High Level Design (HLD)

Face Mask Wear Detector (FMWD)

Revision Number: 1.0

Last Date of revision: 26/06/2022

Document Version Control

Date Issued	version	Description	Programmed By
26/06/2022	1	Initial HLD-V1.0	Shashank Singh

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Abstract

COVID-19 pandemic has rapidly affected our day-to-day life disrupting the world trade and movements. Wearing a protective face mask has become a new normal. In the nearfuture, many public service providers will ask the customers to wear masks correctly to avail of their services. Therefore, face mask detection has become a crucial task to help global society.

COVID-19 mask detector could potentially be used to help ensure your safety and the safety of others.

1 Introduction

1.1 Why this High-Level Design Document?

The purpose of this High-Level Design (HLD) Document is to add the necessary detail to the current project description to represent a suitable model for coding. This document is also intended to help detect contradictions prior to coding, and can be used as a reference manual for how the modules interact at a high level.

The HLD will:

- Present all of the design aspects and define them
- Describe the user interface being implemented
- Describe the hardware and software interfaces
- Describe the performance requirements
- Include design features and the architecture of the project
- List and describe the non-functional attributes like:
  - Security
  - Reliability
  - Maintainability
  - Portability
  - Reusability
  - Application compatibility
  - Resource utilization
  - Serviceability

1.2 Scope

The HLD documentation presents the structure of the system, such as the database architecture, application architecture (layers), application flow (Navigation), and technology architecture. The HLD uses non-technical to mildly-technical terms which should be understandable to the administrators of the system.

1.3 Definitions

Term	*Description*
Database	Collection of all the information monitored by this system
IDE	Integrated Development Environment

2 General Description

2.1 Product Perspective

The face mask wear detection is developed with the prospective to prevent COVID-19 pandemic that has rapidly affected our day-to-day life disrupting the world trade and movements. Wearing a protective face mask has become a new normal. In the nearfuture, many public service providers will ask the customers to wear masks correctly to avail of their services. Therefore, face mask detection has become a crucial task to help global society

2.2 Problem Statement

To create an AI solution for mask wear detection to implement the following cases:

- To detect whether person wear mask or not prevent from this virus.
- To examine that all person can contribute to make this pandemic away.
- To stop the spreading virus to an unknown person who itself don't know that the person itself affected.

2.3 Proposed Solution

The solution proposed here is a face make wear detection-based surveillance can prevent from above mention cases, if any person who don't wear a mask, then the person monitoring or police or any public safety department can take action immediately.

2.4 Further Improvement

The face mask detector can be used on chemical or coal mining factory or industry and Hospital to prevent people from dust to get allergic.

2.5 Technical Requirement

This Document addresses the requirement for detecting face mask health safety at early stage and recommending the necessary and rapid action to avoid imbalanced in the harmony of the society.

- This face mask detector should include a web cam or surveillance camera.
- These can be battery powered or solar powered.
- This software includes proper computing power to process the image or video of such unaware person regarding its own safety.

2.6 Data Requirements

Data requirement completely depend on our problem statement.

- We need images data that is balanced and must have at least 1000 images.
- We require at least 30- 40 images for each class label with annotation.
- An image is nothing more than a two-dimensional array of numbers(pixels)
- Pixel value ranging between 0 to 255
- It is defined by the mathematical function (x, y), the value of f (x, y) at any point is giving the pixel value at that point of an image
- Original image is in the format of (width, height, no of RGB channels).

There are numerous image file formats out there so it can be hard to know which file type best suits your image needs (on your requirement).

- **Jpg**—joint photography expert's groups

- Jpg is lossy format meaning that the image is compressed to make a smaller file but this loss is not noticeable.
- Jpg is a very popular format for digital cameras.

If the data is in video format like (MP4) convert into images based on FPS (no. of frames displayed per second) in real time processing. There are number of tools to convert videos into images. Using cv we can convert video into images

2.7 Tools used

If the data is in video format like (MP4) convert into images based on FPS (no. of frames displayed per second) in real time processing. There are number of tools to convert videos into images. Using cv we can convert video into images

- VS code is an ide (integrated development environment)
- For visualization of plot, matplotlib library are used.
- Frontend development id done using HTML/CSS
- Streamlit is an open source web app framework create using python and typescript and javascript and some other .
- GitHub is used as version control system
- Chrome is used to run Streamlit web framework

2.7.1 Hardware Requirements

- USB camera for object Detection
- Laptop or chrome book for supervision
- Mask or non-mask person image or real time facing

2.8 Constraints

The Face mask wear detector solution system must be user friendly, as automated as possible and user should not be required to know any of workings.

2.9 Assumptions

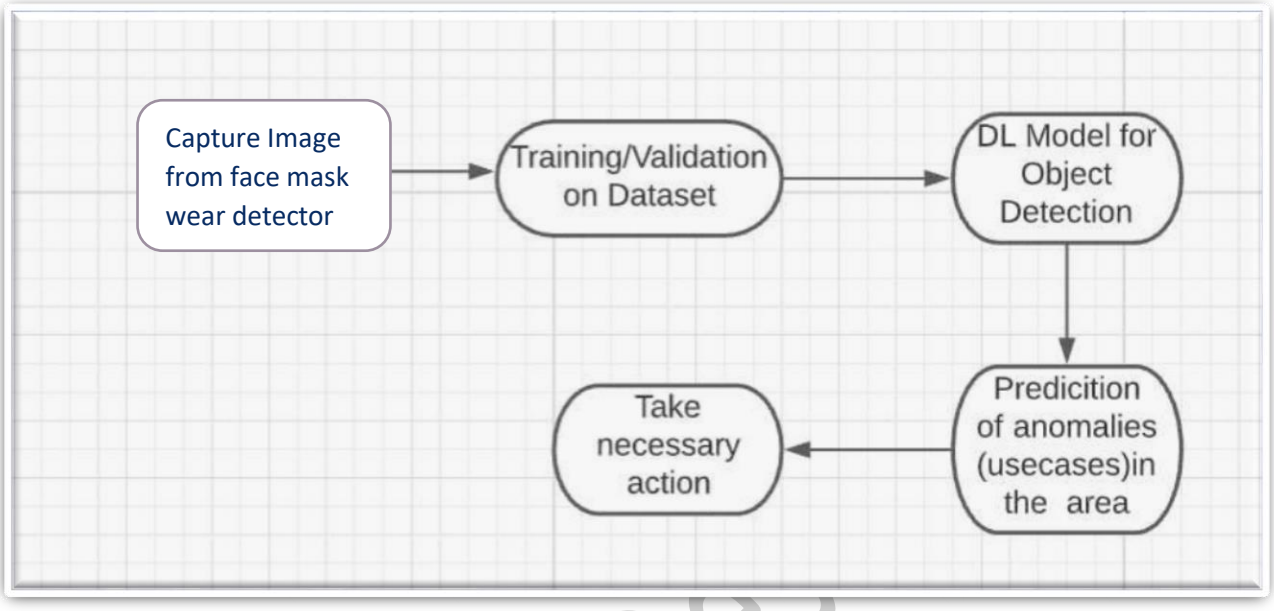
The main objective pf the project is to implement the use cases as previously mentioned (2.2 Problem Statement) for new dataset that comes through Face mask wear detector which has camera installed for capturing the live videos. Deep Learning based object detection model is for detecting the above-mentioned the above use case based on the input data. It is also assumed that all aspect of this project have the ability to work together in the way that designer expecting.

3 Design Details

3.1 Process Flow

For identifying the difference types of anomalies, we will use a deep learning use a deep learning based model. Below is the Process flow diagram id as shown below:

Proposed methodology



3.2 Event log

The system should log every event so that the user will know what process is running internally.

Initial Step-By-Step Description:

1. The System identifies at what step logging required
2. The System should be able to log each and every system flow.
3. Developer can choose logging method. You can choose database logging as well.
4. System should not hang even after using so many loggings. Logging just because we can easily debug issues so logging is mandatory to do.

3.3 Error Handling

Should errors be encountered, an explanation will be displayed as to what went wrong? An error will be defined as anything that falls outside the normal and intended usage.

4. Performance

The solution proposed here is a face make wear detection-based surveillance can prevent from above mention cases, if any person who don't wear a mask, then the person monitoring or concern authority police or any public safety department can take action immediately. So it should be as accurate as possible, So that it will not mislead the concern authorities (cops, public place temple etc…).

4.1 Reusability

The code written and the components used should have the ability to be reused with no problems.

4.2 Application Compatibility

The different components for this project will be using Python as them. Each component will have its own task to perform, and it is the job of the Python to ensure proper transfer of information.

4.3 Resource Utilization

When any task is performed, it will likely use all the processing power available until that function is finished.

6. Conclusion

The Designed Face mask wear detector will detect an unmasked face at real time mode on improve with better algorithm so we can identify the culprit and take necessary step at early stage this immediate step can stop the spreading of covid19 virus, so we can have a pleasant environment in area.