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Web Enabled Mask Detector Robot using Raspberry PI

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ABSTRACT: During these unprecedented times COVID-19 pendamic one of the most crucial precautions to flater the determintal effect of corona virus is to avert the spread of virus world wideasa much as possible. The spread of corona virus depends mostly on human interaction.As the precautions it is mandatory to use face mask these days. In these seviour situation too some people are not cooprating although having these much of different rules and regulations. So to decrease as much as human interaction possible we are designing thus robot which will detect the faces without masks .it will alert the person about the mask click its picture for the proof and then it will print a penalty receipt. We will be using HUSKYLENES AI camera to detect people without camera to detect people without mask.and then a TINY EMBADDED THERMAL PRINTER is used to print the penalty receip

I. INTRODUCTION

During these unprecedented times - COVID-19 pandemic - one of the most crucial precautions to falter the detrimental effects of coronavirus is to avert the spread of the virus worldwide as much as possible. Especially as we know that it is spreading even faster than seasonal influenza viruses: "With the worldwide spread of the novel Coronavirus Disease 2019 (COVID-19), caused by the SARS-CoV-2 virus, we are experiencing a declared pandemic. One of the largest preoccupations about this new virus is its notable ability to spread given the absence of any effective treatment, vaccine, and immunity in human populations. Epidemiologists quantify the ability of infectious agents to spread by estimating the basic reproduction number (R0) statistic (Delamater et al., 2019), which measures the average number of people each contagious person infects. The new coronavirus is transmitting at an average R0 between 2.7 and 3.2 (Billah, Miah & Khan, 2020; Liu et al., 2020).

To decrease interactions as much as possible, I designed this prototype as an all-in-one service with hardware and software. The device follows these protocols while operating

- Live streams while operating
- Receives commands (direction and speed) as Python Arguments from the PHP web application (Mask Detection Robot Dashboard)
- Detects people without a mask automatically using the object classificCaptures pictures of people without a mask after detecting
- Sends pictures of people without a mask to the web application as evidence
- Prints the penalty receipt after detecting, including the QR code of the payment page showing the payment options and the corroborating evidence of the issued fine - the captured picture.

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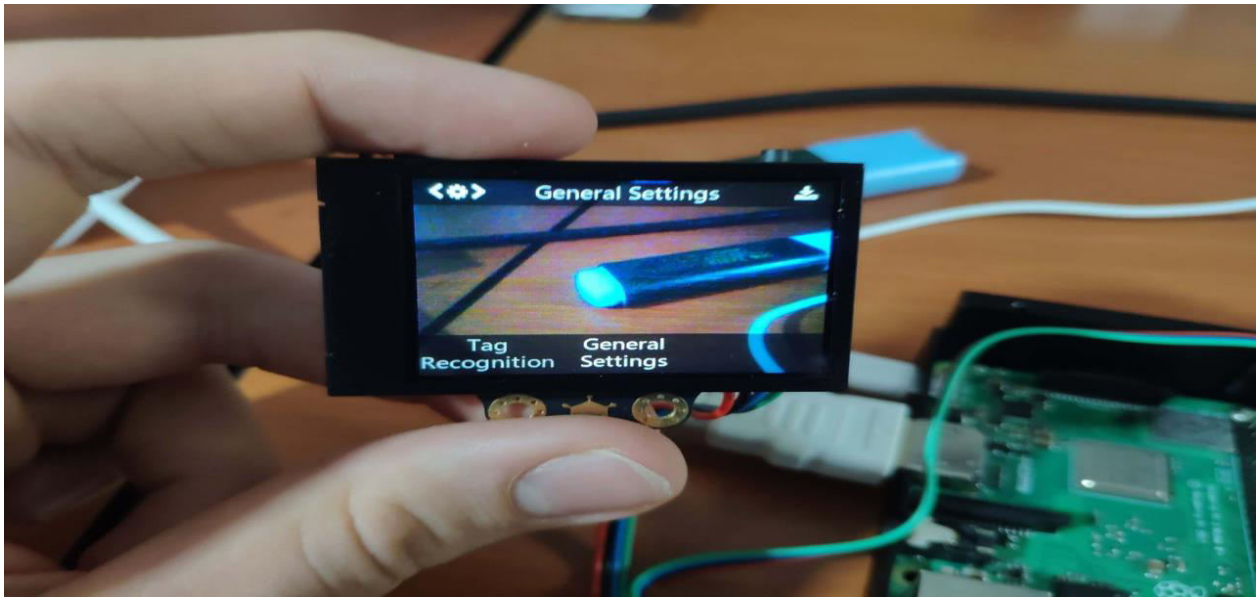
II. METHODOLOGY

Step 1: Detecting people without a mask with the object classification mode in HuskyLens

We chose to use the DFRobotHuskyLens AI camera in my project since it has an embedded screen showing the results of face mask detection. In that regard, we could display the results without making the device more complicated with screen connections. Also, HuskyLens includes build-in algorithms supporting six functions - face recognition, object tracking, object recognition, line tracking, color recognition, and tag recognition - controlled with an easy-to-use interface.

However, we need to activate the object classification mode to detect face masks since the other embedded functions are not capable of face mask detection. The object classification function of HuskyLens can learn from multiple photos of different objects by built-in machine learning algorithms. After completing the object classification learning, when HuskyLens detects the learned object, it can recognize and display the object ID number. Well, the more it learns, the more accurate the recognition can be.



Step 2: Reading results generated by HuskyLens with Raspberry Pi

To be able to send the detected blocks and object ID numbers by HuskyLens to the Raspberry Pi, we will use the I2C protocol and the official HuskyLens library. The primary protocol for communication between the HuskyLens and the Raspberry Pi is I2C. I2C protocol requires us to use the 4-Pin connector to wire ground, power, SDA, and SCL pins.

Step 3: Streaming live video via the Raspberry Pi web server by using Motion

We need to create a Webcam server to be able to live stream with Raspberry Pi. Luckily, creating a Webcam server is easy with the help of the Motion module in Python.

Step 4: Capturing and sending pictures of people without a mask when detected

In this step, we will take a picture when HuskyLens detects someone without a mask and send it to a server (Apache on Raspberry Pi) to be saved as corroborating evidence of the penalty receipt.

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Unfortunately, we cannot capture pictures easily with the Motion module explained in the previous step. Therefore, we need to use another library - *fswebcam* - to take pictures with a USB webcam.

Step 5: Using the embedded (tiny) thermal printer to print text and QR code

In this step, we will print a penalty receipt with the QR code of its payment page when HuskyLens detects people without a mask.

There are various types of thermal printers with different abilities, but all of them are controlled by similar methods and functions. In this project, I used an embedded (tiny) thermal printer supporting TTL and USB.

Step 6: Creating the Autonomous Mask Detection Robot application in Python

In this section, we will talk about how we created an application, named Autonomous Mask Detection Robot, in Python for the robot and what features it includes. The application consists of two parts - files:

- mask_detection_robot.py
- chassis_controls.py

Step 7: Assembling the robot chassis and connecting the L298N Motor Driver Module

In this step, we will assembly a Black Gladiator (Tracked Robot Chassis) to make the device moveable and flexible; and connect an L298N Motor Driver Module to the robot chassis to be able to control motors easily with GPIO pins.

III. SIMULATION RESULTS

• The web-enabled ML face mask detection robot live streams in the PHP web application (Mask Detection Robot Dashboard) while operating.
• The robot detects people without a mask by utilizing the object classification mode of the HuskyLens AI Camera.
• When the robot detects people without a mask, it generates a unique receipt number, captures pictures of people with no mask, and sends them to the PHP web application as evidence.
• Then, the web application creates a payment page for each receipt number and shows the captured picture of the given receipt number as the corroborating evidence of the issued fine. After detecting people with no mask, the robot prints penalty receipts automatically to notify them wearing masks. The penalty receipt shows:
• Receipt Number
• Issue Date
• Issue Time
• Fine Amount
• Due Date
• Warnings
• QR code of the payment page

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IV. CONCLUSION AND FUTURE WORK

More than fifty countries around the world have recently initiated wearing face masks compulsory. People have to cover their faces in public, supermarkets, public transports, offices, and stores. Retail companies often use software to count the number of people entering their stores. They may also like to measure impressions on digital displays and promotional screens. We are planning to improve our Face Mask Detection tool and release it as an open-source project. Our software can be equated to any existing USB, IP cameras, and CCTV cameras to detect people without a mask. This detection live video feed can be implemented in web and desktop applications so that the operator can see notice messages. Software operators can also get an image in case someone is not wearing a mask. Furthermore, an alarm system can also be implemented to sound a beep when someone without a mask enters the area. This software can also be connected to the entrance gates and only people wearing face masks can come in.

Conclusions for this robot is that it will detect the faces of the people without masks and then it will print the penalty receipt. This will minimize the physical contact as much as possible. This face mask detector can be deployed in many areas like shopping malls, airports and other heavy traffic places to monitor the public and to avoid the spread of the disease by checking who is following basic rules and who is not.

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