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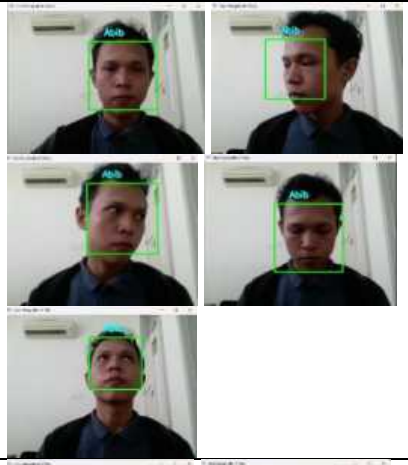
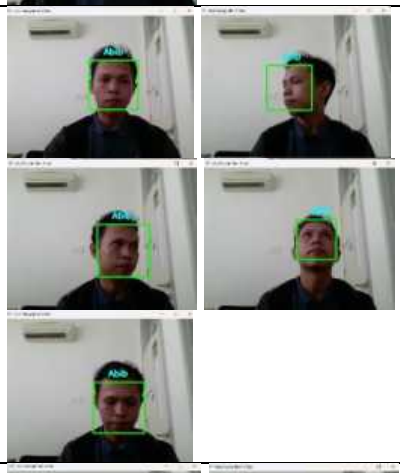
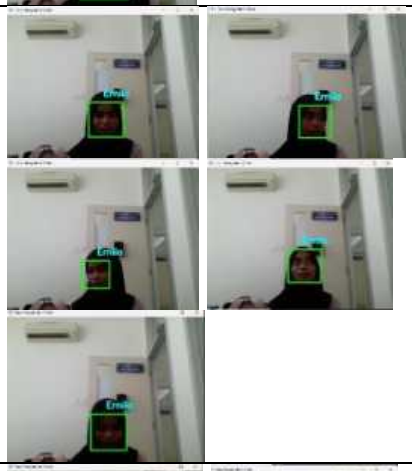
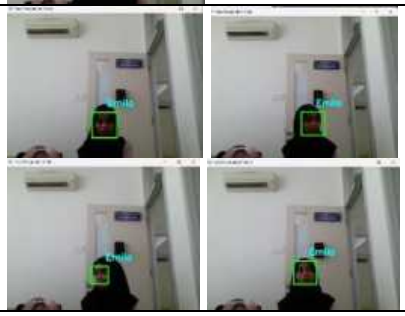
# LAMPIRAN

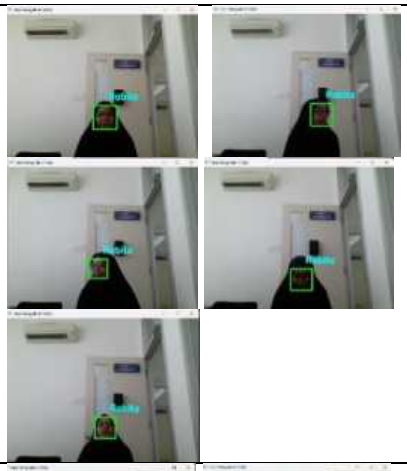
## LAMPIRAN 1 Jarak *face recognition* pada wajah yang terdaftar dalam *database*

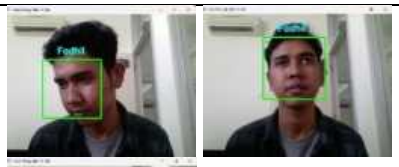
| No | Sampel | Jarak (cm) | Lampiran Foto |
|---|---|---|---|
| 1. | Abib | 30 |  |
| | | 50 |  |
| | | 70 |  |

| No | Sampel | Jarak (cm) | Lampiran Foto |
|---|---|---|---|
| | | 100 |  |
| 2. | Pati | 30 |  |
| | | 50 |  |
| | | 70 |  |
| | | 100 |  |
| 3. | Ernila | 30 |  |

| No | Sampel | Jarak (cm) | Lampiran Foto |
|---|---|---|---|
| | | |  |
| | | 50 |  |
| | | 70 |  |
| | | 100 |  |

| No | Sampel | Jarak (cm) | Lampiran Foto |
|---|---|---|---|
| | | |  |
| 4. | Rabita | 30 |      |
| | | 50 |      |
| | | 70 |      |

| No | Sampel | Jarak (cm) | Lampiran Foto |
|---|---|---|---|
| | | 100 |  |
| 5. | Yuar | 30 |  |
| | | 50 |  |
| | | 70 |  |
| | | 100 |  |
| 6. | Fadhil | 30 |  |

| No | Sampel | Jarak (cm) | Lampiran Foto |
|---|---|---|---|
| | | |   |
| | | 50 |  |
| | | 70 |  |
| | | 100 |  |

**LAMPIRAN 2 Jarak *face recognition* pada wajah yang tidak terdaftar dalam *database***

| No | Sampel | Lampiran Foto |
|---|---|---|
| 1. | Yusuf |   |
| 2. | Kholik |   |

| | | |
|---|---|---|
| 3. | Regita |   |

## LAMPIRAN 3 Program Code

### 1. Kode program untuk modul kamera ESP32 CAM

```
#include "esp_camera.h"
#include <WiFi.h>

//
// WARNING!!! PSRAM IC required for UXGA resolution and high JPEG quality
//            Ensure ESP32 Wrover Module or other board with PSRAM is selected
//            Partial images will be transmitted if image exceeds buffer size
//

// Select camera model
//#define CAMERA_MODEL_WROVER_KIT // Has PSRAM
//#define CAMERA_MODEL_ESP_EYE // Has PSRAM
//#define CAMERA_MODEL_M5STACK_PSRAM // Has PSRAM
//#define CAMERA_MODEL_M5STACK_V2_PSRAM // M5Camera version B Has PSRAM
//#define CAMERA_MODEL_M5STACK_WIDE // Has PSRAM
//#define CAMERA_MODEL_M5STACK_ESP32CAM // No PSRAM
#define CAMERA_MODEL_AI_THINKER // Has PSRAM
//#define CAMERA_MODEL_TTGO_T_JOURNAL // No PSRAM

#include "camera_pins.h"

const char* ssid = "Patioo";
const char* password = "patirzky_17";

void startCameraServer();

void setup() {
  Serial.begin(115200);
        setDebugOutput(true);
        println();

        a_config_t config;
```

```
  config.ledc_channel = LEDC_CHANNEL_0;
  config.ledc_timer = LEDC_TIMER_0;
  config.pin_d0 = Y2_GPIO_NUM;
  config.pin_d1 = Y3_GPIO_NUM;
  config.pin_d2 = Y4_GPIO_NUM;
  config.pin_d3 = Y5_GPIO_NUM;
  config.pin_d4 = Y6_GPIO_NUM;
  config.pin_d5 = Y7_GPIO_NUM;
  config.pin_d6 = Y8_GPIO_NUM;
  config.pin_d7 = Y9_GPIO_NUM;
  config.pin_xclk = XCLK_GPIO_NUM;
  config.pin_pclk = PCLK_GPIO_NUM;
  config.pin_vsync = VSYNC_GPIO_NUM;
  config.pin_href = HREF_GPIO_NUM;
  config.pin_sscb_sda = SIOD_GPIO_NUM;
  config.pin_sscb_scl = SIOC_GPIO_NUM;
  config.pin_pwdn = PWDN_GPIO_NUM;
  config.pin_reset = RESET_GPIO_NUM;
  config.xclk_freq_hz = 20000000;
  config.pixel_format = PIXFORMAT_JPEG;

  // if PSRAM IC present, init with UXGA resolution and higher JPEG quality
  //                     for larger pre-allocated frame buffer.
  if(psramFound()){
    config.frame_size = FRAMESIZE_UXGA;
    config.jpeg_quality = 10;
    config.fb_count = 2;
  } else {
    config.frame_size = FRAMESIZE_SVGA;
    config.jpeg_quality = 12;
    config.fb_count = 1;
  }

#if defined(CAMERA_MODEL_ESP_EYE)
  pinMode(13, INPUT_PULLUP);
  pinMode(14, INPUT_PULLUP);
#endif

  // camera init
  esp_err_t err = esp_camera_init(&config);
  if (err != ESP_OK) {
    Serial.printf("Camera init failed with error 0x%x", err);
          ı;



          _t * s = esp_camera_sensor_get();
```

```
  // initial sensors are flipped vertically and colors are a bit saturated
  if (s->id.PID == OV3660_PID) {
    s->set_vflip(s, 1); // flip it back
    s->set_brightness(s, 1); // up the brightness just a bit
    s->set_saturation(s, -2); // lower the saturation
  }
  // drop down frame size for higher initial frame rate
  s->set_framesize(s, FRAMESIZE_QVGA);

#if defined(CAMERA_MODEL_M5STACK_WIDE) ||
defined(CAMERA_MODEL_M5STACK_ESP32CAM)
  s->set_vflip(s, 1);
  s->set_hmirror(s, 1);
#endif

  WiFi.begin(ssid, password);

  while (WiFi.status() != WL_CONNECTED) {
    delay(500);
    Serial.print(".");
  }
  Serial.println("");
  Serial.println("WiFi connected");

  startCameraServer();

  Serial.print("Camera Ready! Use 'http://");
  Serial.print(WiFi.localIP());
  Serial.println("' to connect");
}

void loop() {
  // put your main code here, to run repeatedly:
  delay(10000);
}
```

## 2. Kode untuk *training* wajah *database* (LPBH)

```
import cv2
import os
import numpy as np

    name = 'CobaData'
    scade_file = 'Cascade Classifier/haarcascade_frontalface_default.xml'
    scade = cv2.CascadeClassifier(face_cascade_file)
```

```
total_images = 5
counter = 1
ids = 1

cam = cv2.VideoCapture(0)                                   # Akses Kamera
while True:
   ret, frame = cam.read()                                  # Membaca setiap frame dari stream
kamera
   frame_copy = frame.copy()                                # Copy frame
   gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)           # Mengubah mode BGR
ke GRAY (hitam putih)

                                                # Proses pencarian wajah
   faces = face_cascade.detectMultiScale(gray, 1.3, 3)      #
<cascade_file>.detectMultiScale(<frame>, <scale_factor>, <min_neighbors>)
   for x, y, w, h in faces:                                 # Looping semua wajah yang terdeteksi
      cv2.rectangle(frame, (x, y), (x+w, y+h), (0, 255, 0), 3)    # Gambar box untuk setiap wajah

      if cv2.waitKey(1) & 0xff == ord('c'):                 # Menunggu tombol c di tekan
         roi_face = frame_copy[y:y+h, x:x+w]                # region of interest dari frame
         cv2.imwrite(f'{folder_name}/wajah.{ids}.{counter}.jpg',# write region wajah
                  roi_face)
         gray_face = gray[y:y+h, x:x+w]                     # region of interest dari frame
         cv2.imwrite(f'{folder_name}/wajah_gray.{ids}.{counter}.jpg',# write region wajah
                  gray_face)
         counter += 1
         if counter > total_images:
            print(f'[INFO] {total_images} IMAGE CAPTURED!')     # info done proses

   cv2.imshow('Face Detect Video', frame)                   # Jendela untuk menampilkan hasil

   if cv2.waitKey(1) & 0xff == ord('x'):                    # Exit dengan tombol x
      break

cam.release()                                               # Menyudahi akses kamera
cv2.destroyAllWindows()                                     # Menutup jendela

recognizer = cv2.face.LBPHFaceRecognizer_create()           # Create recognizer object
images = os.listdir(folder_name)                            # List semua path data wajah pada
folder train data

image_arrays = []                                           # Container semua array data wajah
image_ids = []                                              # Container semua ID data wajah
for image_path in images:                                   # Looping semua path data wajah
   if not image_path.startswith('.'):                       # Pengecualian untuk file yang dimulai
dengan "."
      splitted_path = image_path.split('.')
      print(splitted_path)
      image_id = int(splitted_path[1])
      image = cv2.imread(os.path.join(folder_name, image_path))
      image = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)

      age_array = np.array(image, 'uint8')                  # Ambil array data wajah

      age_arrays.append(image_array)                        # Store array data wajah ke
      tainer
      age_ids.append(image_id)                              # Store ID data wajah ke
```

```
list/container

recognizer.train(image_arrays, np.array(image_ids))          # Train recognizer
recognizer.save('recognizer/faces_data.yml')                 # Save model recognizer
print('[INFO] TRAIN RECOGNIZER SUCCESS!')

recognizer.read('recognizer/faces_data.yml')                 # Load recognizer
font = cv2.FONT_HERSHEY_SIMPLEX                              # Specify jenis font dari
OpenCV

known_names = ['Yuar', 'Ernila', 'Rabita', 'Rehan', 'Abib', 'Pati', 'Fadhlan'] # List untuk nama
yang ada di model

cam = cv2.VideoCapture(0)                                    # Akses Kamera
while True:
    ret, frame = cam.read()                                  # Membaca setiap frame dari stream
kamera
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)           # Mengubah mode BGR
ke GRAY (hitam putih)

                                                 # Proses pencarian wajah
    faces = face_cascade.detectMultiScale(gray, 1.3, 3)      #
<cascade_file>.detectMultiScale(<frame>, <scale_factor>, <min_neighbors>)
    for x, y, w, h in faces:                                 # Looping semua wajah yang terdeteksi
        cv2.rectangle(frame, (x, y), (x+w, y+h), (0, 255, 0), 3)    # Gambar box untuk setiap wajah

        roi_gray = gray[y:y+h, x:x+w]
        ids, dist = recognizer.predict(roi_gray)             # Prediksi wajah siapoa
        cv2.putText(frame, f'{known_names[ids-1]}',
                    (x+50, y-20), font, 1 ,(255, 255, 0), 3)        # Menaruh text pada frame


    cv2.imshow('Face Recognition Video', frame)              # Jendela untuk menampilkan
hasil

    if cv2.waitKey(1) & 0xff == ord('x'):                    # Exit dengan tombol x
        break

cam.release()                                                # Menyudahi akses kamera
cv2.destroyAllWindows()
```

### 3. Kode program untuk *face recognition*

```
from flask import Flask, render_template, Response
import cv2
import requests

app = Flask(__name__)
global_name = "unknown"
stream_url = "http://192.168.18.210:81/stream"
api_endpoint = "http://telcomlaboratoryunhas.com/api/iot-input"  # Replace this with your API
                ndpoint

                l_name_to_api(name):
                pare data to send to the API
```

```
    data = {
        "mac": "7A-EC-20-97-FF-9E",
        "value": name
    }

    try:
        # Send a POST request to the API endpoint
        response = requests.post(api_endpoint, json=data)

        # Check if the request was successful
        if response.status_code == 200:
            print("Name sent successfully to API")
        else:
            print(f"Failed to send name to API. Status code: {response.status_code}")
            print("Response content:", response.content)
    except Exception as e:
        print("Error sending name to API:", e)

def gen_frames():
    face_cascade_file = 'Cascade Classifier/haarcascade_frontalface_default.xml'
    face_cascade = cv2.CascadeClassifier(face_cascade_file)
    recognizer = cv2.face.LBPHFaceRecognizer_create()
    recognizer.read('recognizer/faces_data.yml')                    # Load recognizer
    font = cv2.FONT_HERSHEY_SIMPLEX

    known_names = ['Yuar', 'Ernila', 'Rabita', 'Rehan', 'Abib', 'Pati', 'Fadhil']
        # List untuk nama yang ada di model

    cam = cv2.VideoCapture(stream_url)                                  # Akses Kamera
    name_sent = False  # Flag to track whether the name has been sent to the API
    while True:
        ret, frame = cam.read()                                 # Membaca setiap frame dari stream
          kamera
        gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)              # Mengubah mode
          BGR ke GRAY (hitam putih)

        # Proses pencarian wajah
        faces = face_cascade.detectMultiScale(gray, 1.3, 3)          #
          <cascade_file>.detectMultiScale(<frame>, <scale_factor>, <min_neighbors>)
        for x, y, w, h in faces:                                # Looping semua wajah yang terdeteksi
            cv2.rectangle(frame, (x, y), (x+w, y+h), (0, 255, 0), 3)    # Gambar box untuk setiap
          wajah

            roi_gray = gray[y:y+h, x:x+w]
            ids, dist = recognizer.predict(roi_gray)                # Prediksi wajah siapoa
            name = known_names[ids-1]
            cv2.putText(frame, f'{name}',
                        (x-20, y-20), font, 1 ,(255, 255, 0), 3)        # Menaruh text pada frame

            if not name_sent:
                send_name_to_api(name)  # Send detected name to API
                name_sent = True  # Set flag to True to indicate that the name has been sent

            2.imshow('Face Recognition Video', frame)                # Jendela untuk menampilkan
            asil

            y = cv2.waitKey(1) & 0xFF
```

```
        if key == ord('x'):                    # Exit dengan tombol x
            break
        elif key == ord('r'):                  # Press 'r' to resend the name to API
            name_sent = False  # Reset the flag to allow resending the name

    cam.release()                                          # Menyudahi akses kamera
    cv2.destroyAllWindows()

gen_frames()


if __name__ == "__main__":
    app.run(debug=True)
```

## 4. Kode program RFID Reader dan pembukaan pintu

```
#include <SPI.h>
#include <MFRC522.h>
#include <ESP8266WiFi.h>
#include <ESP8266HTTPClient.h>
#include <WiFiClient.h>
#include <ArduinoJson.h>  // Untuk mengurai JSON
#include <WiFiManager.h>
#define LED_STDBY 4  // led standby
#define LED_FALSE 5  // led False
#define LED_TRUE 15  // led true
#define RST_PIN D1
#define SDA_PIN D2
#define relay D4


const char* ssid = "Lorbaks";
const char* password = "Lorbax19";
const char* serverUrl = "http://telcomlaboratoryunhas.com/api/iot-input";  // Replace with
your server URL
const char* WebURL = "https://telcomlaboratoryunhas.com/api/commands";
const char* mac_system;  // dari giga 98-29-A6-93-3C-BB
//const int relay = 13;
String key = "{\"message\":\""
             "0"
             "\"}";
String idMac;
int id_new = 0;
short perintah = 3;
unsigned long previousMillis = 0;  // Waktu sebelumnya
          ong interval = 1000;     // Interval waktu (1 detik)
          ! mfrc522(SDA_PIN, RST_PIN);


          () {
```

```
  Serial.begin(115200);
  Serial.println();
  WiFi.begin(ssid, password);
  Serial.println(WiFi.macAddress());
  idMac = WiFi.macAddress();

  WiFiManager wifiManager;
  wifiManager.autoConnect("Lorbaks", "Lorbax19");  // "ESP8266-AP" adalah nama AP
WiFi yang akan dibuat jika gagal terhubung ke WiFi sebelumnya
  Serial.println("Terhubung ke jaringan WiFi!");
  Serial.print("SSID: ");
  Serial.println(WiFi.SSID());

  pinMode(LED_STDBY, OUTPUT);
  pinMode(LED_FALSE, OUTPUT);
  pinMode(LED_TRUE, OUTPUT);
  pinMode(relay, OUTPUT);
  SPI.begin();
  mfrc522.PCD_Init();
  Serial.println("Dekatkan Kartu RFID Anda ke Reader");
  Serial.println();
  digitalWrite(LED_STDBY, HIGH);
  digitalWrite(LED_FALSE, LOW);
  digitalWrite(LED_TRUE, LOW);
  //digitalWrite(relay, LOW);
}


void loop() {
  while (WiFi.status() != WL_CONNECTED) {
    delay(1000);
    Serial.println("Connecting to WiFi...");
  }
  unsigned long currentMillis = millis();
  unsigned long currentMicros = micros();  // Waktu mikrodetik saat ini
  if (currentMillis - previousMillis >= interval) {
    web();
    previousMillis = currentMillis;
  }

  // if (currentMicros - previousMicros >= intervalMicros) {
  if (mfrc522.PICC_IsNewCardPresent() && mfrc522.PICC_ReadCardSerial()) {
            ();

            ɔusMicros = currentMicros;
```

```
  switch (perintah) {
    case 1:
      digitalWrite(LED_STDBY, LOW);
      digitalWrite(LED_FALSE, LOW);
      digitalWrite(LED_TRUE, HIGH);
      Serial.println("1");
      digitalWrite(relay, HIGH);
      Serial.println("Pintu Terbuka");
      delay(10000);

      digitalWrite(LED_STDBY, HIGH);
      digitalWrite(LED_FALSE, LOW);
      digitalWrite(LED_TRUE, LOW);
      perintah = 0;
      digitalWrite(relay, LOW);
      break;

    case 2:
      digitalWrite(LED_STDBY, LOW);
      digitalWrite(LED_FALSE, HIGH);
      digitalWrite(LED_TRUE, LOW);
      Serial.println("2");
      delay(500);
      digitalWrite(LED_STDBY, HIGH);
      digitalWrite(LED_FALSE, LOW);
      digitalWrite(LED_TRUE, LOW);
      perintah = 0;
      break;

  }
}

void web() {
  WiFiClient client;
  HTTPClient http;
  http.begin(client, WebURL);

  // Mengeksekusi permintaan dan menyimpan hasil
  int httpCode = http.GET();
  if (httpCode == 200) {
    if (httpCode == HTTP_CODE_OK) {
          payload = http.getString();
          println("Data JSON diterima:");
          println(payload);
```

```
    // Mengurai data JSON
    DynamicJsonDocument doc(1024);  // Ubah sesuai kebutuhan
    deserializeJson(doc, payload);

    // Memeriksa setiap objek dalam JSON
    JsonArray data = doc.as<JsonArray>();
    for (JsonObject item : data) {
      int id = item["id"];
      String mac = item["mac"];
      String status = item["status"];
      // Menampilkan data per ID
      // Serial.println("ID: " + String(id));
      // Serial.println("MAC: " + mac);
      // Serial.println("Status: " + status);
      // Serial.println();

      // Melakukan sesuatu dengan data yang diambil
      if (id > id_new) {
        if (mac == idMac) {
          if (status == "0") {
            Serial.println("terbuka");
            perintah = 2;
          }
          if (status == "1") {
            Serial.println("id salah");
            perintah = 1;
          }
        }
        id_new = id;
      }
    }
  }
 } else {
  Serial.println("Gagal mengambil data dari endpoint.");
 }
 Serial.println(id_new);

 http.end();
 client.stop();
}

void kirimid() {
        nt client;
        ient http;
        n(client, serverUrl);
        nt("UID tag :");
```

```
  String rfid = "";
  for (byte i = 0; i < mfrc522.uid.size; i++) {
    rfid += mfrc522.uid.uidByte[i];
  }
  Serial.println(rfid);
  http.addHeader("Content-Type", "application/json");
  String mac = "6E-1B-ED-BE-13-B3";
  String postData = "{\"mac\":\"" + mac + "\",\"value\":\"" + rfid + "\"}";
  int httpResponseCode = http.POST(postData);
  delay(1000);
  String response = http.getString();
  Serial.println("Response: " + response);
  Serial.println("HTTP Response code: " + String(httpResponseCode));
  if (httpResponseCode == 200) {
    perintah = 1;
  } else if (httpResponseCode == 400) {
    perintah = 2;
  }
  http.end();
  client.stop();
}
```

**5. Kode program untuk website**

Kode program dapat diakse pada pada link https://github.com/agthm3/website-face