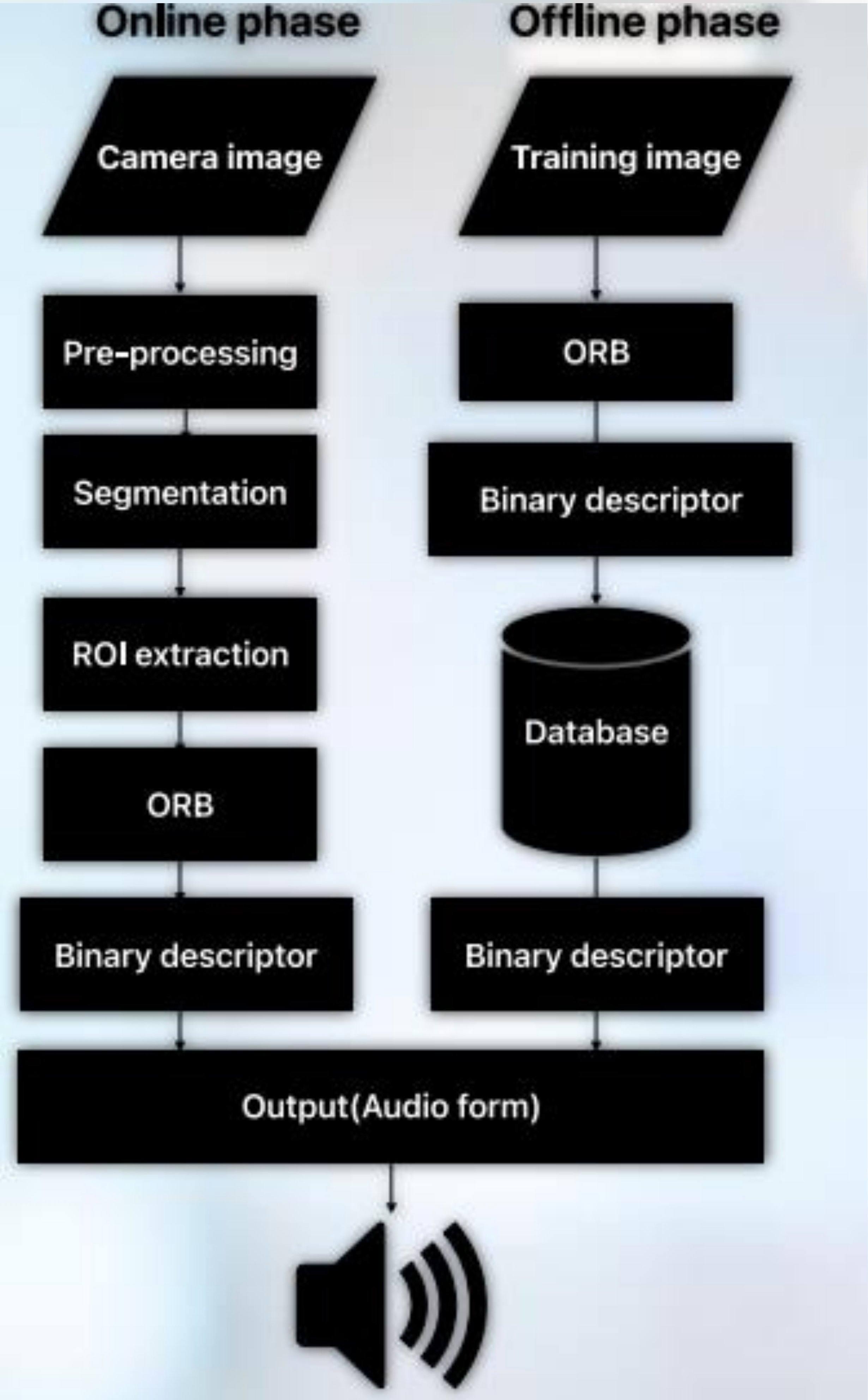
Proposed System

Our android application uses Teachable machine online software which helps to train our dataset and use it with the TF-lite quantized, floating point module in the asset folder of the Application. Through this model 600 images are classified, and each image is checked according to its accuracy of matching with the denomination. In it, multiple classes are created with each currency value. By uploading the image size and setting an accurate epoch value.

Advantages

- This application does not require an active internet connection
- Easy to train and deploy.
- It is a camera-based application wherein just a piece of note is enough to recognise the denomination
- It is an open-source application so we can play with multiple classes.
- Easy steps no such as ML knowledge are required even if the user has minimal knowledge and wants to make a model then he can check it on new examples.

System Architecture



Methodology

Teachable Machine

Teachable Machine uses a pre-trained convolutional neural network (CNN) as the basis for its image classification algorithm. In particular, the tool uses the Inception v3 CNN architecture, which was trained on the ImageNet dataset to recognize a wide range of objects and scenes in photographs. Teachable Machine then adapts this pre-trained model to the specific classification task by retraining it on the user's own dataset. This process is known as transfer learning and it enables users to create accurate image classifiers without requiring any knowledge of deep learning or computer vision.

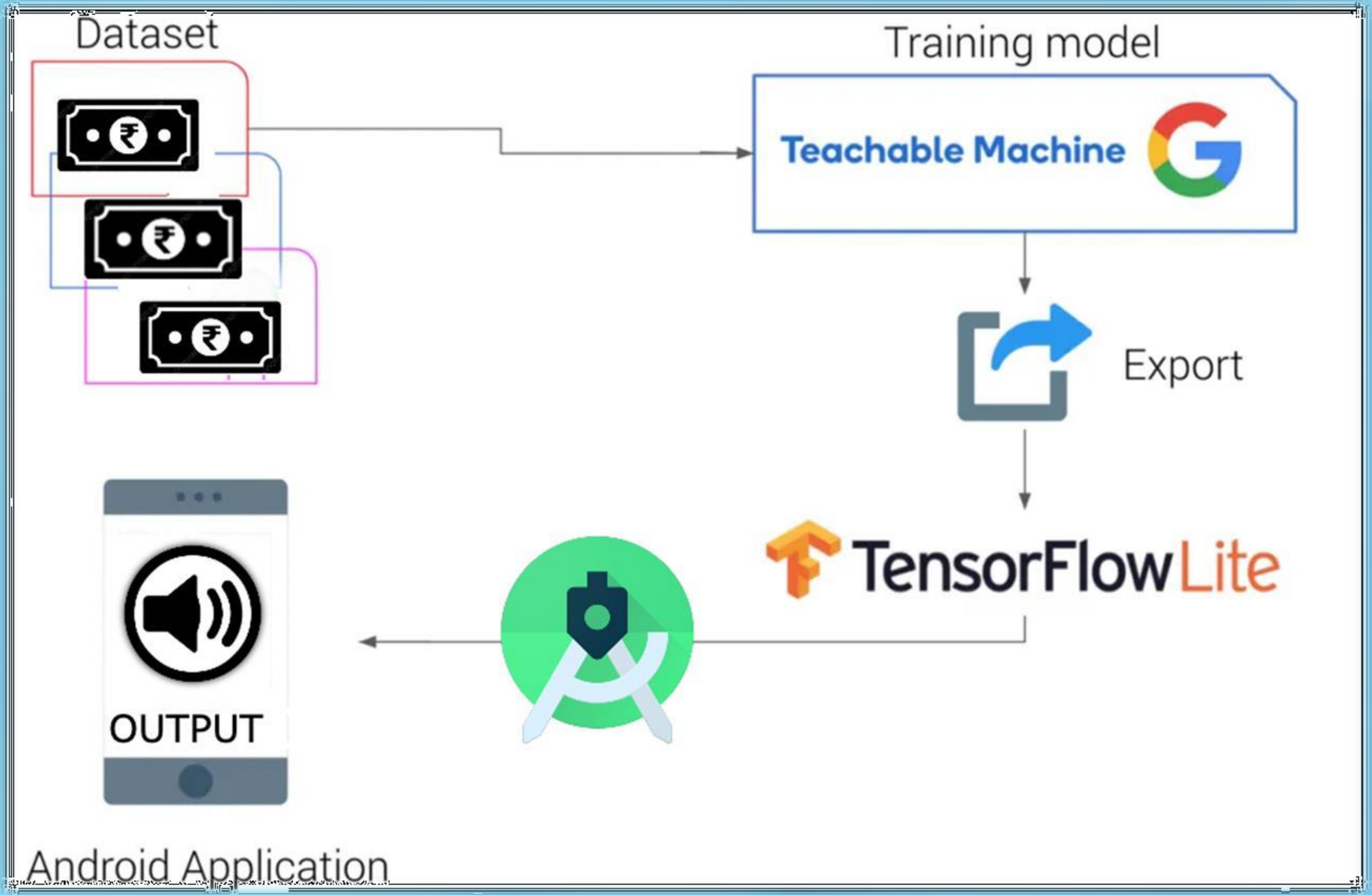
TensorFlow.js

Teachable Machine uses TensorFlow.Js, a library for machine learning in JavaScript, to train and run the models you make in your web browser. Teachable Machine library built on top of TensorFlow.js, this library provides an easy-to-use API for loading and pre-processing data.

MobileNetV2

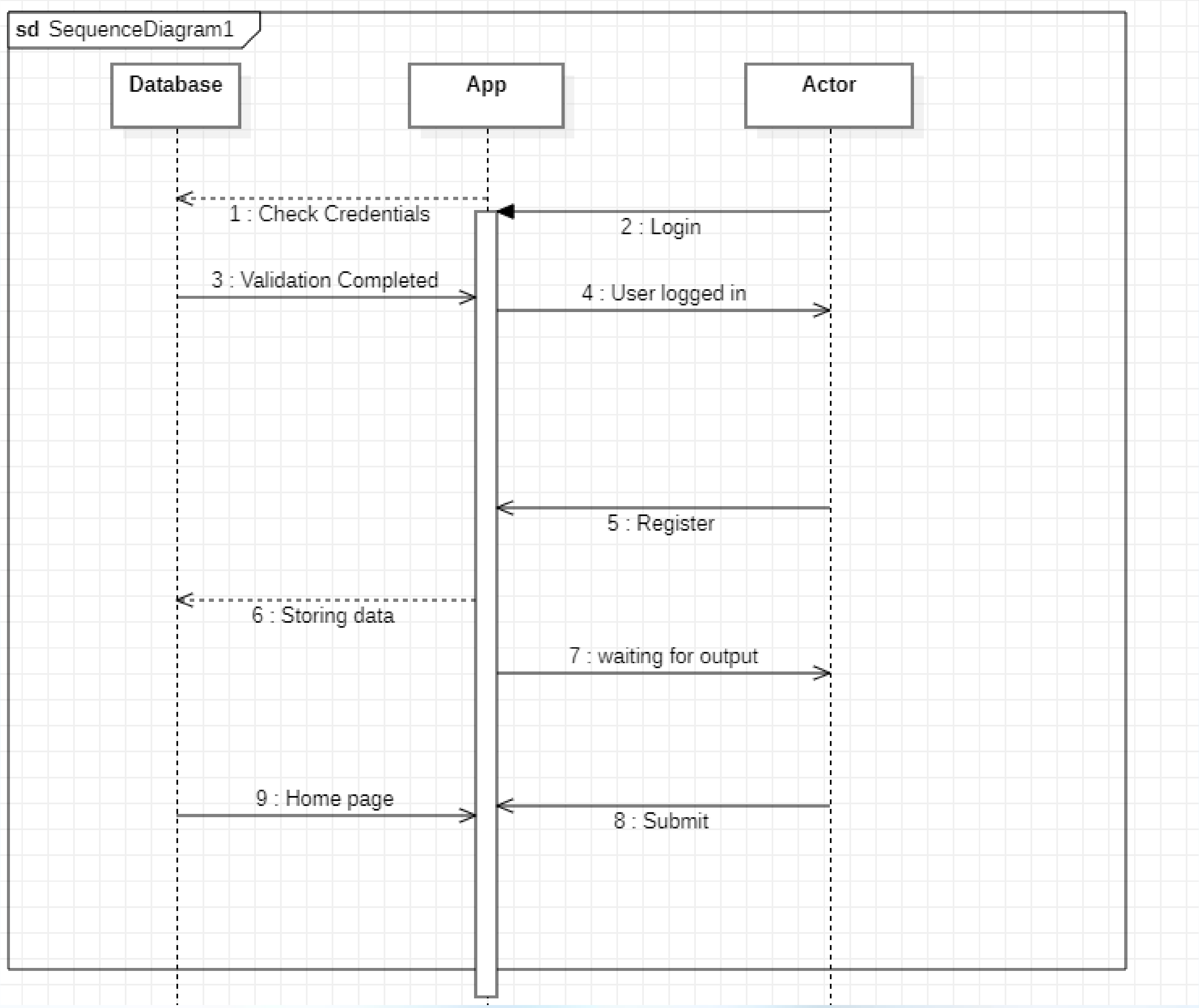
In Teachable Machine, MobileNetV2 is one of the available pre-trained models that can be used for image classification tasks. Specifically, it is used as the base model for the image classifier, which is then fine-tuned on the user's own dataset using transfer learning. This allows users to quickly create accurate image classifiers without requiring any prior knowledge of deep learning or computer vision. MobileNetV2 is a popular choice for image classification tasks in mobile and web applications due to its small size and fast inference speed,

DATASETS



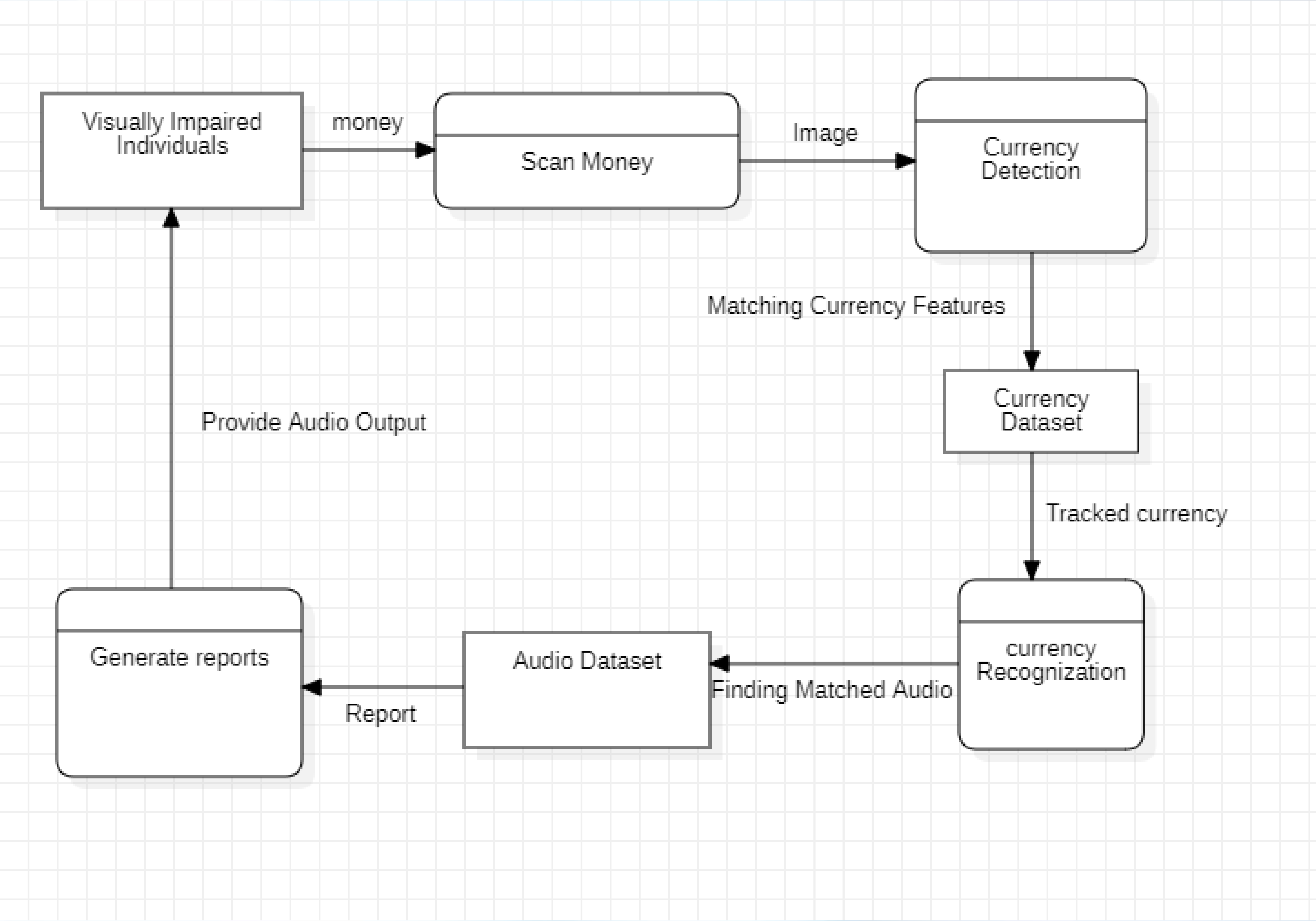
Dataset
Training model
Teachable Machine
Export
TensorFlow Lite
OUTPUT
Android Application

UML DIAGRAMS

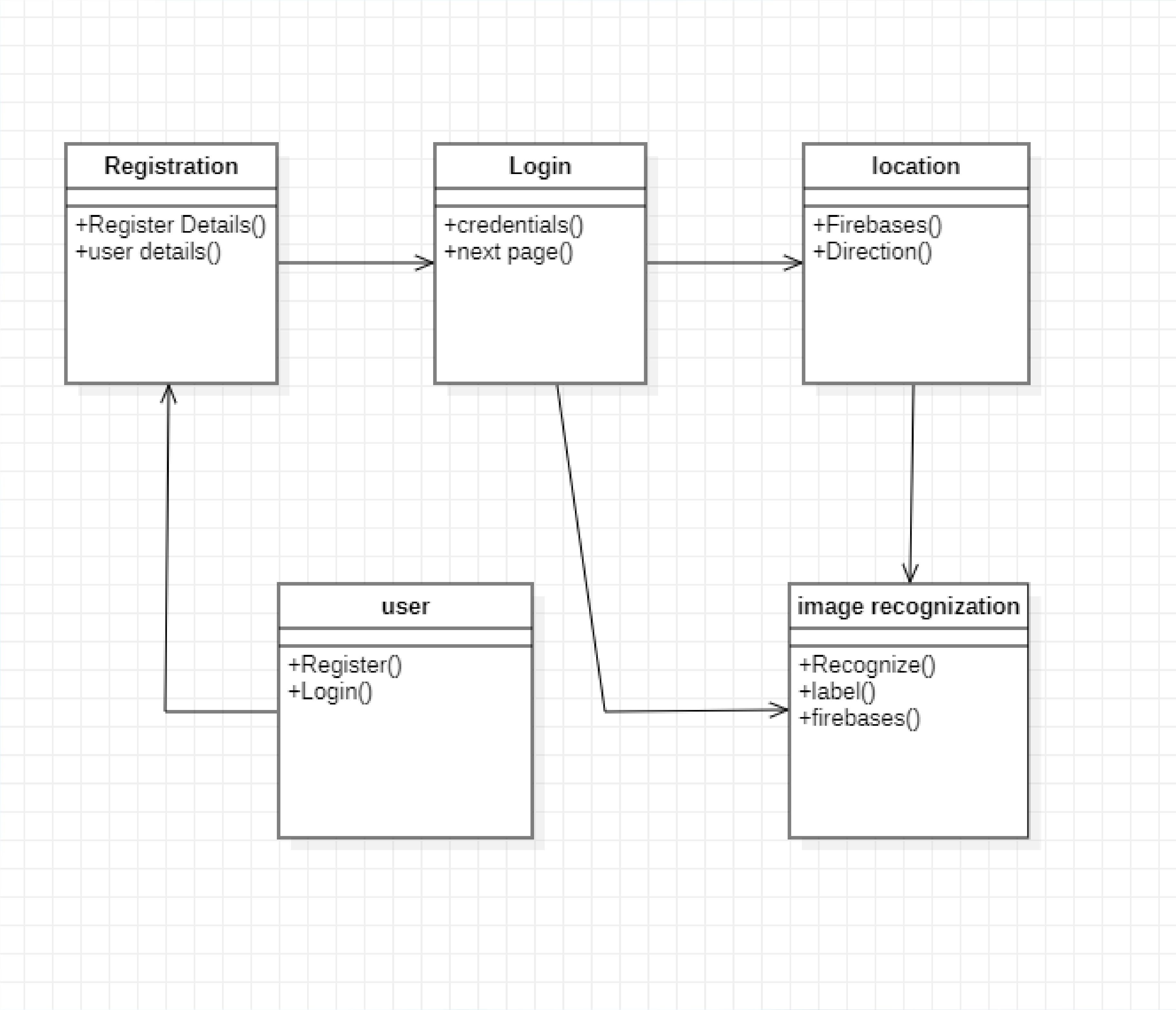


SEQUENCE DIAGRAM

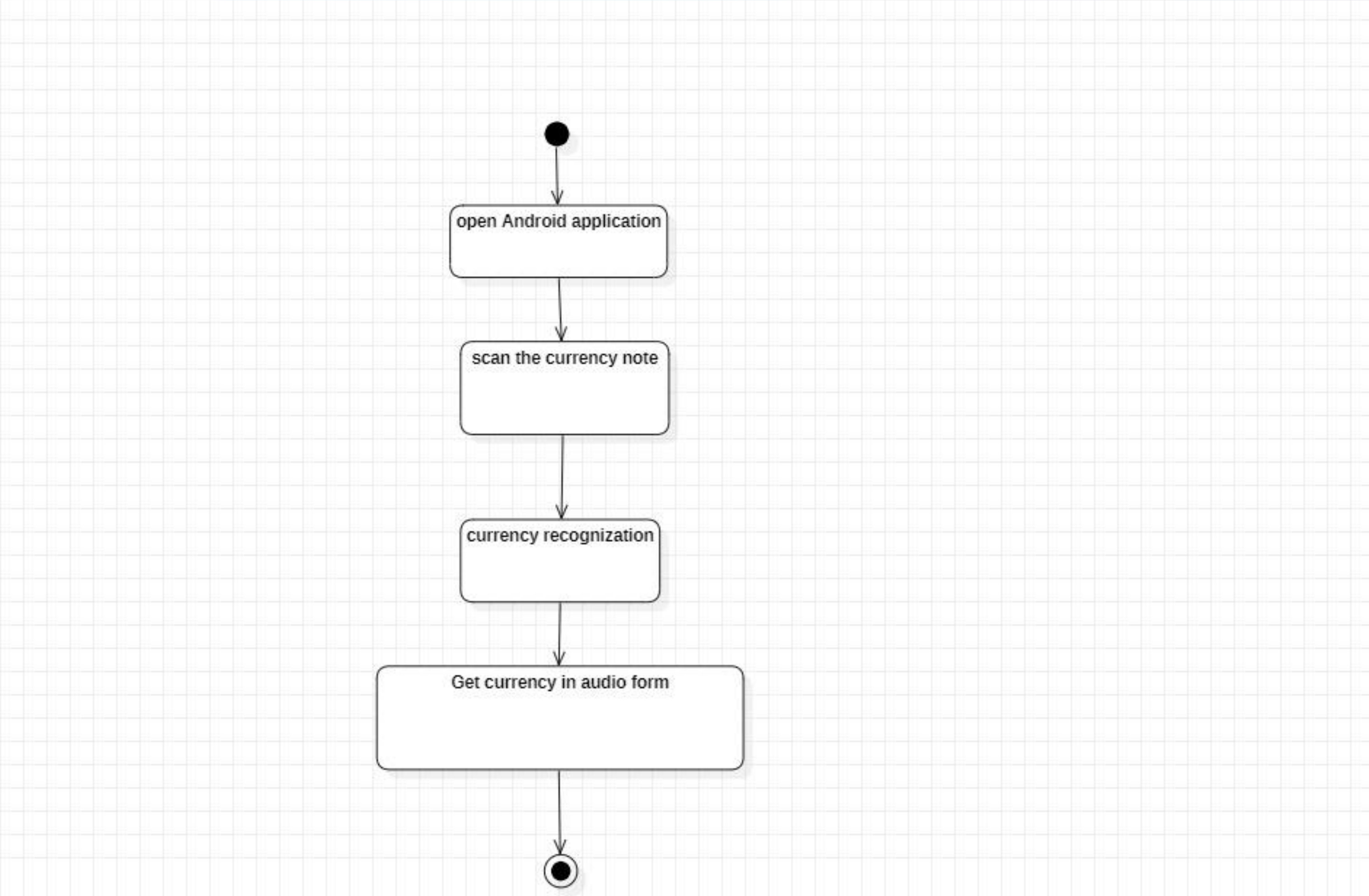
DEPLOYMENT DIAGRAM



CLASS DIAGRAM



ACTIVITY DIAGRAM



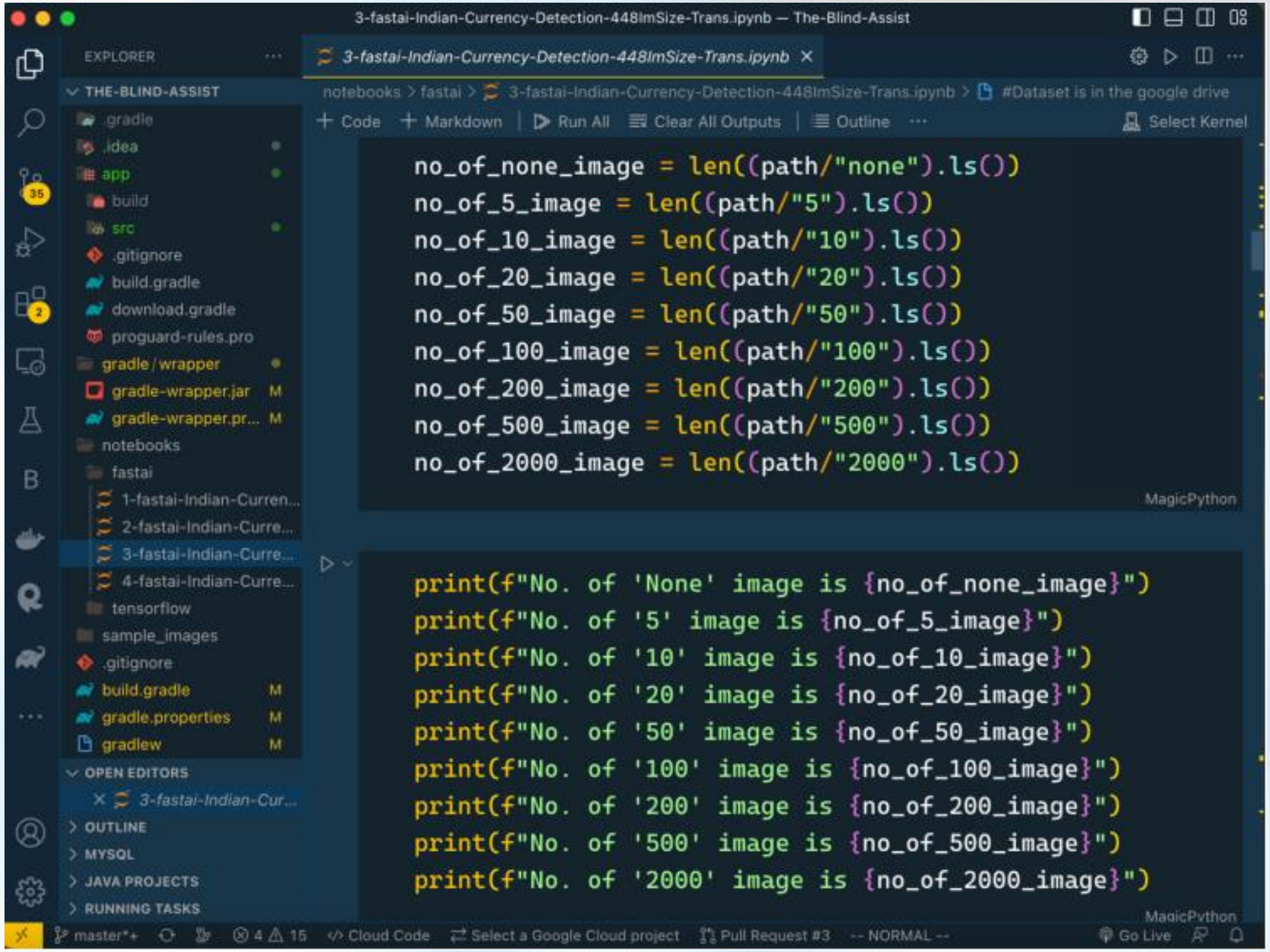
IMPLEMENTATION

```java
runInBackground(
    new Runnable() {
      @Override
      public void run() {
        if (classifier != null) {
          final long startTime = SystemClock.uptimeMillis();
          final List<Classifier.Recognition> results = classifier.recognizeImage(croppedBitmap);
          lastProcessingTimeMs = SystemClock.uptimeMillis() - startTime;
          LOGGER.v("Detect: %s", results);
          cropCopyBitmap = Bitmap.createBitmap(croppedBitmap);

          runOnUiThread(
              new Runnable() {
                @Override
                public void run() {
                  showResultsInBottomSheet(results);
                  showFrameInfo(previewWidth + "x" + previewHeight);
                  showCropInfo(cropCopyBitmap.getWidth() + "x" + cropCopyBitmap.getHeight());
                  showCameraResolution( cameraInfo: canvas.getWidth() + "x" + canvas.getHeight());
                  showRotationInfo(String.valueOf(sensorOrientation));
                  showInference( inferenceTime: lastProcessingTimeMs + "ms");
                }
              });
        }
        readyForNextImage();
      }
    });
}
```

Screenshot of code for currency recognition

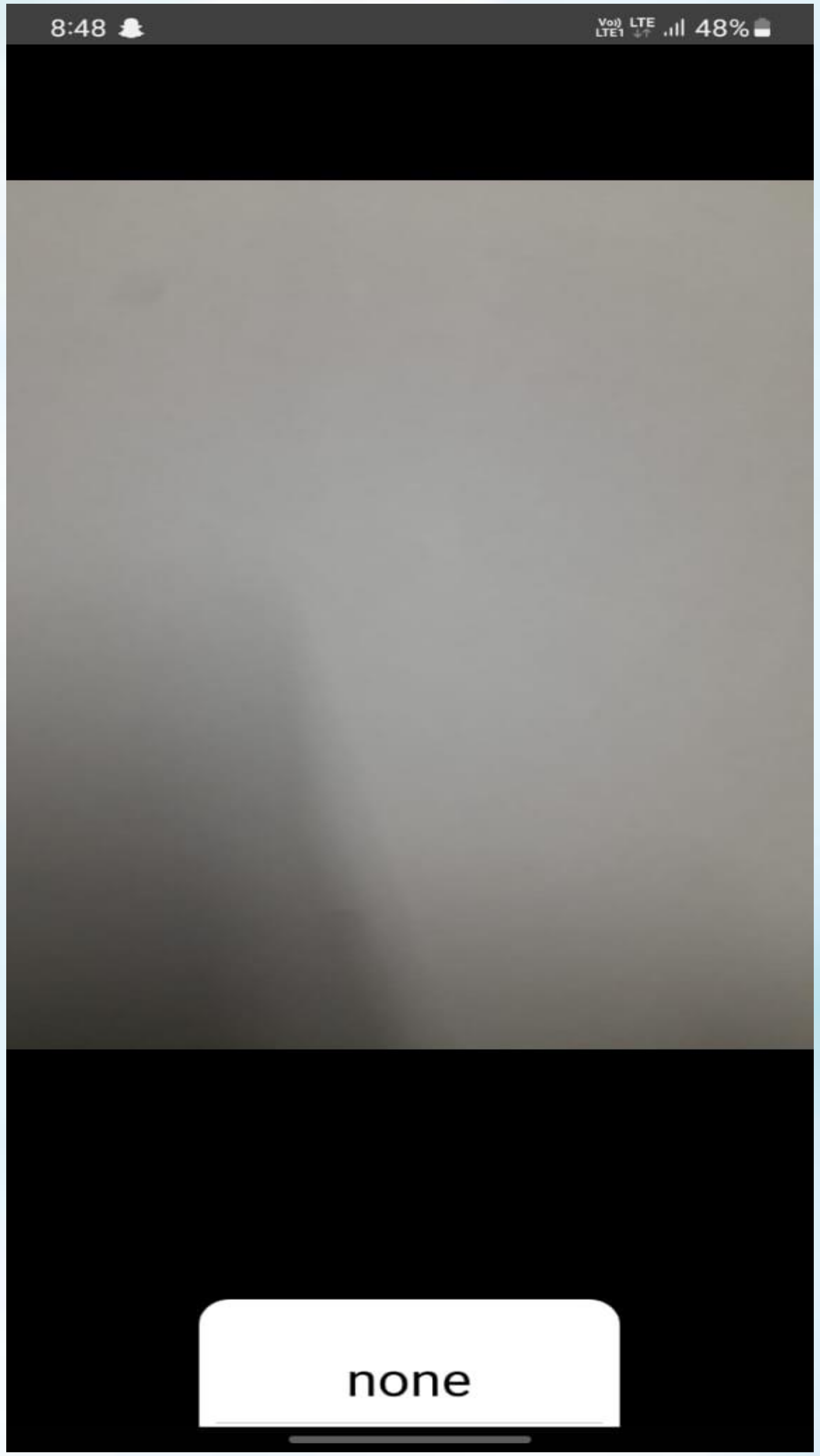
```java
/** An {@link ImageReader} that handles preview frame capture. */
private ImageReader previewReader;
/** {@link CaptureRequest.Builder} for the camera preview */
private CaptureRequest.Builder previewRequestBuilder;
/** {@link CaptureRequest} generated by {@link #previewRequestBuilder} */
private CaptureRequest previewRequest;
/** {@link CameraDevice.StateCallback} is called when {@link CameraDevice} changes its state. */
private final CameraDevice.StateCallback stateCallback =
    new CameraDevice.StateCallback() {
      @Override
      public void onOpened(final CameraDevice cd) {
        // This method is called when the camera is opened.  We start camera preview here.
        cameraOpenCloseLock.release();
        cameraDevice = cd;
        createCameraPreviewSession();
      }

      @Override
      public void onDisconnected(final CameraDevice cd) {
        cameraOpenCloseLock.release();
        cd.close();
        cameraDevice = null;
      }

      @Override
      public void onError(final CameraDevice cd, final int error) {
        cameraOpenCloseLock.release();
        cd.close();
        cameraDevice = null;
        final Activity activity = getActivity();
        if (null != activity) {
          activity.finish();
        }
      }
    };
```

Screenshot of code for camera activity



Screenshot of code audio frequency module

OUTPUTS




8:50
48%
भारतीय रिज़र्व बैंक
पचास रुपये
RESERVE BANK OF INDIA
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0HM 789437
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भारतीय रिज़र्व बैंक
RESERVE BANK OF INDIA
₹100
100


8:50
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RESERVE BANK OF INDIA
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पाँच सौ रुपये
RESERVE BANK OF INDIA
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Conclusion

The proposed system is designed for the detection and recognition of currencies that recognize an Indian banknote in order to help blind people in their daily life. The system is trained in a variety of images with different backgrounds and magnification techniques, resulting in a highly accurate system for recognizing banknotes. After installing and programming the model in small, commercially available digital signal processing

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Thank You