

## LAMPIRAN

```
#include "esp_camera.h"
#include "esp_timer.h"
#include "img_converters.h"
#include "Arduino.h"
#include "fb_gfx.h"
#include "soc/soc.h"          // disable brownout problems
#include "soc/rtc_cntl_reg.h" // disable brownout problems
#include "esp_http_server.h"
#include <WiFi.h>
// Telegram
#include <WiFiClientSecure.h>
#include <UniversalTelegramBot.h>
#include <ArduinoJson.h>

// GPS
#include <SoftwareSerial.h>
#include <TinyGPS++.h>

// Replace with your network credentials
const char* ssid = "Sn";
const char* password = "0987654321";

// Initialize Telegram BOT
String BOTtoken =
"6700497583:AAGS8pRsvPhD9JNQ3BZ9PbkAYxRRz8Gs3vs"; // Replace
with your Bot Token
String CHAT_ID = "1133606550"; // Replace with your Chat ID

// GPS Module
```

```
SoftwareSerial gpsSerial(13, 15); // RX, TX (ESP32 GPIO13 and GPIO15)
TinyGPSPlus gps;

// Buzzer
#define BUZZER_PIN 12
//FLASH
#define FLASH_LED_PIN 4
bool flashState = LOW;

WiFiClientSecure clientTCP;
UniversalTelegramBot bot(BOTtoken, clientTCP);

bool sendPhoto = false;
bool buzzerState = LOW;
bool welcomeMessageSent = false; // Variable to track if the welcome message
has been sent

int botRequestDelay = 1000;
unsigned long lastTimeBotRan;
// Function Declaration
String getGPSLocation();
void triggerBuzzer();

// Camera configuration
#define CAMERA_MODEL_AI_THINKER
#include "camera_pins.h"

#define PART_BOUNDARY "1234567890000000000000987654321"

#define CAMERA_MODEL_AI_THINKER
```

```

// Konfigurasi pin kamera
#define PWDN_GPIO_NUM 32
#define RESET_GPIO_NUM -1
#define XCLK_GPIO_NUM 0
#define SIOD_GPIO_NUM 26
#define SIOC_GPIO_NUM 27

#define Y9_GPIO_NUM 35
#define Y8_GPIO_NUM 34
#define Y7_GPIO_NUM 39
#define Y6_GPIO_NUM 36
#define Y5_GPIO_NUM 21
#define Y4_GPIO_NUM 19
#define Y3_GPIO_NUM 18
#define Y2_GPIO_NUM 5
#define VSYNC_GPIO_NUM 25
#define HREF_GPIO_NUM 23
#define PCLK_GPIO_NUM 22

#define _STREAM_CONTENT_TYPE "multipart/x-mixed-replace; boundary="
PART_BOUNDARY
#define _STREAM_PART "Content-Type: image/jpeg\r\nContent-
Length: %u\r\n\r\n"
#define _STREAM_BOUNDARY "--" PART_BOUNDARY "\r\n"

httpd_handle_t camera_httpd = NULL;
httpd_handle_t stream_httpd = NULL;

static const char PROGMEM INDEX_HTML[] = R"rawliteral(
<html>
<head>

```

```
<title>CCTV SMARTHOME</title>
<meta name="viewport" content="width=device-width, initial-scale=1">
<style>
  body { font-family: Arial; text-align: center; margin:0px auto; padding-top:
30px;}
  table { margin-left: auto; margin-right: auto; }
  td { padding: 8 px; }
  .button {
    background-color: #2f4468;
    border: none;
    color: white;
    padding: 10px 20px;
    text-align: center;
    text-decoration: none;
    display: inline-block;
    font-size: 18px;
    margin: 6px 3px;
    cursor: pointer;
    -webkit-touch-callout: none;
    -webkit-user-select: none;
    -khtml-user-select: none;
    -moz-user-select: none;
    -ms-user-select: none;
    user-select: none;
    -webkit-tap-highlight-color: rgba(0,0,0,0);
  }
  img { width: auto ;
    max-width: 100% ;
    height: auto ;
  }
</style>
```

```

</head>
<body>
  <h1>CCTV SMARTHOME</h1>
  
</body>
</html>

```

```
)rawliteral";
```

```
// Handler untuk halaman utama
```

```
static esp_err_t index_handler(httpd_req_t *req) {
  httpd_resp_set_type(req, "text/html");
  return httpd_resp_send(req, (const char *)INDEX_HTML,
    strlen(INDEX_HTML));
}
```

```
// Handler untuk streaming kamera
```

```
static esp_err_t stream_handler(httpd_req_t *req) {
  camera_fb_t * fb = NULL;
  esp_err_t res = ESP_OK;
  size_t _jpg_buf_len = 0;
  uint8_t * _jpg_buf = NULL;
  char * part_buf[64];

  res = httpd_resp_set_type(req, _STREAM_CONTENT_TYPE);
  if (res != ESP_OK) {
    return res;
  }
}
```

```
while (true) {
  fb = esp_camera_fb_get();
  if (!fb) {
    Serial.println("Camera capture failed");
  }
}
```

```

    res = ESP_FAIL;
} else {
    if (fb->width > 400) {
        if (fb->format != PIXFORMAT_JPEG) {
            bool jpeg_converted = frame2jpg(fb, 80, &_jpg_buf, &_jpg_buf_len);
            esp_camera_fb_return(fb);
            fb = NULL;
            if (!jpeg_converted) {
                Serial.println("JPEG compression failed");
                res = ESP_FAIL;
            }
        } else {
            _jpg_buf_len = fb->len;
            _jpg_buf = fb->buf;
        }
    }
}
if (res == ESP_OK) {
    size_t hlen = snprintf((char *)part_buf, 64, _STREAM_PART, _jpg_buf_len);
    res = httpd_resp_send_chunk(req, (const char *)part_buf, hlen);
}
if (res == ESP_OK) {
    res = httpd_resp_send_chunk(req, (const char *)_jpg_buf, _jpg_buf_len);
}
if (res == ESP_OK) {
    res = httpd_resp_send_chunk(req, _STREAM_BOUNDARY,
strlen(_STREAM_BOUNDARY));
}
if (fb) {
    esp_camera_fb_return(fb);
    fb = NULL;
}

```

```

    _jpg_buf = NULL;
} else if (_jpg_buf) {
    free(_jpg_buf);
    _jpg_buf = NULL;
}
if (res != ESP_OK) {
    break;
}
}
return res;
}
// Handler untuk perintah
esp_err_t cmd_handler(httpd_req_t *req) {
    char* buf;
    size_t buf_len;
    int ret;

    buf_len = httpd_req_get_url_query_len(req) + 1;
    if (buf_len > 1) {
        buf = (char*)malloc(buf_len);
        if (!buf) {
            httpd_resp_send_500(req);
            return ESP_FAIL;
        }
        if (httpd_req_get_url_query_str(req, buf, buf_len) == ESP_OK) {
            if (httpd_query_key_value(buf, "cmd", buf, buf_len) == ESP_OK) {
                if (strcmp(buf, "location") == 0) {
                    // Logika untuk mendapatkan lokasi GPS
                    String location = getGPSLocation();
                    httpd_resp_send(req, location.c_str(),
HTTPD_RESP_USE_STRLEN);

```

```

        } else if (strcmp(buf, "alert") == 0) {
            // Logika untuk mengaktifkan buzzer
            triggerBuzzer();
            httpd_resp_send(req, "Buzzer activated",
HTTPD_RESP_USE_STRLEN);
        } else {
            httpd_resp_send_404(req);
        }
    } else {
        httpd_resp_send_404(req);
    }
} else {
    httpd_resp_send_500(req);
}
free(buf);
} else {
    httpd_resp_send_404(req);
}
return ESP_OK;
}

// Memulai server kamera
void startCameraServer() {
    httpd_config_t config = HTTPD_DEFAULT_CONFIG();
    config.server_port = 80;

    httpd_uri_t index_uri = {
        .uri      = "/",
        .method   = HTTP_GET,
        .handler  = index_handler,
        .user_ctx = NULL
    }

```

```
};
```

```
httpd_uri_t stream_uri = {  
    .uri      = "/stream",  
    .method   = HTTP_GET,  
    .handler  = stream_handler,  
    .user_ctx = NULL  
};
```

```
httpd_uri_t cmd_uri = {  
    .uri      = "/action",  
    .method   = HTTP_GET,  
    .handler  = cmd_handler,  
    .user_ctx = NULL  
};
```

```
if (httpd_start(&camera_httpd, &config) == ESP_OK) {  
    Serial.println("Registering index URI");  
    httpd_register_uri_handler(camera_httpd, &index_uri);  
    Serial.println("Index URI registered");  
  
    Serial.println("Registering cmd URI");  
    httpd_register_uri_handler(camera_httpd, &cmd_uri);  
    Serial.println("Cmd URI registered");  
  
    Serial.println("Registering stream URI");  
    httpd_register_uri_handler(camera_httpd, &stream_uri);  
    Serial.println("Stream URI registered");  
}  
config.server_port += 1;
```

```

config.ctrl_port += 1;

if (httpd_start(&stream_httpd, &config) == ESP_OK) {
    httpd_register_uri_handler(stream_httpd, &stream_uri);
}
}

void triggerBuzzer() {
    tone(BUZZER_PIN, 2000); // Start buzzer with 1000 Hz frequency
    delay(5000);           // Keep the buzzer on for 1 second
    noTone(BUZZER_PIN);   // Stop the buzzer
}

String getGPSLocation() {
    String latitude, longitude;
    while (gpsSerial.available() > 0) {
        char c = gpsSerial.read();
        Serial.print(c); // Debug: Cetak karakter yang dibaca
        gps.encode(c);
        if (gps.location.isUpdated()) {
            latitude = String(gps.location.lat(), 6);
            longitude = String(gps.location.lng(), 6);
            break;
        }
    }
}

if (latitude.length() > 0 && longitude.length() > 0) {
    String locationURL = "https://www.google.com/maps?q=" + latitude + "," +
longitude;
    Serial.println("Location: " + locationURL); // Debug: Cetak URL lokasi
    return locationURL;
}

```

```

    } else {
        return "Unable to get GPS location.";
    }
}

// Fungsi untuk mengirim pesan Telegram dengan keyboard
void sendMenu(String chat_id) {
    String welcome = "Selamat datang di CHATBOT GPS TRACKER!\n";
    welcome += "Silakan pilih perintah dari menu di bawah:\n";

    // Membuat custom keyboard
    String keyboardJson = F("[[\"  Ambil Foto\"],[\"  Lokasi GPS\"],[\"
Aktifkan Buzzer\"],[\"  Toggle Flash\"]]");
    bot.sendMessageWithReplyKeyboard(chat_id, welcome, "", keyboardJson, true);
}

void handleNewMessages(int numNewMessages) {
    for (int i = 0; i < numNewMessages; i++) {
        String chat_id = String(bot.messages[i].chat_id);
        String text = bot.messages[i].text;
        String from_name = bot.messages[i].from_name;
        if (from_name == "") from_name = "Guest";

        // Menangani perintah dari pengguna
        if (text == "/start") {
            sendMenu(chat_id);
        } else if (text == "  Ambil Foto") {
            sendPhoto = true;
            bot.sendMessage(chat_id, "Mengambil foto...", "");
        } else if (text == "  Lokasi GPS") {
            String location = getGPSLocation();
            bot.sendMessage(chat_id, location, "");
        }
    }
}

```

```

    Serial.println("Sent location: " + location);
} else if (text == "  Aktifkan Buzzer") {
    triggerBuzzer();
    bot.sendMessage(chat_id, "Buzzer diaktifkan.", "");
} else if (text == "  Toggle Flash") {
    flashState = !flashState;
    digitalWrite(FLASH_LED_PIN, flashState);
    bot.sendMessage(chat_id, flashState ? "Flash is ON" : "Flash is OFF", "");
}
}
}
String sendPhotoTelegram() {
    const char* myDomain = "api.telegram.org";
    String getAll = "";
    String getBody = "";

    //Dispose first picture because of bad quality
    camera_fb_t * fb = NULL;
    fb = esp_camera_fb_get();
    esp_camera_fb_return(fb); // dispose the buffered image

    // Take a new photo
    fb = NULL;
    fb = esp_camera_fb_get();
    if(!fb) {
        Serial.println("Camera capture failed");
        delay(1000);
        ESP.restart();
        return "Camera capture failed";
    }
}

```

```

Serial.println("Connect to " + String(myDomain));

if (clientTCP.connect(myDomain, 443)) {
  Serial.println("Connection successful");

  String head = "--RandomNerdTutorials\r\nContent-Disposition: form-data;
name=\"chat_id\"; \r\n\r\n" + CHAT_ID + "\r\n--
RandomNerdTutorials\r\nContent-Disposition: form-data; name=\"photo\";
filename=\"esp32-cam.jpg\"\r\nContent-Type: image/jpeg\r\n\r\n";
  String tail = "\r\n--RandomNerdTutorials--\r\n";

  size_t imageLen = fb->len;
  size_t extraLen = head.length() + tail.length();
  size_t totalLen = imageLen + extraLen;

  clientTCP.println("POST /bot"+BOTtoken+"/sendPhoto HTTP/1.1");
  clientTCP.println("Host: " + String(myDomain));
  clientTCP.println("Content-Length: " + String(totalLen));
  clientTCP.println("Content-Type: multipart/form-data;
boundary=RandomNerdTutorials");
  clientTCP.println();
  clientTCP.print(head);

  uint8_t *fbBuf = fb->buf;
  size_t fbLen = fb->len;
  for (size_t n=0;n<fbLen;n=n+1024) {
    if (n+1024<fbLen) {
      clientTCP.write(fbBuf, 1024);
      fbBuf += 1024;
    }
  }
}

```

```
else if (fbLen%1024>0) {
    size_t remainder = fbLen%1024;
    clientTCP.write(fbBuf, remainder);
}
}

clientTCP.print(tail);

esp_camera_fb_return(fb);

int waitTime = 10000; // timeout 10 seconds
long startTimer = millis();
boolean state = false;

while ((startTimer + waitTime) > millis()){
    Serial.print(".");
    delay(100);
    while (clientTCP.available()) {
        char c = clientTCP.read();
        if (state==true) getBody += String(c);
        if (c == '\n') {
            if (getAll.length()==0) state=true;
            getAll = "";
        }
        else if (c != '\r')
            getAll += String(c);
        startTimer = millis();
    }
    if (getBody.length()>0) break;
}
clientTCP.stop();
```

```
    Serial.println(getBody);
}
else {
    getBody="Connected to api.telegram.org failed.";
    Serial.println("Connected to api.telegram.org failed.");
}
return getBody;
}
void setup() {
    WRITE_PERI_REG(RTC_CNTL_BROWN_OUT_REG, 0); //disable brownout
detector

    Serial.begin(115200);
    Serial.setDebugOutput(true);
    Serial.println();
    // Setup Buzzer
    pinMode(BUZZER_PIN, OUTPUT);
    digitalWrite(BUZZER_PIN, LOW);
    // Setup Flash
    pinMode(FLASH_LED_PIN, OUTPUT);
    digitalWrite(FLASH_LED_PIN, LOW);
    // Setup GPS
    gpsSerial.begin(9600);

    // Initialize the camera
    camera_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 (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;
}

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

```

}

// Wi-Fi connection
WiFi.begin(ssid, password);
while (WiFi.status() != WL_CONNECTED) {
  delay(1000);
  Serial.println("Connecting to WiFi...");
}
Serial.println("Connected to WiFi");

// Telegram BOT
clientTCP.setCACert(TELEGRAM_CERTIFICATE_ROOT); // Add root
certificate for api.telegram.org
bot.updateToken(BOTtoken);

startCameraServer();
}

void loop() {
  if (sendPhoto) {
    Serial.println("Preparing photo");
    sendPhotoTelegram();
    sendPhoto = false;
  }
  if (millis() - lastTimeBotRan > botRequestDelay) {
    int numNewMessages = bot.getUpdates(bot.last_message_received + 1);
    while (numNewMessages) {
      handleNewMessages(numNewMessages);
      numNewMessages = bot.getUpdates(bot.last_message_received + 1);
    }
    lastTimeBotRan = millis();
  }
}

```

```
}  
while (gpsSerial.available() > 0) {  
  gps.encode(gpsSerial.read());  
}  
}
```

	<b>KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET DAN TEKNOLOGI</b> <b>POLITEKNIK NEGERI SRIWIJAYA</b> <b>JURUSAN TEKNIK KOMPUTER</b> Jalan Srijaya Negara, Palembang 30139 Telp. 0711-353414 fax. 0711-355918 Website : <a href="http://www.polsri.ac.id">www.polsri.ac.id</a> E-mail : <a href="mailto:info@polsri.ac.id">info@polsri.ac.id</a>	 
	<b>REKOMENDASI UJIAN TUGAS AKHIR</b>	

Pembimbing Laporan Tugas Akhir, memberikan rekomendasi ujian laporan tugas akhir kepada,

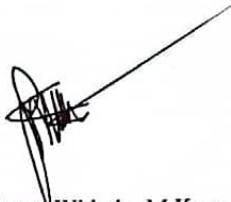
Nama : Ajeng Putri Lestari  
 NIM : 062130701710  
 Jurusan / Program Studi : Teknik Komputer / DIII Teknik Komputer  
 Judul Tugas Akhir : Rancang Bangun Alat Pelacak Hewan Berbasis *Internet of Things*

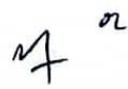
Mahasiswa tersebut telah memenuhi persyaratan dan dapat mengikuti Ujian Laporan Tugas Akhir, pada Tahun Akademik 2023/2024.

Palembang, 2024

Disetujui oleh,  
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Judul	:	Rancang Bangun Alat Pelacak Hewan Berbasis Internet of Things	
NO.	TANGGAL	URAIAN	PARAF PEMBIMBING
1	24 Juni 2024	Revisi Bab 1, 2, 3	
2	01 Juli 2024	Revisi bab 1, 3	
3	09 Juli 2024	Revisi alat	
4	10 Juli 2024	Ace BAB I	
5	11 Juli 2024	Ace BAB II	
6	15 Juli 2024	Ace BAB III	
7	18 Juli 2024	Revisi Kapura Camer	
8	22 Juli 2024	Bab IV	
9	25/2024. /07	Ace BAB IV Ace BAB V	

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Dosen Pembimbing 2	:	Mustaziri, S.T.,M.Kom	
Judul	:	Rancang Bangun Alat Pelacak Hewan Berbasis Internet of Things	
NO.	TANGGAL	URAIAN	PARAF PEMBIMBING
1.	26 Juni 2024	Revisi Bab I	7
2.	1 Juli 2024	Revisi Bab II	7
3.	4 Juli 2024	Revisi Bab III	7
4.	10 Juli 2024	Revisi Bab IV	7
5.	15 Juli 2024	Revisi Bab IV	7
6.	17 Juli 2024	Revisi alat	7
7.	18 Juli 2024	ACC Alat	7
8.	22 Juli 2024	Revisi tabel pengujian	7
9.	22 Juli 2024	ACC Bab IV	7
10.	25 Juli 2024	ACC Bab V	7

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	<b>PELAKSANAAN REVISI UJIAN TUGAS AKHIR (TA)</b>	

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 Jurusan/Program Studi : Teknik Komputer/D3-Teknik Komputer  
 Judul Tugas Akhir : Rancang Bangun Alat Pelacak Hewan Berbasis *Internet of Things*.

Telah melaksanakan revisi terhadap Laporan Tugas Akhir yang diujikan pada hari Selasa tanggal 29 bulan Juli tahun 2024.

Pelaksanaan revisi terhadap Laporan tugas Akhir tersebut telah disetujui oleh Dosen Penguji yang memberikan revisi.

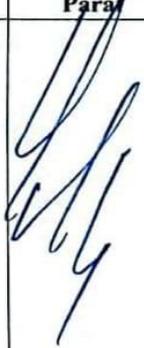
No	Komentar	Nama Dosen Penguji	Tanggal/ Bulan	Tanda Tangan
1	ACC	Yulian Mirza, S.T., M.Kom	12/8 2024	
2	ACC	Ir. Alan Novi Tompunu, S.T., M.T., IPM., ASEAN Eng	16/8 2024	
3	ACC	Hartati Deviana, S.T., M.Kom	16/8 2024	
4	ACC	Rian Rahmanda Putra, S.Kom., M.Kom	12/8 2024	

Palembang, Juli 2024  
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	data judul Pembahasan kesimpulan	

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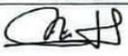
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