PROJECT REPORT

ROBOTICS AND AUTOMATION

TITLE:

Smart Robot with Facial Recognition Feature for Thermal Screening

GROUP MEMBERS:

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ABSTRACT:

We feel that robotics is an emerging field and it will be useful in all sectors be it electronics, medicine, household, sports, agriculture, etc.

We are ECE students, so this is a robot with a vision capable of scanning body temperature. Specially helpful in many places in this COVID-19 situation.

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AIM:

- The robot can measure the temperature of people contactless which will be really helpful in this COVID 19 Scenario

- The person detector can also be used to identify the patient's body temperature and take quick response according to the result

INTRODUCTION:

Face of an individual is a biometric trait that can be used in computer-based automatic security system for identification or authentication of that individual. While recognizing a face through a machine, the main challenge is to accurately match the input human face with the face image of the same person already stored in the face-database of the system. Not only the computer scientists, but the neuroscientists and psychologists are also taking their interests in the field of development and improvement of face recognition. Numerous applications of it relate mainly to the field of security. Having so many applications of this interesting area, there are challenges as well as pros and cons of the systems. Face image of a subject is the basic input of any face recognition system. Face images may be of different types like visual, thermal, sketch and fused images. A face recognition system suffers from some typical problems. Say for example, visual images result in poor performance with illumination variations, such as indoor and outdoor lighting conditions, low lighting, poses, aging, disguise etc. So, the main aim is to tackle all these problems to give an accurate automatic face recognition. These problems can be solved using thermal images and also using fused images of visual and thermal images. The image produced by employing fusion method provides the combined information of both the visual and thermal images and thus provides more detailed and reliable information which helps in constructing more efficient face recognition system. Objective of this chapter is to introduce the role of different IR spectrums, their applications, some interesting critical observations, available thermal databases, review works, some experimental results on thermal faces as well as on fused faces of visual and thermal face images in face recognition field; and finally sorting their

limitations out.

THERMAL FACE RECOGNITION:

Any typical face image is a complex pattern consisting of hair, forehead, eyebrow, eyes, nose, ears, cheeks, mouth, lips, philtrum, teeth, skin, and chin. Human face has other additional features like expression, appearance, adornments, beard, moustache etc. The face is the feature which best distinguishes a person, and there are "special" regions of the human brain, such as the fusiform face area (FFA), which when get damaged prevent the recognition of the faces of even intimate family members. The patterns of specific organs such as the eyes or parts thereof are used in biometric identification to uniquely identify individuals.

Thermal face recognition deals with the face recognition system that takes thermal face as an input. In preceding description, the concept of thermal images will be made clearer. Thermal human face images are generated due to the body heat pattern of the human being. Thermal Infra-Red (IR) imagery is independent of ambient lighting conditions as the thermal IR sensors only capture the heat pattern emitted by the object. Different objects emit different range of Infra-red energy according to their temperature and characteristics. The range of human face and body temperature nearly same and quite uniform, varying from 35.5°C to 37.5°C providing a consistent thermal signature. The thermal patterns of faces are derived primarily from the pattern of superficial blood vessels under the skin. The vein and tissue structure of the face is unique for each person and, therefore, the IR images are also unique.

MOTIVATION:

- Many new innovation in the field of Robotics is made to tackle the crisis of Covid 19.
- The small innovation may be helpful to detect some initial stage of problems and cause caution in the early stage only
- One of the main problem, contact lessness, may be solved by this small robot easily
- The robot can be modified and be used in various ways with some programming changes
- So overall the value of the project can be evolved with its modification

All of the thinking are motivating factors for us to make progress in this project

METHODOLOGY:

- 1st of all the Arduino will be programmed to recognize the face of a person
- After detecting the person the sensor will detect the temperature of the person
- The temperature will be shown in the screen
- The temperature will be detected below or above the caution level
- According to the danger the led lights glows and gives the signal.
- Thus the project will be accomplished

EXPECTED OUTCOME:

- The bot will be recognizing the person coming in front of the camera
- The bot will read the temperature of the person in front of the camera
- May be it can be designed as a detector by setting a temperature above which caution alert will be generated
- The bot will be helpful in both household as well as hospitals

HARDWARE /SOFTWARE DETAILS

- MLX90614
- Wires
- Web camera
- LED lights
- Display
- Arduino nano
- Breadboard

CODE

PYTHON CODE:

```
import numpy as np
import cv2
import serial
import time
import datetime
# Setting serial port to COM4 at bard rate of 9600
ser = serial.Serial('COM3',9600)
time.sleep(1)
face_cascade =
cv2.CascadeClassifier('data\haarcascade_frontalface_alt2.xml')

cap = cv2.VideoCapture(0)

while(True):
    #capture frame by frame
    # Read and record the data
    ret, frame = cap.read()
```

```
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)
    faces = face_cascade.detectMultiScale(gray,
scaleFactor=1.5, minNeighbors=5)
#(WORK ON HOW TO USE MORE NO OF HARCASCADE
AT SAME TIME)

    for (x,y,w,h) in faces:
        print(x,y,w,h)
        roi_gray = gray[y:y+h, x:x+w]
        roi_color = frame[y:y+h, x:x+w]

        #Recognize? Deep learning model



        img_item = "my-image_new.png"
        cv2.imwrite(img_item, roi_gray)

        color = (255,0,0)
        stroke = 2
        k=cv2.rectangle(frame,(x,y),(x+w,y+h),color,stroke)

        b = ser.readline()         # read a byte string
        string_n = b.decode()
        string=string_n.rstrip()

        cv2.putText(k, string, (x, y-10),
cv2.FONT_HERSHEY_SIMPLEX, 0.8, (200,255,12), 2)
        time.sleep(0.4)
```

```
        if np.any(k)==True:
            print(string)

    #Display the frame
    cv2.imshow('Frame',frame)



    if cv2.waitKey(20) & 0xFF == ord('q'):
        break

#when done release the capture
cap.release()
cv2.destroyAllWindows()
```

ARDUINO CODE:

```
#include <Wire.h>
#include <Adafruit_MLX90614.h>
Adafruit_MLX90614 mlx = Adafruit_MLX90614();
float data;

void setup() {
  Serial.begin(9600);
  //Serial.println("Adafruit MLX90614 test");
  mlx.begin();
  pinMode(6,OUTPUT);
  pinMode(7,OUTPUT);
}

void loop() {
```

```
  digitalWrite(6,LOW);
  digitalWrite(7,LOW);
data=mlx.readObjectTempC();
Serial.print(data);
if (data>37){Serial.println("*C CAUTION");
digitalWrite(6,HIGH); digitalWrite(7,LOW);}
else {Serial.println("*C SAFE"); digitalWrite(7,HIGH);
digitalWrite(6,LOW);}
Serial.println();
delay(500);}
```

RESULTS / PROJECT VIDEO:

https://drive.google.com/file/d/1h_Lk5s9ScuGe9ekwpEggTlrNKamhlxCf/view?usp=drivesdk

REFERANCES:

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-:THANK YOU:-