



Jomo Kenyatta University of Agriculture and Technology

**Development of a Face Recognition Device
to Monitor Entry Points of Institutions and
Class Attendance
(Otherwise called Visage)**

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1 Introduction

1.1 Background

Face recognition can be done using Artificial intelligence for applications such as control of access, which will be the main focus of this project. It proves to be better than the state of the art method of control access i.e. manual check of Identification cards at the gate. Although this technology is not yet 100 a thorough training of models can ultimately reach very high levels of accuracy.

Another application of Face Recognition technology is in generating sign sheets for different lectures at the university. Therefore, Visage will seek to incorporate face recognition with attendance registration.

1.2 Problem Statement

Monitoring students entering an institution is an important security step both for the other students as well as for the school property. It is a way to keep off intruders and prevent potential attacks. This monitoring is currently done manually i.e. students have to show their IDs every time they want to enter the school. Another important practice in university education is the signing of sign sheets. This enables the lecturers to keep track of students who attend or don't attend classes. A minimum percentage of classes has to be attained for one to sit for exams.

These two activities, access control and class attendance, are limited in various aspects. For access control, a student may lose their IDs which will have them refused access into the school despite their frequency there. Also, intruders may use student IDs to access the school. For class attendance, the inaccuracy is due to the prevalent exercise of students signing for their counterparts who do not attend classes. This leaves lecturers at a fix

at the end of the semester when they cannot explain low grades among some of their students.

To solve these two issues, Visage is going to be a face recognition device with attendance generation capabilities. The device will be portable and mountable on the wall.

1.3 Objectives

1.3.1 Main Objective

To develop a rugged Face recognition device for access control and attendance monitoring

1.3.2 Specific Objectives

1. To design and fabricate a rugged housing for the electronic components of Visage.
2. To build models for Face Recognition.
3. To train the models using data from a given population i.e. volunteers
4. To deploy and showcase Visage at the Tech Expo 12.0

1.4 Justification of Project

1. Circumstances, like Covid-19, may arise that may need registration of people entering social places e.g. churches. These registrations should not lead to very long queues as was the case previously.
2. Face recognition devices for access control exist but may be expensive. Visage will aim at being cost-effective while maintaining or surpassing the efficiency levels.

3. Visage is an opportunity for young African scholars like ourselves to not only learn but also to build using Artificial Intelligence.
4. If Visage is successful it will put JKUAT on the AI map.
5. Employment opportunities for the future for the many data and Machine Learning engineers.

2 Mechanical Design

2.1 Concept Design 1

Some Design Considerations

1. The device should be rugged i.e. it should be able to withstand all weather and conditions.
2. Should be able to house the electronics.
3. Should allow air circulation to prevent the electronics and components from overheating
4. Should have a slot for camera and fan. Fan should further cool the device to minimize chances of overheating.
5. Should provide cheap means of rotational motion.

Use of sheet metal is one possible option for the device fabrication. Sheet metal is:

1. Easy to design.
2. Relatively cheap.
3. Able to withstand unfavorable conditions.
4. Readily available.

Mild steel is commonly available, but is heavy and easily corroded. Aluminum is light but is expensive. Further research will enable us to choose the metal to use.

An interim design of Visage housing is shown below.

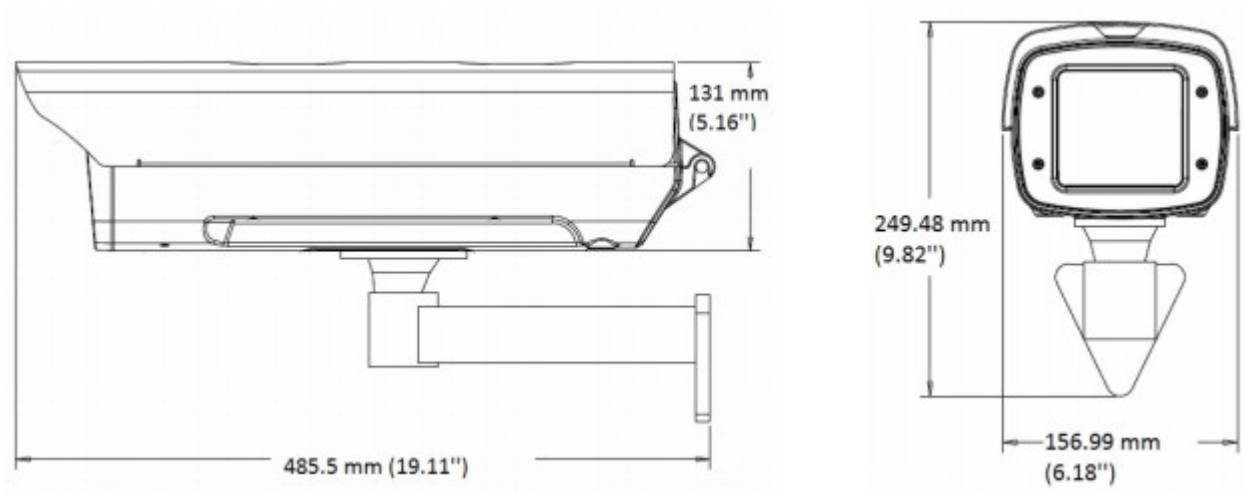


Figure 2.1: Interim Design for Visage using sheet metal

2.2 Conceptual Design 2

The second conceptual design is proposed to be made of 3D printed material, either PLA, ABS, CPE or Nylon. The different materials have different properties that can be used depending on the specific application. The material properties and viability of this design is still under investigation with the aim to achieve the following.

- Cooling
- A rigid structure
- A cost effective design
- Ease of implementation

3 Expected Outcomes

1. A rugged device will be built for the device.
2. The face recognition model for the device will be developed.
3. Visage will be ready for showcasing and pitch during the Tech Expo 12.0.

3.1 Progress

Work that has been done previously

1. Research on technologies for Face recognition.
2. Test runs using OpenCV with Python for Face Recognition.

Work in Progress

Currently working on the design for the product housing. Two designs are in progress i.e. design for fabrication using Sheet metal, and design for fabrication using 3D printing.

Expected timeline for Mechanical Design completion

10th June, 2022

4 Proposed Budget

Item	Quantity	Cost	Total Cost
Raspberry pi 3B+	1	10,000	10,000
3D Printing cost	TBD	TBD	TBD
Sheet Metal cost	TBD	TBD	TBD
Fasteners	TBD	TBD	TBD
Total			10,000

Table 4.1: Proposed budget

Raspberry pi 3B+ has already been provided for this project.

5 Work Plan

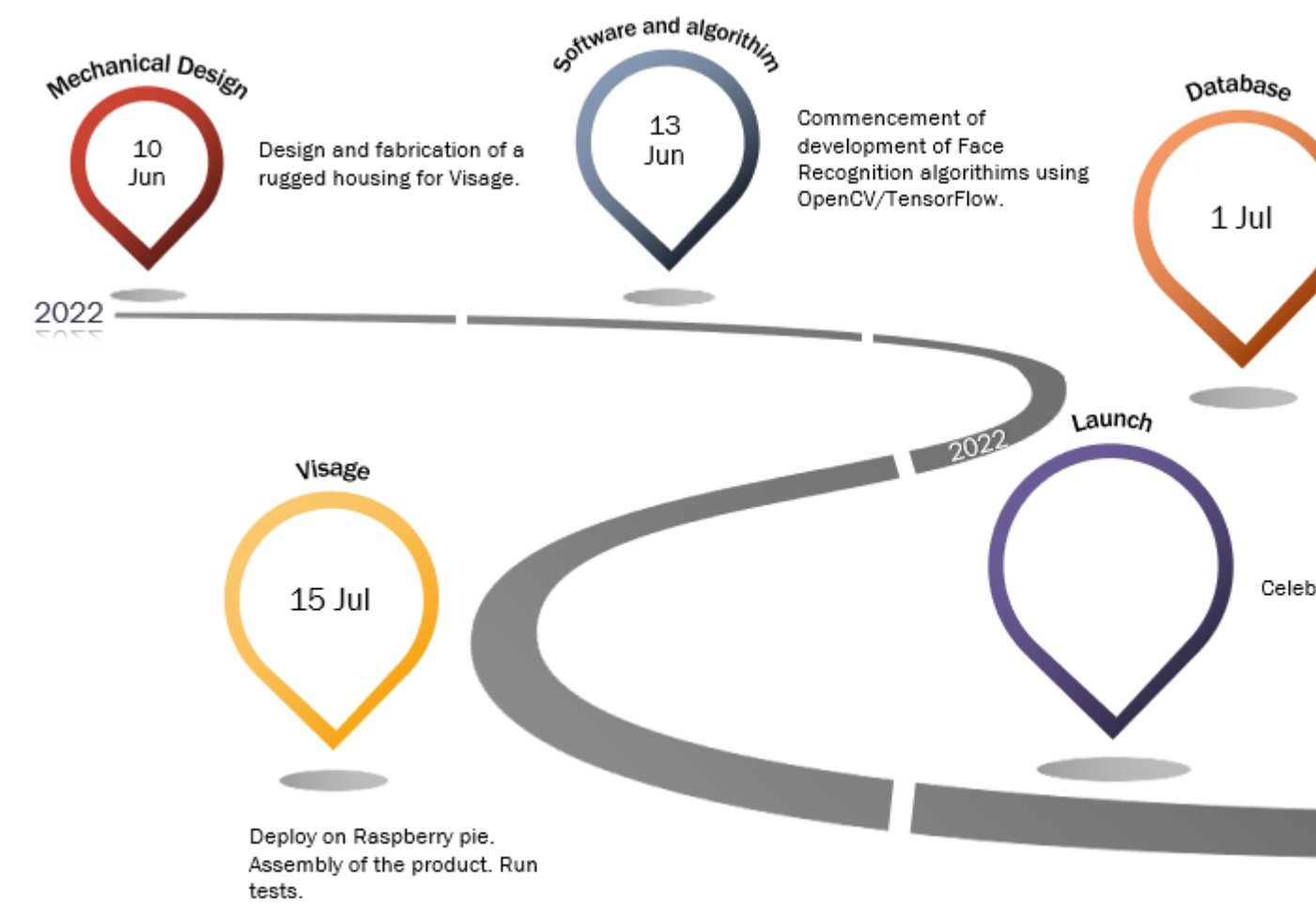


Table 5.1: Milestone Timeline

References