



INDEPENDENT UNIVERSITY, BANGLADESH

COURSE: Microprocessor, Interfacing and
Assembly Language (CSE 216L/CSC212L)

SECTION: 01

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DATE OF SUBMISSION:

17th October 2021

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FACE MASK DETECTION USING ARTIFICIAL INTELLIGENCE TO OPERATE AUTOMATIC DOOR

PROJECT SUMMARY

The project that we are building is face mask detection using AI. The system is designed to detect the faces and to determine whether the person is wearing a face mask or not. The system can be used in the hospital, market, bus terminals, restaurants, and other public gatherings where the monitoring has to be done. This project consists of an Android phone that will capture the image of people willing to enter the public places and detect whether the person wears a face mask or not using the AI system. Furthermore, if the system detects the presence of a mask, then the user will be allowed to enter the place by signaling the automatic door to open; otherwise, a message will be displayed on an LCD screen that the user is not wearing a mask; thus, entry is prohibited.

In addition, there can be a situation that a person has forgotten to get a mask thus in such situations if a mask dispenser system can be included by the owners to make sure people without wearing masks can also avail their services. By this, everyone will be able to get access into such places while maintaining health precautions.

PROBLEM STATEMENT

After the new Coronavirus disease (COVID-19) case spread rapidly in Wuhan-China in December 2019, the World Health Organization (WHO) confirmed that this is a dangerous virus that can be spread from one human to another through droplets and airborne particles. The virus mainly spreads mostly by droplet infection when people cough or if someone is in contact with an ill person (contracted COVID-19). The COVID-19 pandemic is one of the most pressing issues of recent times. Despite an ever-increasing pool of scientific evidence pointing to the effectiveness of the simple act of wearing face masks in greatly reducing the number of cases. In a study, it was found that wearing masks reduces the chances of contracting Covid-19 up to 34 percent. Yet here in Bangladesh only 64% of urban dwellers regularly wear masks, leading to the high infection rates we have seen the past few months.

Too often we see individuals showing callous disregard for their fellow human beings' safety by refusing to take such simple measures. They cite reasons ranging from the trivially selfish

“masks are uncomfortable”, to the ignorant “covid isn’t a real concern here” - putting at jeopardy the old, the frail, and the immunocompromised.

Places such as malls and hospitals are very crowded. Maintaining health protocols such as social distance or confirming that each individual is wearing a mask can be nearly impossible to handle. The risk of transmission is even higher indoors due to proximity and lack of proper ventilation. Passive “No Mask No Service” signs do little to encourage mask-wearing, and employees attempting to enforce such policies often come under severe harassment from incensed patrons.

In the countries such as Bangladesh, people are not used to wearing masks, thus it becomes difficult for them to make a habit. On the other hand, even if measures are taken such as staff monitoring the people entering, there are higher chances of spreading covid in this situation as social distancing is not being maintained and if the mask is not worn. So in order to create a safer environment for us all, something must be done to encourage the habit of wearing masks among the general public.

SOLUTION

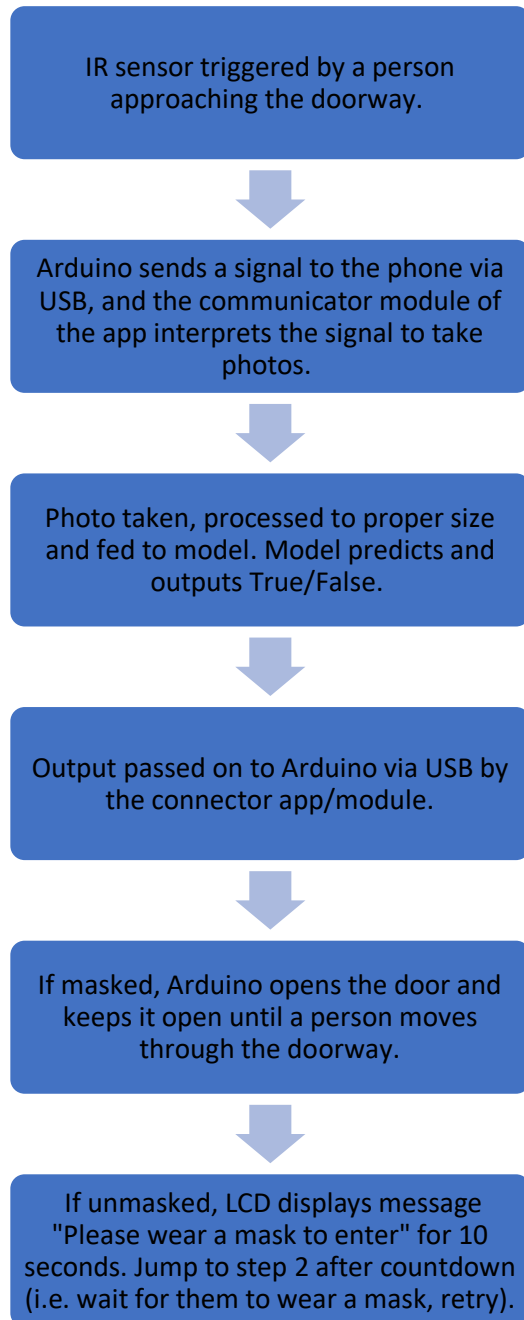
The method of wearing masks could be beneficial, in reducing COVID-19 transmission in low-income countries where the supply of vaccines is limited. The goal is not to punish people by denying them service for not wearing a mask. Instead, it is there to nudge them in the right direction and help them get into the habit of wearing masks. There should be a mask dispenser by the door so that people can enter the "proper" way - contributing towards creating a safer environment for everyone inside, and the consistent, repeated act might be enough to form a habit. Too often hear of employees being harassed by angry customers when requesting them to wear masks - having an automated system can help prevent that. With enough of these systems active in public places, the “inconvenience” might be more effective at making people wear masks than simple passive "Wear Masks" signs.

Therefore, we have come up with a system for crowded places such as malls, using artificial intelligence, and using an android phone which will contain the face detection app, the system will be able detect whether a person is wearing a mask or not. If a person is not wearing a mask, then entry to such places will be denied, and a message will be displayed with the help of an LCD screen, the user will be able to see why he is not being granted access and if they are granted access then signal will be send to the automatic door to open. This parts will be managed by the microcontroller which in our project will be the Arduino-nano.

The reason for choosing Android phones over dedicated controllers such as a Raspberry Pi is as follows: every year, an astounding number of devices are sent to landfills due to being considered outdated. Our project requires only a very basic device with a working camera. Thus, we can draw from this plentiful source and give these devices a new lease on life - a cost-effective and eco-friendly solution.

STEP BY STEP WORKFLOW

Workflow of the automated door:



The app has three modules:

- i. The communicator module - sends/receives simple True/False signals between the Arduino and the smartphone via USB. We send a signal to the Arduino when we want it to open the door. We receive a signal on the phone when a person triggers a sensor, and we have to take a photo/infer, etc.
- ii. The camera module - utilizes the device's camera. When given a signal, it takes a photo and saves the image on an image view.
- iii. The AI module - processes the image (resizing it to 224x224, converting to bitmap, and finally into a tensor image) and feeds it to a TensorFlow-lite model trained to distinguish between mask-wearers and non-mask-wearers. The output is a boolean; true if masked. This boolean is given to the communicator module to be passed on to the microcontroller.

PROJECT TIME FRAME

Title: FACE MASK DETECTION SYSTEM USING ARTIFICIAL INTELLIGENCE TO OPERATE AUTOMATIC DOOR

Start Week		Oct 5, 2019								
Week	1	2	3	4	5	6	7	8	9	10
Starting	Oct 5	Oct 12	Oct 19	Oct 26	Nov 2	Nov 9	Nov 16	Nov 23	Nov 30	Dec 7
Analysis	Research feasibility									
	Informations regarding app and AI									
Design	App modules									
	Hardware configuration									
	Planning the final design									
Implementation	Codes for the app									
	Training the AI model									
					Integration with app and AI model					
Testing					Make arduino communication module					
	Testing the AI model									
				Testing the app						
					Testing the whole project					
								Submit final draft		

PROJECT END

CHALLENGES/RISK OF PROJECT

While this technology comes with bearing blessings, there are complications when it comes to its execution and limitations to its working capabilities, which we are aware we will be facing as well. The complications and limitations will be clearer during the actual building of the module, but the ones understood so far are listed below:

1. The system does not essentially detect masks, so an individual wearing any sort of face-covering may be detected as wearing a mask and not signaled otherwise.
2. Illumination can alter the face appearance drastically. Thus, the slightest change in lighting conditions causes a significant challenge for automated face recognition and can have a significant influence on its results.
3. Facial Recognition Systems are highly sensitive to pose variations. The pose of a face varies when the head movement and viewing angle of the person changes. The movements of the head or differing POV of a camera can invariably cause changes in face appearance and generate variations making automated face recognition rates drop drastically.

CONCLUSION

The mass rise of covid-19 has made the mask an essential part of our daily lives to ensure safety. Although face masks are getting to be a whole new implemented standard for everyday life, to build a safe environment that contributes to public safety, it becomes necessary to be observant throughout the day and act against those who do not wear masks in public places or workplaces. So, this project is aimed to solve a crucial situation that we are facing worldwide so that people become more habitual in wearing the mask, thus keeping themselves and others safe through this process.

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