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Team ID: B21-CAP0454

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Inactive Member ID and Name:
1.  -

Selected Theme: Economic Resilience

Title of the Project: Automated Self Checkout (ASC) with Object Detection for Better Shopping Experience

Executive Summary:
Supermarkets manage the daily entry and exit of goods. Many supermarkets rely on manual cashier systems to serve customers in the payment process. This causes the queue of customers to get longer. This result is not suitable with the COVID-19 pandemic situation which requires a person not to stay in public for long. Usually the cashier scans the code on the product to get details about it. But, scanning the barcode to identify the price product one by one for big-scale supermarket products is inefficient. By applying Machine Learning, it is hoped that the shopping checkout process can be done easily and quickly where the model can identify the product from the input image. This project is based on research carried out to answer research questions such as what is the best method for training/preparing data, model and architecture, how is the algorithm and the platforms/instruments for video stream-based object detection. This project will use an external camera as a video or image capture. The video or image that has been taken will be processed for object identification. After the product is identified, the total product price will then be calculated.

Project Scope & Deliverables:

This project aims to implement a cashierless system for shopping centers or minimarkets without using barcodes. The system will use object detection instead of barcodes. This project will use android as media. Then machine learning is needed for object identification, and cloud computing as a data store as well as data processing.

Project scope for our project divided into three,

1. Machine Learning
   Machine learning task is to preprocess data for object detection training, make a model and architecture that detects some objects and then classifies it to a class of product, and also validates the model.

2. Mobile Programming (Android)
   The Android task is to prepare for the UI/UX and make requests to the server for access to the data from the server. Make a request to upload the image to storage and receive a reply message from the backend services.

3. Cloud Computing
   Cloud Computing prepares a cloud database to access data between data scanning or data input to validate. Saves the image to storage, creates a function to trigger the vision API and sends the result back.

Project Schedule:

| No | Schedule | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 |
|---|---|---|---|---|---|---|
| 1. | Design activity diagram, ui for mobile apps | ■ | | | | |
| 2. | Design cloud infrastructure | ■ | | | | |
| 3. | Building ML models | ■ | ■ | ■ | | |
| 4. | Building mobile apps | ■ | ■ | ■ | | |
| 5. | Building cloud infrastructure | | ■ | ■ | | |
| 6. | Connecting backend service with frontend mobile apps, and ML models | | | ■ | ■ | |
| 7. | Testing and re-deploy | | | | ■ | ■ |
| 8. | Creating final deliverables | | | | | ■ |

Project Resources:

- The budget

  This project needs some or all of the following list :

  1. Google Cloud Vision API
  2. Google Cloud Storage
  3. Firebase

| Standard Storage | | |
|---|---|---|
| Jakarta | ✏️ | ⊗ |
| Total Amount of Storage: 1,000 GiB | | |
| USD 23.00 | | |

| Nearline Storage | | |
|---|---|---|
| Singapore | ✏️ | ⊗ |
| Total Amount of Storage: 1,000 GiB | | |
| USD 10.00 | | |

| Cloud Vision | ✏️ | ⊗ |
|---|---|---|
| Label Detection: 10,000 | | |
| OCR: 10,000 | | |
| Explicit Content Detection: 0 | | |
| Facial Detection: 0 | | |
| Landmark Detection: 0 | | |
| Logo Detection: 0 | | |
| Image Properties: 10,000 | | |
| Web Detection: 6,000 | | |
| Document Text Detection: 0 | | |
| USD 58.00 | | |

Total estimated cost: 91$ per 1 month including usage of free tier services

- Paper / Journals / Articles :
  - Object Detection Algorithm Based on Improved YOLOv3
  - Self  Checkout System Using Image Detection
  - Vision-based vehicle detection and counting system using deep learning in highway scenes
  - AI-based machine vision for retail self-checkout system
  - PERANCANGAN APLIKASI PRIVATE MOBILE CASH REGISTER UNTUK MEMANTAU PENJUALAN UMKM
  - New Automated Checkout System

- Datasets :
  - Fruits 360

Risk and Issue Management Plan:

A list of factors that could derail the project and a plan for how issues will be identified, addressed, and controlled. Probably also good if you already have plan B for the identified factors or threats.

1. Some products may have similar packaging designs, which may result in decreased accuracy. So OCR based identification might be used for the solution.
2. Low accuracy due to inadequate camera equipment
3. External factors such as light can affect image capture on the camera
4. Failed to identify the object