Social Distancing Indicator

A MINI-PROJECT REPORT

Submitted by

BL.EN.U4AIE21121 Srinidhi Kannan

BL.EN.U4AIE21126 Suryamritha M

BL.EN.U4AIE21139 Varshini Balaji

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AMRITA VISHWA VIDYAPEETHAM

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Abstract

Due to the increasing number of Covid-19 cases it is necessary for us to take precautionary measures, here we have taken two of the important measures i.e., Maintaining Social Distancing and wearing mask.For Social Distancing we have done an indicator using Arduino,ultrasonic distance sensor and buzzer in Tinkercad.We are also explaining how Social Distancing Indicator can be done using PIR Sensor ,Bluetooth and Deep Learning. We also have a MATLAB Simulation for understanding the concept of Deep Learning.We have created an APP for the detection of mask.

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List of Abbreviations

1. PIR- Passive Infrared Sensor
2. RSSI- Received Signal Strength Indication
3. ToA- Time of Arrival
4. TDoA- Time Difference of Arrival
5. UHF- Ultra-High Frequency
6. ISM- Industrial Scientific and Medical
7. GHz- Gigahertz

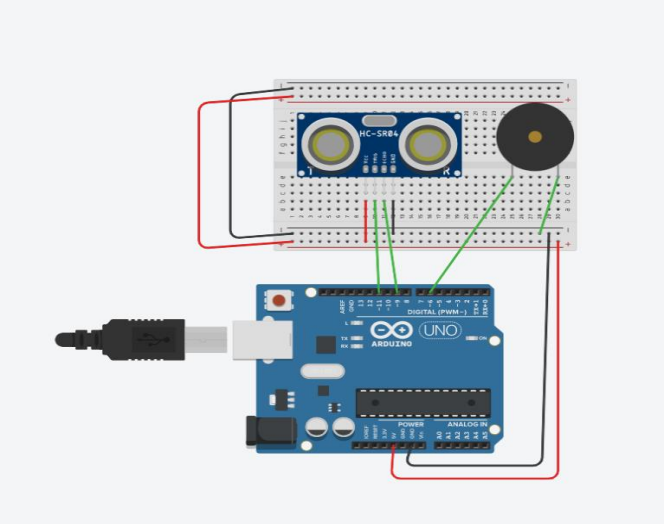
Chapter 1-Social Distancing Indicator

1.1 Introduction

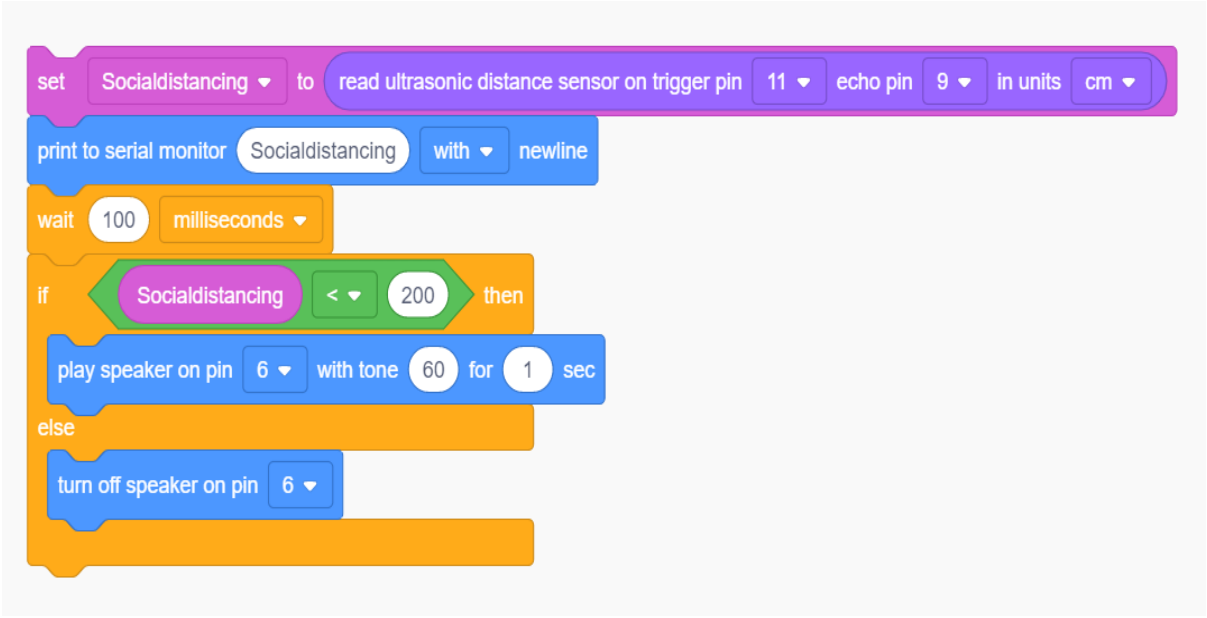
Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. It originated in Wuhan, China. Symptoms of COVID-19 are variable, ranging from mild symptoms to severe illness. Common symptoms include headache, loss of smell (anosmia) and taste (ageusia), nasal congestion and runny nose, cough, muscle pain, sore throat, fever, diarrhea, and breathing difficulties. In some of the tips avoid the spread of Covid-19 we have chosen the topic Social Distancing and Wearing of Masks.

The Components of the Basic Social Distancing Indicator circuits are: Arduino, piezo buzzer and Ultrasonic sensor.

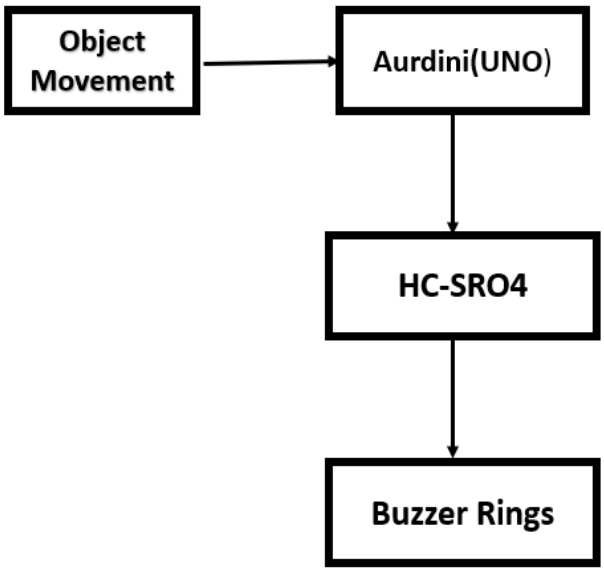
1.2 Tinkercad Simulation



1.3 Simple Circuit Code



1.4 Block Diagram



1.4 Conclusion

Social distance keeper using ultrasonic sensor and buzzer. As we know during this pandemic situation everyone should maintain social distance to fight with corona so this circuit will alert users if they come closer than 200cm and buzzer will ring.

Chapter 2 – Social Distancing Indicator using PIR Sensor and Bluetooth

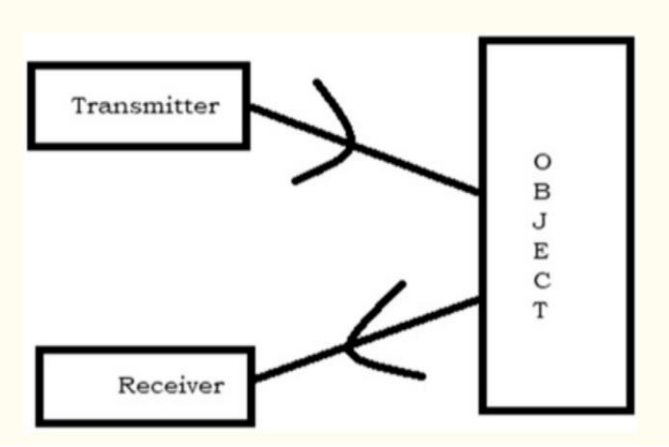
2.1 Social Distancing Indicator using PIR Sensor

2.1.1 Introduction

- PIR sensor interfaced with Arduino which will detect the human presence. If human presence will be there, then it will notify the individual through the audio message. Hence, the individual will be alerted and will maintain the social distancing at the public place also.

2.1.2 Working

PIR sensor works by detecting the presence of thermal energy in confined spaces. It calculates infrared light radiating from an object in its field of view. This is made up of a pyroelectric sensor that can detect different levels of radiation. When a temperature difference is detected by one of its beams, the sensor will be activated. When all the beam detects the same temperature again, the sensor will be deactivated.



2.1.3 Conclusion

By wearing this device, any person will come to know the presence of a human being nearby him/her. Due to that, it will be helpful to keep social distancing to avoid the spread of the COVID-19 virus.

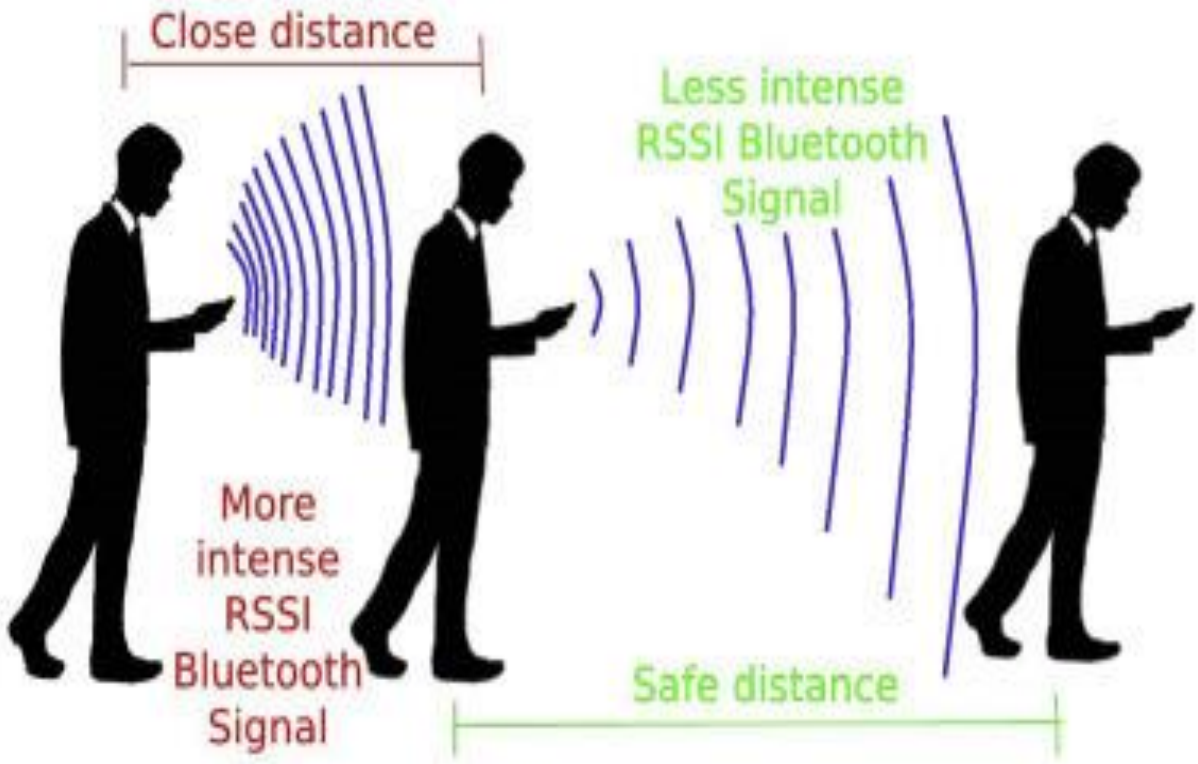
2.2 Social Distancing Indicator using Bluetooth

2.2.1 Introduction

Bluetooth is a short-range wireless technology standard that is used for exchanging data between fixed and mobile devices over short distances using UHF radio waves in the ISM bands, from 2.402 to 2.48 GHz, and building personal area networks. Bluetooth technology allows devices to communicate with each other without cables or wires. Bluetooth relies on short-range radio frequency, and any device that incorporates the technology can communicate as long as it is within the required distance.

2.2.2 Working

Bluetooth it is suitable for low consumption because its active energy use is less than 40 mW. Besides that, Bluetooth is cost effective, and has deployment flexibility. Bluetooth cannot handle efficiently Time of Arrival (ToA), or Time Difference of Arrival (TDoA) techniques because of its narrow band signals, so RSSI is the more reliable option. Since RSSI has an inversely proportional relationship to squared distance, different radio propagation models to estimate the distance between two nodes based on RSSI was used.



2.2.3 Conclusion

The aim of this research is to build an RSSI-based mobile application to comply with social distancing using Bluetooth signals from smartphones. We use Bluetooth technology to maintain the social distancing between two people.

Chapter 3 – Social Distancing Detector usind Deep Learning

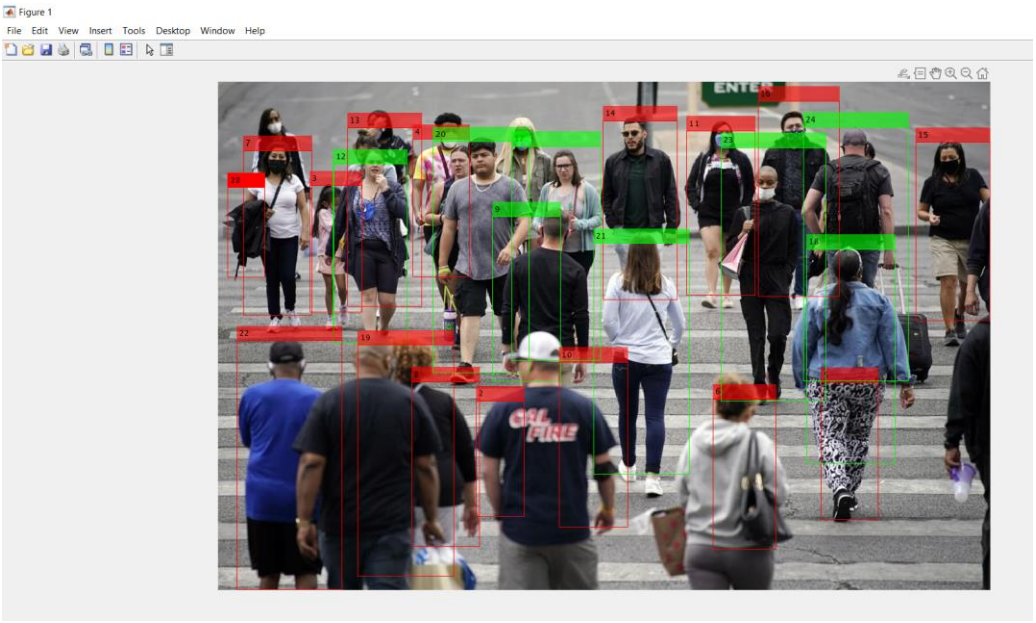
3.1 Introduction

The field of artificial intelligence is essentially when machines can do tasks that typically require human intelligence. It encompasses machine learning, where machines can learn by experience and acquire skills without human involvement. Deep learning is a subset of machine learning where artificial neural networks, algorithms inspired by the human brain, learn from large amounts of data.

The Main Components of this model are:

- Deep learning has gained more attention in object detection was used for human detection purposes.
- Develop a social distancing detection tool that can detect the distance between people to keep safe.
- Evaluation of the classification results by analyzing real-time video streams from the camera.

3.2 MATLAB Simulation



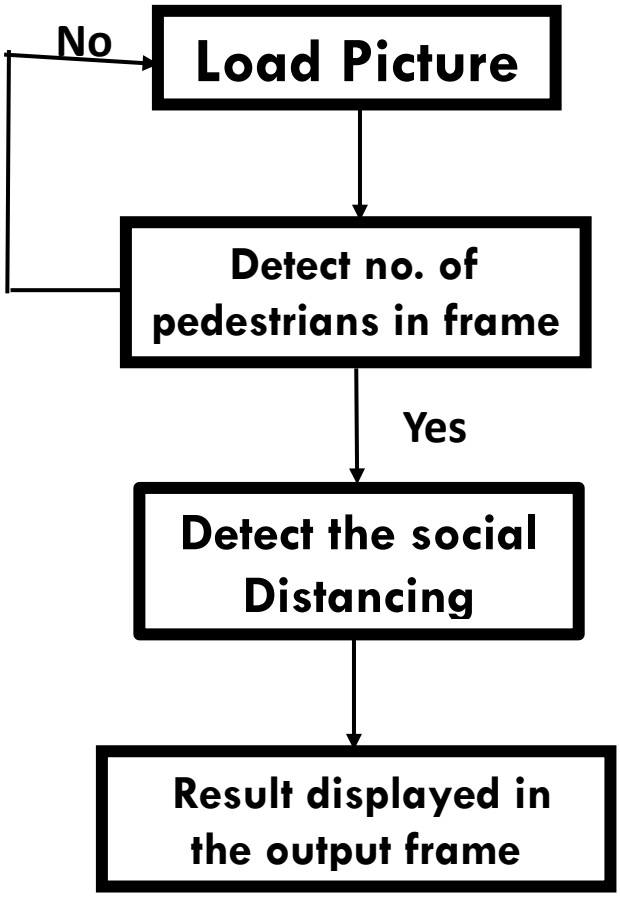
3.3 MATLAB Code

C: ▸ Users ▸ kannann ▸ AppData ▸ Local ▸ Temp ▸ Temp1_Code-FACE PARTS DETECTION USING MATLAB.zip

Editor - C:\Users\kannann\Documents\MATLAB\maskdetec.m *

```
1
2   detec = peopleDetectorACF();
3
4   I = imread(['pplwalking.jpg']);
5
6   [bboxes,scores]=detect(detec,I);
7
8   for i =2:size(bboxes,1)
9
10      d1_v = abs(bboxes(i,1)+bboxes(1,3)-bboxes(i,1));
11      d2_v = abs(bboxes(i,1)+bboxes(i,3)-bboxes(1,1));
12      d1_h = abs(bboxes(5,2)-bboxes(i,2));
13      d2_h = abs(bboxes(1,2)+bboxes(1,4)-bboxes(i,2)-bboxes(i,4));
14      if ((d1_v<200 | d2_v<200)&&(d1_h<100 | d2_h<100))
15          I = insertObjectAnnotation(I,'rectangle',bboxes(i,:),i,'color','red');
16          I = insertObjectAnnotation(I,'rectangle',bboxes(1,:),i,'color','red');
17      else
18          I = insertObjectAnnotation(I,'rectangle',bboxes(i,:),i,'color','green');
19      end
20  end
21  imshow(I)
22
```

3.4 Block Diagram



3.5 Conclusion

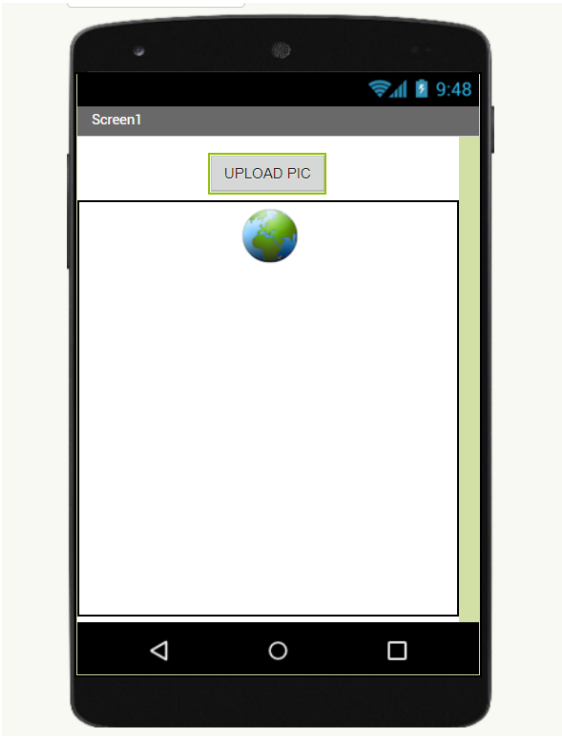
Deep learning has shown a research trend in multi class object recognition and detection in Artificial Intelligence has achieved outstanding performance on challenging datasets. We can tell if people are following social distancing or notes based on the red and green boxes drawn. It is also working on web cameras, CCTV, etc and can detect people in real-time. Helps authorities to redesign the layout of public places to take precautionary actions to mitigate high risk zone. It can be used in other fields also like autonomous vehicles, human action recognition, crowd analysis, etc.

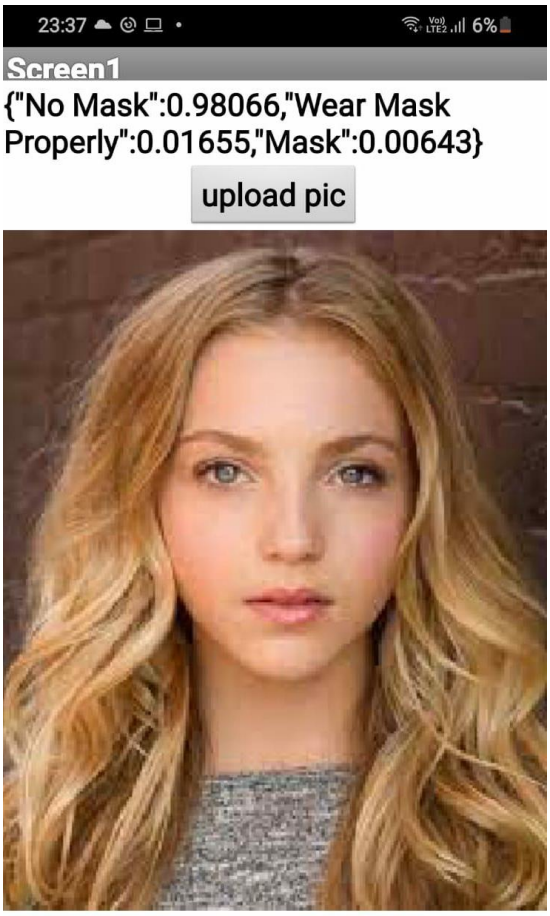
Chapter 4 – Mask Detection

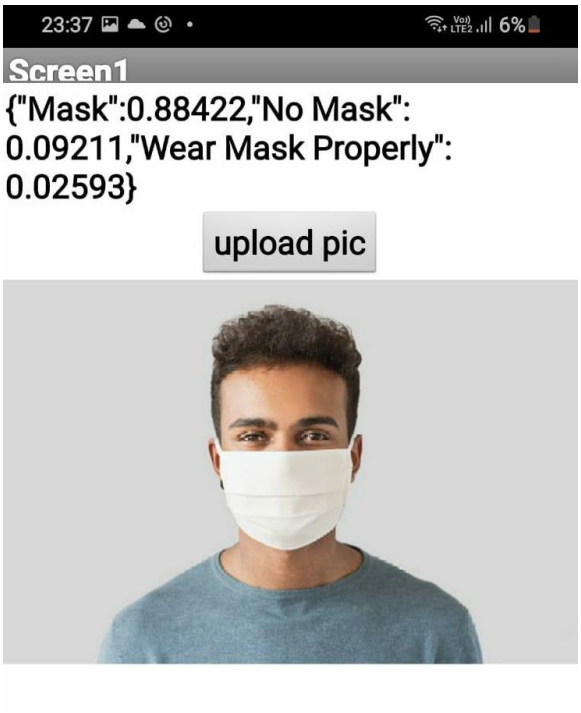
4.1 Introduction

Face mask detection refers to detect whether a person is wearing a mask or not. In fact, the problem is reverse engineering of face detection where the face is detected using different machine learning algorithms for the purpose of security, authentication, and surveillance. Face detection is a key area in the field of Computer Vision and Pattern Recognition.

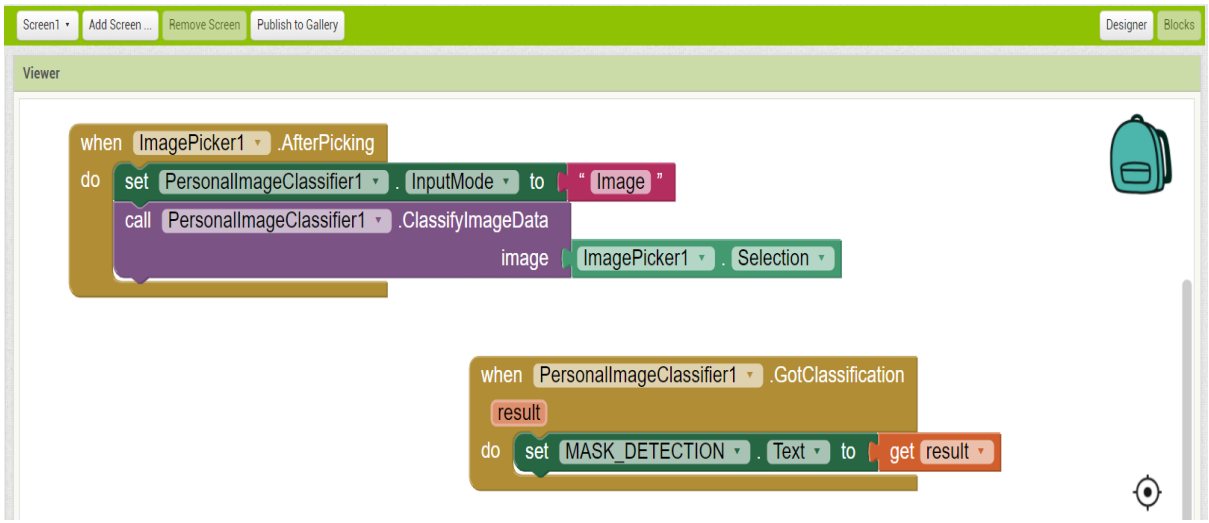
4.2 Sociald APP Output







4.3 Sociald APP Code



4.4 Algorithm of the APP

Frontend

- Click on the link given below to create this app.

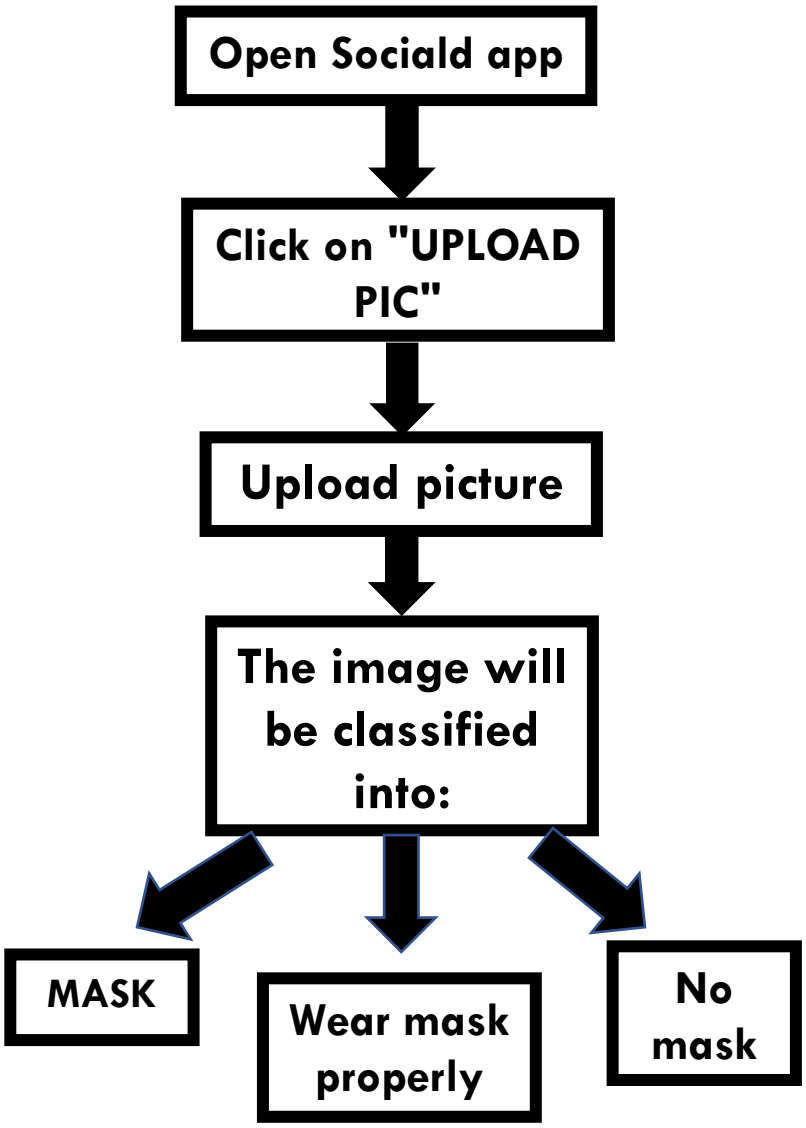
http://ai2.appinventor.mit.edu/

- Create a new project named "MASK DETECTION".
- Drag the 'button' option from 'user interface' (in palette), and drop it inside the mobile visual.
- Properties-> text-> UPLOAD PIC
- Media(palette)-> drag and drop image picker option.
- Drag and drop 'web viewer'.
- Download 'personal image classifier' from the link provided below and click on it.
- https://classifier.appinventor.mit.edu/oldpic/
- Categorise the pictures by adding labels as 'mask', 'no mask' and 'wear mask properly', then download the model (model.mdl).
- From extension, import 'personal image classifier1'. Drag and drop in the mobile visual. Change input mode to image and web viewer to web viewer1.
- Upload model.mdl in the model option.

Backend

- Build-> android app(.apk)
- Download MIT APP INVENTOR 2 in your android device.
- Scan the QR code that appears on your laptop from your android app.
- App will be downloaded and ready to use.

4.5 Block Diagram



4.6 Conclusion

Wearing a mask may be obligatory in the near future, considering the Covid-19 crisis. Many public service providers will ask the customers to wear masks correctly to avail of their services. The deployed model will contribute immensely to the public health care system. In future it can be extended to detect if a person is wearing the mask properly or not. The model can be further improved to detect if the mask is virus prone or not i.e. the type of the mask is surgical, N95 or not

Literature Survey

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