An Application of Mask Detector For Prevent Covid-19 in Public Services Area

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Abstract. Coronavirus disease (COVID-19) that has entered Indonesia made the government impose large-scale social restrictions to reduce the spread of the coronavirus. As the increase in patients confirmed positive, the government continues to appeal and ask the Indonesian to use masks. Whether it is a healthy people or those who are sick. This appeal is in line with the recommendations of the World Health Organization (WHO) in preventing the spread of COVID-19. Therefore it is necessary to develop tools for monitor people who have not used masks in public service areas in real-time. We develop an application of mask detection using a camera that functions as photo and video input and connected to Speed Maix Bit microprocessor to process data and display it to the LCD. We purposed the tools to solve the problems regarding people who were not used masks or not immediately to minimize the spread of COVID-19. Our final experiment demonstrates that the application highly detects people using masks or not in the public area. This study contributed to the conception, design system, and rules-based for application of mask detector to prevent Covid-19.

1. Introduction
Coronaviruses are enveloped RNA viruses that are distributed broadly among humans, other mammals, and birds and that cause respiratory, enteric, hepatic, and neurologic diseases. Six coronavirus species are known to cause human disease [1]. COVID-19 is an acute resolved disease but it can also be deadly. Severe disease onset might result in death due to massive alveolar damage and progressive respiratory failure [2].

The best prevention at times of a pandemic like this is to avoid contracting the virus. The most important thing for prevention is the use of face masks; Then, when coughing and sneezing covered with tissue which is then safely disposed of. Next, wash your hands regularly with soap or disinfection containing at least 60% alcohol (if soap and water are not available), avoiding direct contact with an infected person. The last is not to touch the eyes, nose, and mouth with unwashed hands [3].

Some previous researches have relevant to our study. They are including about face-mask sampling detects [4], masking of random-walk motion [5], hyper-realistic mask detection [6], mask R-CNN [7], masking movement [8], 3-D face-masking detection and tracking [9], and immobilization mask [10]. All of the researches relevant to our study but there is none discussed the mask detector to prevent Covic-19 in public services. In our study, the public services
including hospitals, stations, supermarkets, banks, stores, or other public places. So, our research proposed an application of a mask detector to prevent Covid-19 in the public services area.

In this research, we developed an application to solve the problem for break the distribution chain of COVID-19 in the public service area, because when someone is outside the house there will be lots of threats of virus transmission. So the whole community needs to use masks. Then, we aim to develop applications and investigate mask detectors to prevent Covid-19 because the use of masks can prevent the transmission of sparks that can be used to protect others, and help contaminate the environment due to this spark, to minimize the spread of COVID-19 due to the use of masks which has been monitored in public areas.

2. Materials and Method

2.1. MicroPython and Sipeed Maix Bit

Sipeed Maix Bit which includes the MaixPy programming language. Standard libraries that are often used plus several special libraries, available at MaixPy [11]. MicroPython is a lean and efficient implementation of the Python 3 programming language [11]. And, the compiler neural network called nncase1 converts the TFLite and Caffe models to the corresponding model format. The accelerator currently only has support for a limited group of CNN layers and the activation function is also a limited model size of 5.9 MiB [12]. In our research, the development board of Sipeed Maix Bit shown in Figure 1.

2.2. RISC-V Architecture

RISC-V is an open and free instruction set architecture (ISA), originally developed at UC Berkeley and currently managed and supported by the RISC-V Foundation. The popularity of RISC-V continues to grow which is used for teaching and research, as well as industry. In today’s market innovation and development, especially in the field of embedded systems with low costs and easy internet. RISC-V must be used for all RISC-V processor implementations and a set of optional standard extensions [13].

2.3. Image Classification, Object Detection, and Object Classification

Image classification is the deep convolutional neural network (CNN), which has achieved a state of the art performance in the large-scale single-label object recognition task [14]. The other part, Salient object detection methods commonly serve as the first step for a variety of computer vision applications including image and video compression, image segmentation, content-aware image editing, object recognition, visual tracking, photosynthesis, and information discovery image retrieval [15]. The approaches to classify the objects are Shape-based classification, Motion-based classification, Color-based classification, and texture-based classification. The approaches
to classify the objects are Motion-based classification, Shape-based classification, Color-based classification, and texture-based classification [16].

2.4. Machine Learning
Machine learning enables the extraction of meaningful patterns from examples. The appeal of having a computer that performs repetitive and well-defined tasks is clear. Machines learning algorithms are potentially useful components of computer-aided diagnosis and decision support systems [17]. Sipeed Maix Bit which uses a K210 dendrite processor is the main device used to design this system. It was modified with a kit that included an SPI LCD and camera. We modified the accompanying box to make the case casing for the hardware and it is shown in Figure 2.

![Figure 2. Case for Hardware](image)

To recognize the Sipeed Maix ecosystem. There are several ways to recognize Sipeed Maix ecosystem and to use the sipeed maix board. In this project, we use the MicroPython version. The next stage is to create a special data model by creating a data model for this hardware including converting TensorFlow, Yolo, or even hardware. But because I don’t have a powerful computer to make accurate data models, sipeed maix already has a cloud platform to create a special data model called Maixhub, before we go to maixhub, we need to collect the masks and data sets that you can take both of them are kaggle. The data sets downloaded from kaggle will be used at Maixhub and train data on how to create model data and display it on the LCD screen.

From the data model that has been designed, the thing to do next is to add many other features. Features that can be added such as notifications when a mask is not detected, Statistics of mask users in certain areas to ensure security in certain areas, and can be utilized with new laws that are currently implemented in Indonesia for people to leave the house without wearing a mask.

3. Result and Discussion
3.1. Designing Prototype
This system has a workflow as shown in Figure 1. First, the camera will be activated in a position that covers an area that is passed by many people, then the camera will check for people who pass through that area. After that, the system will decide whether the person uses a mask or not. When detected using a mask, the process is complete, then when detected not using a mask, the system will return to check. In general, designing a prototype shown in Figure 4.
3.2. Designing Program

Before the system is made and ready for use, the program design is done first. Like determining what components and programming languages to use. So that later, in making this tool more directed and not out of context from what it should.

The above script is a SModel script to recognize people who wear masks or not from the designed data model. This algorithm in Figure 7a that shown inline 21 to line 31 identifies discrete objects and mask using instantaneous while-do void fraction data. Every object is characterized in detail, including size, shape, and pattern. This algorithm adopted from the inline research about face-masking [4]. The algorithm identifies the characteristics of objects in this case made using a ruled based approach [18], [19].

3.3. System Testing

The system can detect when the person is using a mask. Information results displayed via the LCD are mask_detector, which means that the person is wearing a mask. The system can detect when the person is not using a mask. Information results displayed via the LCD are no_mask, which means that the person is not wearing a mask. In Indonesian, this result uses to decide
for the peoples are not wearing the mask. It means the application in this study is one of the decision support systems applications [20]. In this phase, we also tested the idea that this could mask movement [8]. The testing conducted using computer-simulated but was not reducing the risk of detection.

![Figure 5](image)

**Figure 5.** Testing when people use mask (a), don’t use mask (b), Camera can detect people using masks (c)

The results obtained, the camera can detect the person using a mask or not through a camera that has been connected Sipeed Maix Bit and information that will appear on the LCD in the form of writing following what the camera captures. The "mask_detector" for people who use masks and "no_mask" for people who don't use masks. Our final experiment (Fig. 6 to Fig 8) demonstrates that the application highly detect people using masks or not in the public area. This experiment adopted the physical evaluation that used in the other research [21] and complement the other research about Covid-19 [22]. But the results in this research different from the previous study that shown by the reduction in sensitivity to artificial random walk motion [5]. Also, this results have a lack of a gold standard criterion for registration accuracy-test [23].

4. Conclusion
This paper explains the application of mask detector to prevent Covid-19 in public services. The authors propose an application to solve the existing problems so that checking people use masks in the public services are more effective. The mask detector module displays information when people do not use masks in hospitals or public places. The mask detector module produces accurate information when the camera is placed in a position that reaches an area that is passed by many people.

Regarding the limitations of research, this research can still be developed for further research. So, the future work for further development is the module can store information on how many people do not use masks in hospitals or public areas in the database. Then, it can be an evaluation material for hospitals or government in following up on people who are still not aware of the importance of using masks in conditions of the COVID-19 outbreak.

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