

CS341 DESIGN PROJECT

ABSTRACT SUBMISSION INCORPORATING REVIEW COMMENTS

TITLE:

Application or Device to help blind people shopping in grocery stores.

(Object detection using visual recognition implemented by deep learning model and computer vision (openCV) to help blind people in grocery stores)

TEAM MEMBERS:

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NAME AND DESIGNATION OF MENTOR:

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(Assistant Professor, CSE Dept)

ABSTRACT:

The aim of the project is to help blind people to overcome the challenges they face while shopping at grocery store. We implement this by using a camera enabled device to detect common objects in a grocery store.

Model training and classification

Model is utilized in creating a classifier that classifies the images thrown towards it. In other words, it creates a deep neural network trained to analyse images. This generates provides a list of results along with their corresponding confidence scores after evaluating an input image. This result is used in future.

TensorFlow is a core end-to-end open source platform to develop and train ML models. Deep-Learning can be implemented through TensorFlow. The command “import tensorflow” is used in codes like python, Java, etc. to recall the attributes, contents or tools of this open-source library. It contains functions like fit(), compile(), predict(), etc. The trained model is in a file format named ‘keras’ or ‘h5’. Once the training is complete, “model.save()” function is used to save the model. This model is converted into TensorFlow-Lite before it is placed in Android device.

The model is placed in Android (assets folder in android studio) and then pass an instance from camera feed into the model, which will then predict the object as a list of possible things with their confidence score. This model is trained on several images and it is able to classify images through confidence scores. This custom classifier with the required number classes is utilized for classification. For example, a 'fruit' classifier may have classes like 'apple', 'mango', 'pear', etc.

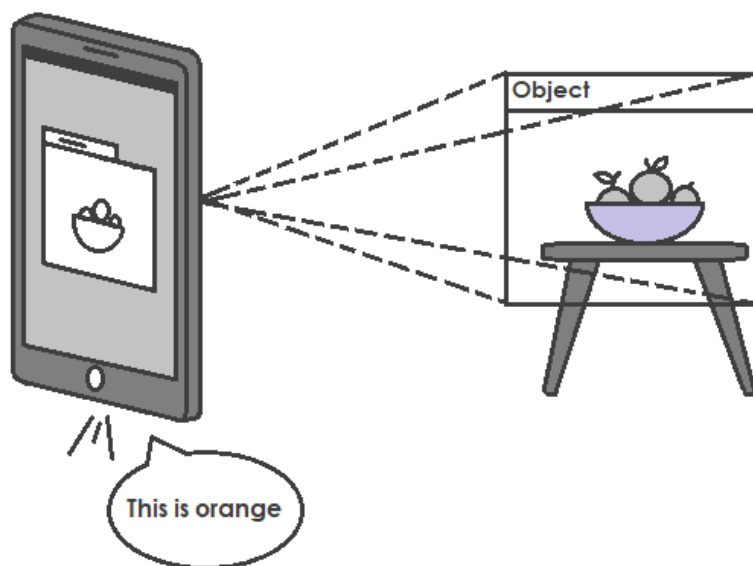
Each class contains more than hundreds of images meaningful to that class along with details of the specific object placed in different surroundings or environment. In TensorFlow, we may use validation data along with training data to test the accuracy of the model.

Image Processing

OpenCV tools are utilized for image pre-processing. The captured image or frame is pre-processed and the unwanted details are removed from the image. For example, a picture of apples placed in a wooden box. Here, the wooden box is an unwanted part in the image. This is removed using ROI-Parameters (Region of interest) in the OpenCV. After filtering and pre-processing the image, it is then passed into the model for classification (classification explained under 'Model training and classification').

Development

Android-Studio or Flutter is used to code the application for android platform. Development software and tools like Android-Studio and Flutter is used to compile the code and produce cross platform application that implements our idea.



Design issues and complexity

The data of user isn't collected advertisement or marketing. This keeps their privacy intact. The application works by just tapping the screen which in turn captures the image and passes it to the model. The result predicted by the model is spoken out through 'text-to-speech' functionality.

The application won't use any complex user interface because there's no meaning to keep a good-looking UI in an application which is mainly focused to help blind people, since they won't be able to see it. Just tapping the main screen of the app is enough to trigger further process and at last speak out the result.

REVIEW COMMITTEE RECOMMENDATIONS:

Accepted with minor revisions

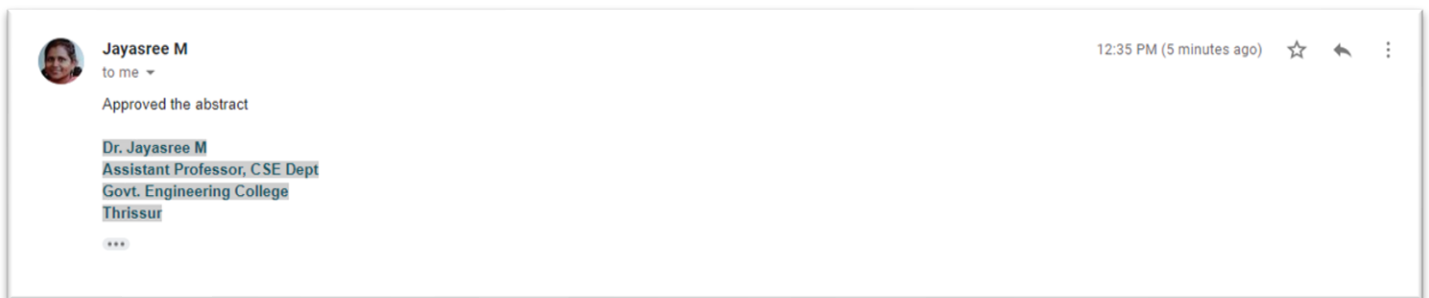
- Issues raised regarding new variety of products that were not included in the initial training:

We create a database to keep the unclassified or undetected images. These set of images are uploaded to cloud database and sorted via image-recognition. These images are analysed and the model is retrained and a monthly in-app update is pushed across all devices. This will resolve the issue of detecting new objects in grocery store.

- Issues raised when different items of same physical appearance are scanned: For example, peach and apple.

The models are custom trained using multitude of images. It also contains different classes, each assigned for a particular fruit or vegetable. If the classifier is unable to classify an object, it will give an error-prompt to the user to seek help from nearby person.

APPROVAL OF MENTOR



APPROVAL OF COORDINATOR