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A Mask Detection Method for People Under the Threat of COVID-19

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Abstract: This electronic Object detection, which aims to automatically mark the coordinates of objects of interest in pictures or videos, is an extension of image classification. In recent years, it has been widely used in intelligent traffic management, intelligent monitoring systems, military object detection, and surgical instrument positioning in medical navigation surgery, etc. COVID-19, a novel coronavirus outbreak at the end of 2019, poses a serious threat to public health. Many countries require everyone to wear a mask in public to prevent the spread of coronavirus. To effectively prevent the spread of the coronavirus, we present an object detection method based on single-shot detector (SSD), which focuses on accurate and real-time face masks detection in the supermarket. We make contributions in the following three aspects: 1) presenting a lightweight backbone network for feature extraction, which based on SSD and spatial separable convolution, aiming to improve the detection speed and meet the requirements of real-time detection; 2) proposing a Feature Enhancement Module (FEM) to strengthen the deep features learned from CNN models, aiming to enhance the feature representation of the small objects; 3) constructing COVID-19-Mask, a large-scale dataset to detect whether shoppers are wearing masks, by collecting images in two supermarkets. The experiment results illustrate the high detection precision and real-time performance of the proposed algorithm.

Keywords: CNN, Deep Learning, Feature Enhancement Module(FEM), Single Shot Detector(SSD).

I. INTRODUCTION

Deep learning allows computational models that are composed of multiple processing layers to learn representations of data with multiple levels of abstraction. These methods have dramatically improved the state-of-the-art in speech recognition, visual object recognition, object detection and many other domains such as drug discovery and genomics. Deep learning discovers intricate structure in large data sets by using the back propagation algorithm to indicate how a machine should change its internal parameters that are used to compute the representation in each layer from the representation in the previous layer. Deep convolutional nets have brought about breakthroughs in processing images, video, speech and audio, whereas recurrent nets have shone light on sequential data such as text and speech.

For classification tasks, higher layers of representation amplify aspects of the input that are important for discrimination and suppress irrelevant variations. An image, for example, comes in the form of an array of pixel values, and the learned features in the first layer of representation typically represent the presence or absence of edges at particular orientations and locations in the image. The second layer typically detects motifs by spotting arrangements of edges, regardless of small variations in the edge positions. The third layer may assemble motifs into larger combinations that correspond to parts of familiar objects, and subsequent layers would detect objects as combinations of these parts. The key aspect of deep learning is that these layers of features are not designed by human engineers: they are learned from data using a general-purpose learning procedure. Deep learning is making major advances in solving problems that have resisted the best attempts of the artificial intelligence community for many years. It has turned out to be very good at discovering intricate structures in high-dimensional data and is therefore applicable to many domains of science, business, and government. In addition to beating records in image recognition and speech recognition, it has beaten other machine-learning techniques at predicting the activity of potential drug molecules, analyzing particle accelerator data, reconstructing brain circuits, and predicting the effects of mutations in non-coding DNA on gene expression and disease. Perhaps more surprisingly, deep learning has produced extremely promising results for various tasks in natural language understanding, particularly topic classification, sentiment analysis, question answering and language translation. We think that deep learning will have many more successes soon because it requires very little engineering by hand, so it can easily take advantage of increases in the amount of available computation and data. New learning algorithms and architectures that are currently being developed for deep neural networks will only accelerate this progress.

II. LITERATURE REVIEW

The city of Wuhan in China is the focus of global attention due to an outbreak of a febrile respiratory illness due to a coronavirus 2019-nCoV. In December 2019, there was an outbreak of pneumonia of unknown cause in Wuhan, Hubei province in China, with an epidemiological link to the Huanan Seafood Wholesale Market where there was also sale of

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live animals. Notification of the WHO on 31 Dec 2019 by the Chinese Health Authorities has prompted health authorities in Hong Kong, Macau, and Taiwan to step up border surveillance, and generated concern and fears that it could mark the emergence of a novel and serious threat to public health (WHO, 2020a; Parr, 2020). The Chinese health authorities have taken prompt public health measures including intensive surveillance, epidemiological investigations, and closure of the market on 1 Jan 2020. SARS-CoV, MERS-CoV, avian influenza, influenza and other common respiratory viruses were ruled out.

The Chinese scientists were able to isolate a 2019-nCoV from a patient within a short time on 7 Jan 2020 and perform genome sequencing of the 2019-nCoV. The genetic sequence of the 2019-nCoV has become available to the WHO on 12 Jan 2020 and this has facilitated the laboratories in different countries to produce specific diagnostic PCR tests for detecting the novel infection (WHO, 2020b). The 2019-nCoV is a β CoV of group 2B with at least 70% similarity in genetic sequence to SARS-CoV and has been named 2019-nCoV by the WHO.

III. INPUT DESIGN

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:

- What data should be given as input?
- How the data should be arranged or coded?
- The dialog to guide the operating personnel in providing input.
- Methods for preparing input validations and steps to follow when error occur.

1. Input Design is the process of converting a user-oriented description of the input into a computer-based system. This design is important to avoid errors in the data input process and show the correct direction to the management for getting correct information from the computerized system.
2. It is achieved by creating user-friendly screens for the data entry to handle large volume of data. The goal of designing input is to make data entry easier and to be free from errors. The data entry screen is designed in such a way that all the data manipulates can be performed. It also provides record viewing facilities.
3. When the data is entered it will check for its validity. Data can be entered with the help of screens. Appropriate messages are provided as when needed so that the user will not be in maize of instant. Thus, the objective of input design is to create an input layout that is easy to follow.

IV. SYSTEM ARCHITECTURE

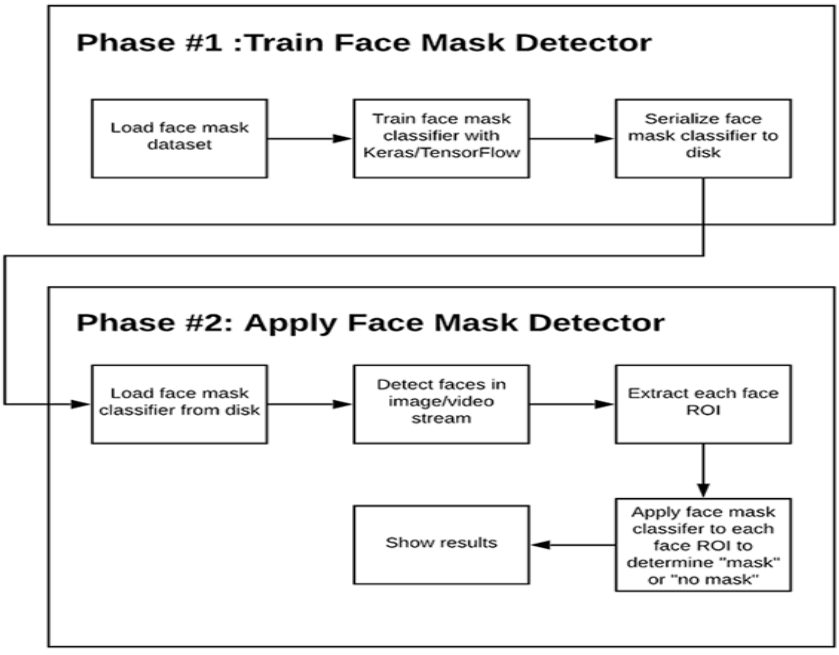

Fig. 1 Block Diagram of proposed system

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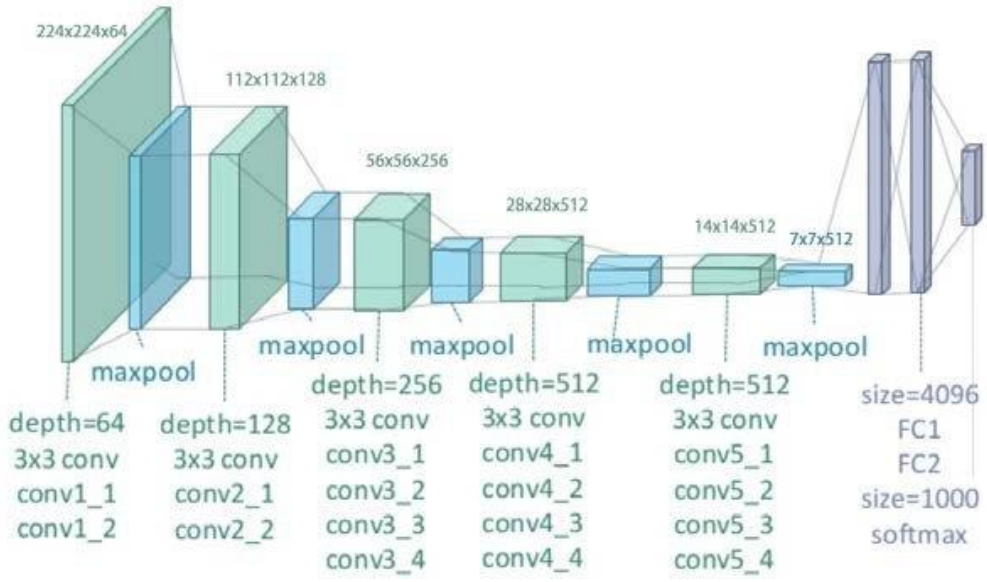

Fig.2 Image size measurement

V. OUTPUT DESIGN

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output.

It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

1. Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people will find the system can use easily and effectively. When analysis design computer output, they should Identify the specific output that is needed to meet the requirements.
2. Select methods for presenting information.
3. Create document, report, or other formats that contain information produced by the system.

The output form of an information system should accomplish one or more of the following objectives.

- ❖ Convey information about past activities, current status or projections of the future.
- ❖ Signal important events, opportunities, problems, or warnings.
- ❖ Trigger an action.
- ❖ Confirm an action.

VI. RESULT

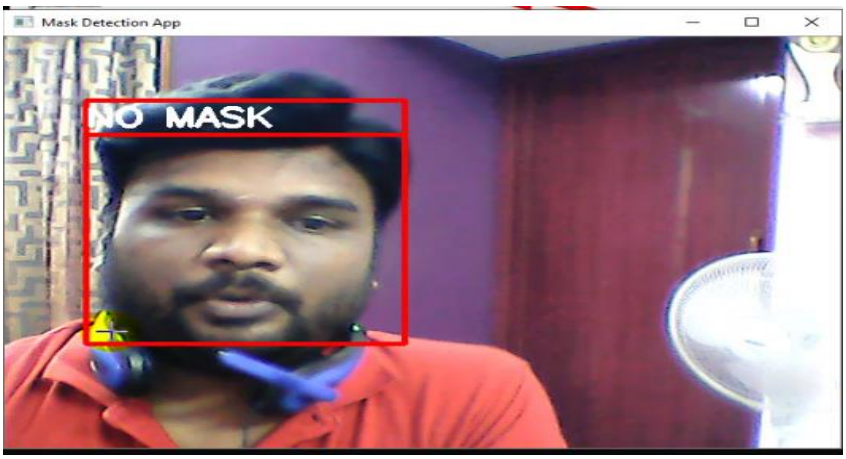

Fig.3 Output 1

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Fig.4 Output 2

VII. CONCLUSION

This research paper discusses the mask detection method for the people under the threat of Covid-19 virus. In this paper, the method used is single-shot detector (SSD), which focuses on accurate and real-time face masks detection in the supermarket. We have make contributions in the following three aspects: 1) presented a lightweight backbone network for feature extraction, which based on SSD and spatial separable convolution, aiming to improve the detection speed and meet the requirements of real-time detection; 2) proposed a Feature Enhancement Module (FEM) to strengthen the deep features learned from CNN models, aiming to enhance the feature representation of the small objects; 3) constructed COVID-19-Mask, a large-scale dataset to detect whether shoppers are wearing masks, by collecting images in two supermarkets. The experiment results illustrated the high detection precision and real-time performance of the proposed algorithm.

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