System for Mask-Wearing Alert to Prevent COVID-19

Nguyễn Minh Việt
Thai Nguyen University of Information and Communication Technology
Thai Nguyen University, Thai Nguyen, Vietnam
student404@ictu.edu.vn

***Abstract*—This thesis presents a system for detecting and alerting individuals whether they are wearing masks or not, using facial recognition technology. The system was developed using Python and OpenCV, and it can be deployed on a Raspberry Pi. The system includes face detection, preprocessing of images, and the use of a deep learning model for classification. The system was able to detect and classify whether individuals were wearing masks or not in real-time. However, the performance was limited in low light conditions and the accuracy was not as high due to the limited size of the training dataset. Future work could involve collecting a larger dataset and improving the system's performance in various lighting conditions.**

***Index Terms*—facial recognition, mask detection, Raspberry Pi, OpenCV, deep learning, Python**

I. Introduction

The introduction covers various aspects of the system, including face recognition methods, the architecture of a face recognition system, and the detection of masks on faces. It also discusses the use of Raspberry Pi and Python programming, as well as the OpenCV library. The limitations of the methods are also mentioned. The system aims to assist in preventing the spread of COVID-19 by ensuring individuals are wearing masks. However, the system's performance is constrained by the limited training dataset and low light conditions, which can affect the accuracy of the mask detection [1]. Published articles on the methods and subject of this project provide context for this English summary [9].

II. Methods

The system was developed using Python and the OpenCV library. It includes face detection, preprocessing of images, and the use of a deep learning model for classification. The system can be deployed on a Raspberry Pi and uses a webcam for real-time face detection and classification. The system uses a Haar cascade classifier for face detection and a deep learning model for classifying whether individuals are wearing masks or not. The preprocessing step involves converting the image to grayscale, applying histogram equalization, and normalizing the pixel values. The system was trained using a dataset of images of individuals wearing and not wearing masks. The limitations of the system include reduced performance in low light conditions and limited accuracy due to the small training dataset [1].

Supervisor: Đặng Văn Ngọc, Thai Nguyen University of Information and Communication Technology (dvngoc@ictu.edu.vn).

III. Results

The system was able to detect and classify whether individuals were wearing masks or not in real-time. However, the performance was limited in low light conditions and the accuracy was not as high due to the limited size of the training dataset. The system was tested using a webcam and a Raspberry Pi. The system was able to detect faces and classify them as wearing or not wearing masks. However, the accuracy of the system was lower in low light conditions, and the system was unable to detect faces accurately in such conditions. The system was also unable to detect faces that were partially occluded by objects or hair. The system was able to provide real-time alerts to individuals who were not wearing masks, but the accuracy of these alerts was limited due to the limitations of the system [1].

IV. Discussion

The system has limitations, such as reduced performance in low light conditions and limited accuracy due to a small training dataset. Future work could involve collecting a larger dataset and improving the system's performance in various lighting conditions. The system's performance can be improved by using more advanced face detection and classification techniques, such as deep learning models with larger training datasets. The system can be further improved by incorporating additional sensors, such as infrared cameras, to enhance the accuracy of the mask detection. The system can also be improved by incorporating additional features, such as audio alerts, to provide more effective alerts to individuals who are not wearing masks [1].

V. Conclusion

The system was successfully developed and tested, but it has limitations that need to be addressed. The system can be used to alert individuals whether they are wearing masks or not, but further improvements are needed to enhance its performance. The system can be deployed on a Raspberry Pi and uses a webcam for real-time face detection and classification. The system's performance can be improved by using more advanced face detection and classification techniques, such as deep learning models with larger training datasets. The system can also be improved by incorporating additional sensors, such as infrared cameras, to enhance the accuracy of the mask detection [1].

References

[1] Nguyễn Minh Việt, ”System for Mask-Wearing Alert to Prevent COVID-19,” internal undergraduate thesis (original in Vietnamese), Thai Nguyen University of Information and Communication Technology, 2021.

[2] Nguyễn Thanh Hải, “Giáo Trình: Xử Lý Ảnh”, Xuất bản Đại Học Quốc Gia TP.HCM, 2013

[3] Simon Monk, “Programming the Raspberry Pi Getting Started with Python”, 2015

[4] Raspberry Pi, https://vi.wikipedia.org/. Trang web truy cấp lần cuối vào ngày 13/4/2021

[5] Raspberry Pi, https://www.electronicwings.com/, 2019. Trang web truy cấp lần cuối vào ngày 13/4/2021

[6] Python, https://www.python.org/downloads/. Trang web truy cấp lần cuối vào ngày 17/8/2020

[7] OpenCV, https://minhng.info/tutorials/opencv-region-of-interest-roi-la-gi.html. Trang web truy cấp lần cuối vào ngày 29/8/2020

[8] Deep learning, https://nordiccoder.com/blog/deep-learning-la-gi/. Trang web truy cấp lần cuối vào ngày 30/12/2019. 57

[9] Henderi, Ageng Setiani Rafika, Harco Leslie Hendric Spits Warnar, Meldi Anggara Saputra, ”An Application of Mask Detector For Prevent Covid-19 in Public Services Area,” Journal of Physics: Conference Series, vol. 1641, no. 1, pp. 012063, 2020. DOI: 10.1088/1742-6596/1641/1/012063.