**Fechet Ionela-Paula**

Name: Smart Home

Team members:

Fechet Ionela Paula- 1309B

Heghea Mihail Cristian- 1309A

Maftei Elena Claudia- 1310A

Radu Cosmina Mihaela- 1309B

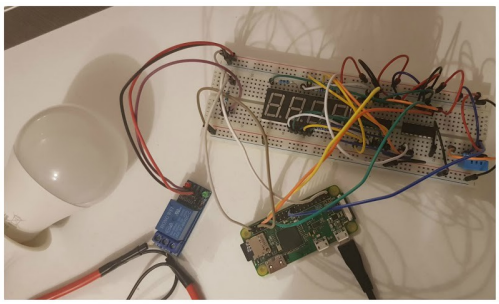
This project implements a system for an intelligent home. It consists of an alarm which can be turned off or on through a web page. It has been used PIR sensor. When it detects some movements, it will send an email which must be set from the interface.

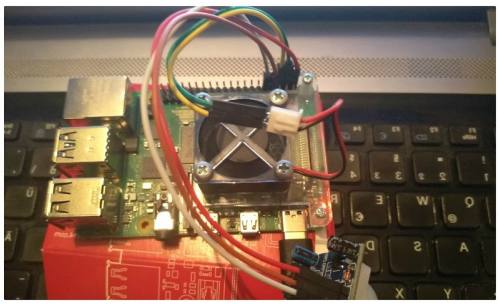
It also consists of a temperature detection sensor which tells us the temperature value, the humidity and it also helps you to turn the light on. This all could be possible due to the usage of a temperature and humidity sensor. Once the actual temperature is wanted, the user must just press a button. Regarding the light bulb controlling, a relay has been used as well as a tension source which can be turned on/off. All these can be controlled from the interface.

We used Flask framework and html, which can help the user to easily interact with the components.

Elevator pitch: Get comfortable in your own home and this smart application will help you live better than before.

Cover image:





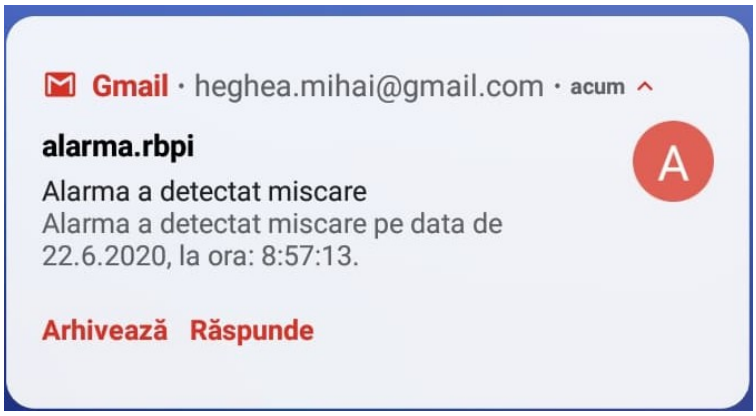
Story:

In order to have a better secured home and live a in good conditions in your own house, this application is the best for you:

-it awares you of the temperature from your room

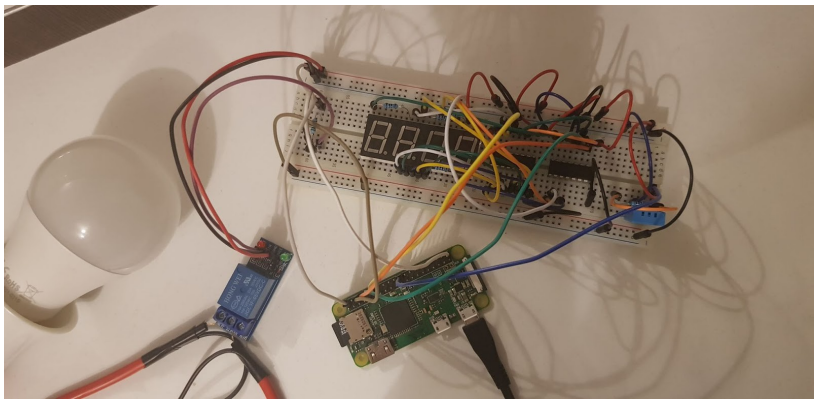
-it helps you turn the light on/off just by pressing a button
-it awares you of the humidity from your room, as humidity can affect human health because it affects our thermal comfort - in other words, whether we feel too hot or too cold.
-you have the option to enable an alarm which can make you aware of the presence of an unknown person in your own house. The message is sent through an email which is set through a web interface. The message tells you that it has detected some movements in your house as well as the moment of time when it happened.

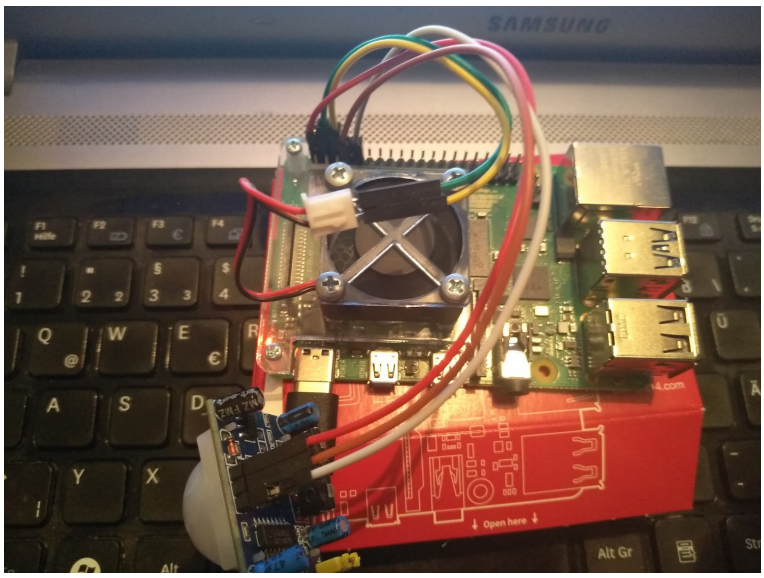
To enable all these functionalities, there are some buttons and links on the web interface. The user can anytime find out what the temperature is by pressing the “Temperature” link, as well as the “Humidity” when he wants to know about humidity. When it comes to setting the alarm, there are 2 buttons : on and off. “On” button enables the alarm and once it observes some movements in your house, you will be notified by receiving an email. An example of email:

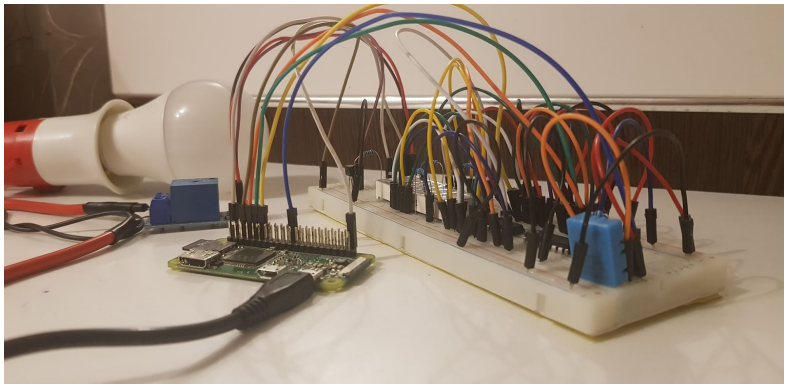


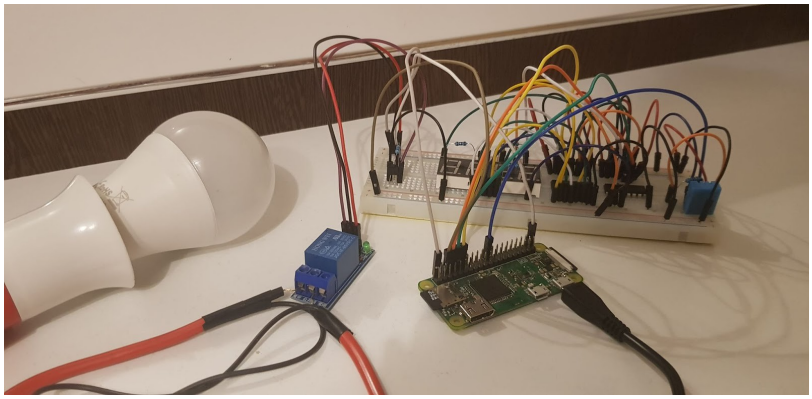

Video: https://www.youtube.com/watch?v=Vh1hknU9L3M&feature=youtu.be

Photos:







Components and apps:

Hardware Components:

- Raspberry Pi Zero W
- DHT11 Temperature & Humidity Sensor (4 pins)
- PIR sensor for movement detection
- Raspberry Pi 4
- BreadBoard

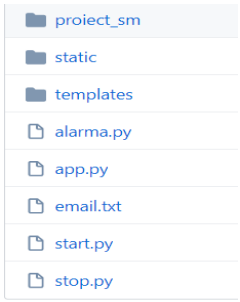
- Light bulb
- Relay
- Resistor 5100Ohm
- 2 shifting registers for displaying (74HC595)
- 4 resistors 150Ohm, one digit (4 Digit 7 Segment).

Software Components:

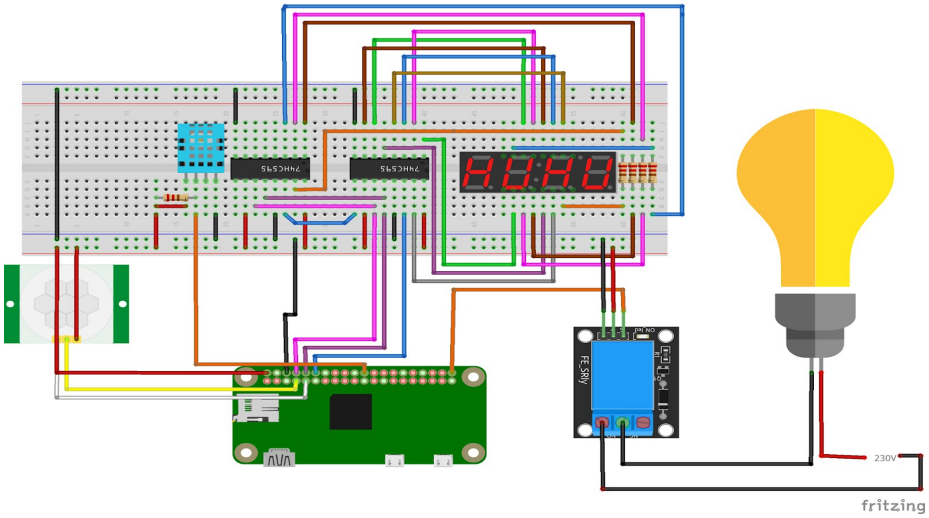
- Raspbian
- Python
- Flask

**Project Structure**

The project folders must be as in the picture below in order to make the application work properly. In static files, we used resources such as images and css. In “templates” folder we included everything which is related to html. Everything that ends in .py is a python script which allows us to execute commands (e.g: turn on the alarm, turn on the light, get the temperature/humidity).




Schematics:




## Code:

The code can also be found here: https://github.com/PaulaFechet/SM

### Alarma.py

It will detect some movements and then send an email to the owner and he will be notified about this

```
import RPi.GPIO as GPIO

import time

import smtplib


def readEmail():

  f = open("email.txt", "r") # se deschide fișierul cu adresa de mail

  return f.read() # se întoarce un șir de caractere care contine adresa de mail



server = smtplib.SMTP('smtp.gmail.com', 587) #instantiere server smtp
server.starttls() #porinre server smtp
server.login("alarma.rbpi@gmail.com","Alarma123") # conectare cu adresa de mail care o sa
trimita mail utilizatorului
GPIO.setmode(GPIO.BOARD) # alegerea modului de utilizare al pinilor
move=7 # pinul pe care se primește semnalul atunci cand senzorul detecteaza miscare
GPIO.setup(move, GPIO.IN) # pinul 7 trebuie sa fie de tip input
time.sleep(0.1)
movesDetected = 0 # inițial nu s-a detectat nici o mișcare
```

```
prevDetection = time.localtime() # momentul detectării mișcării anterioare atunci cand porneste aplicația este momentul pornirii acesteia
try:
  while 1:
    if GPIO.input(move)==1: # atunci cand detecteaza miscare
      movesDetected+=1 # numărul de mișcări detectate de la ultima avertizare este incrementat
      timeDetection = time.localtime() # se preia momentul detectiei miscarii
      minDetection = timeDetection.tm_min
      print("Detectie miscare")
      if prevDetection.tm_min > timeDetection.tm_min: # dacă minutul detecției este din ora următoare sau mai târziu
        minDetection = 60+timeDetection.tm_min # se aduna cu 60 (numărul de minute al unei ore) pentru a se putea face diferența mai jos
      if prevDetection.tm_mday != timeDetection.tm_mday or prevDetection.tm_hour != timeDetection.tm_hour or (minDetection-prevDetection.tm_min > 2 and movesDetected >=2) or movesDetected>4:
        #dacă se detectează mișcare în alta zi sau alt ora sau în interval de 2 minute se înregistrează cel puțin 2 mișcări sau se
        # înregistrează mai mult de 4 mișcări în mai puțin de 2 minute, este trimis mail către utilizator cu o avertizare
        movesDetected=0 # se reseteaza numărul de mișcări detectate
        headers = ["From: alarma.rbpi@gmail.com", "Subject: Alarma a detectat miscare", "To: heghea.mihai@gmail.com", "MIME-Version: 1.0", "Content-Type: text/html"]
          headers = "\r\n".join(headers) # se construieste header-ul mail-ului
        msg = "Alarma a detectat miscare pe data de "
        msg+= str(timeDetection.tm_mday)+"."
        msg+= str(timeDetection.tm_mon)+"."
        msg+= str(timeDetection.tm_year)+", la ora: "
        msg+=str(timeDetection.tm_hour)+":"
        msg+=str(timeDetection.tm_min)+":"
        msg+=str(timeDetection.tm_sec)+"." # se construiește mesajul trimis prin e-mail, acesta conține data, ora, minutul și secunda la care s-a raportat acea avertizare
        print(msg)
```

```
        email = readEmail() # se preia adresa de mail către care sa se trimită
acel email, adresa se va adăuga din interfața web
        print("Mesaj trimis catre: "+email)
        server.sendmail("alarma.rbpi@gmail.com",email ,headers+"\r\n\r\n"+ msg)
# trimiterea efectiva a mail-ului
        prevDetection = timeDetection # momentul detecției anterioare devine
momentul detecției curente
      if minDetection-prevDetection.tm_min>2 and movesDetected<2:
        movesDetected=0 # în cazul în care în 2 minute nu se detectează cel puțin
2 mișcări, se reseteaza numărul de mișcări și implicit și intervalul
      time.sleep(4)
except Exception as excep:
  print(excep)
finally:
  GPIO.cleanup()
```

**Digit_temp.py** for digitally displaying the temperature

```
import RPi.GPIO as GPIO
import Adafruit_DHT #import librarie pentru a calcula umiditatea si temperatura
import time
import math as math

GPIO.setmode(GPIO.BCM) #alegere pini
dataPin = 18
latchPin = 15
clockPin = 14

GPIO.setup(dataPin, GPIO.OUT) #setare pini
GPIO.setup(latchPin, GPIO.OUT)
GPIO.setup(clockPin, GPIO.OUT)

GPIO.output(dataPin, GPIO.LOW) #configurare pini
GPIO.output(latchPin, GPIO.LOW)
```

```
GPIO.output(clockPin, GPIO.LOW)


#reinitializare variabile pentru afișarea pe digit
g = 0b01000000
dot = 0b10000000
zero = 191 #0b10111111
zero_no_dot = 63 #0b00111111
one = 134 #0b10000110
one_no_dot = 6 #0b00000110
two = 219 #0b11011011
two_no_dot = 91 #0b01011011
three = 207 #0b11001111
three_no_dot = 79 #0b01001111
four = 230 #0b11100110
four_no_dot = 102 #0b01100110
five = 237 #0b11101101
five_no_dot = 109 #0b01101101
six = 253 #0b11111101
six_no_dot = 125 #0b01111101
seven = 135 #0b10000111
seven_no_dot = 7 #0b00000111
eight = 255 #0b11111111
eight_no_dot = 127 #0b01111111
nine = 239 #0b11101111
nine_no_dot = 111  #0b01101111


digit = 0


def Digit(x):
  global digit
  if x == 1:
    digit = 14 #0b00001110 activează primul digit punand pe 0 catodul
corespunzător acestuia
```

```
 elif x == 2:
     digit = 13 #0b00001101 activează al doilea digit punand pe 0 catodul
corespunzător
 elif x == 3:
   digit = 11 #0b00001011 activeaza al treilea digit
 elif x == 4:
   digit = 7 #0b00000111 activeaza al patrulea digit
 elif x == 5:
     digit = 0 #0b00000000 activează punctul



def shift(buffer): #functie de shiftare ce face posibilă afișarea unor valori
diferite pe fiecare digit

 global digit

 for i in range(0,8):
   GPIO.output(dataPin, (128 & (digit << i)))
   GPIO.output(clockPin, GPIO.HIGH)
   time.sleep(0.001)
     GPIO.output(clockPin, GPIO.LOW)

 for i in range(0,8):
   GPIO.output(dataPin, (128 & (buffer << i)))
   GPIO.output(clockPin, GPIO.HIGH)
   time.sleep(0.001)
     GPIO.output(clockPin, GPIO.LOW)

 GPIO.output(latchPin, GPIO.HIGH)
 time.sleep(0.001)
   GPIO.output(latchPin, GPIO.LOW)
```

```
def afla_nr(x): #functie ce determina ce leduri se vor aprinde în functie de numărul dat ca parametru
 nr = 0
 global zero_no_dot
 global one_no_dot
 global two_no_dot
 global three_no_dot
 global four_no_dot
 global five_no_dot
 global six_no_dot
 global seven_no_dot
 global eight_no_dot
 global nine_no_dot
 if x == 0:
   nr = zero_no_dot
 elif x == 1:
   nr = one_no_dot
 elif x == 2:
   nr = two_no_dot
 elif x == 3:
   nr = three_no_dot
 elif x == 4:
   nr = four_no_dot
 elif x == 5:
   nr = five_no_dot
 elif x == 6:
   nr = six_no_dot
 elif x == 7:
   nr = seven_no_dot
 elif x == 8:
   nr = eight_no_dot
 elif x == 9:
```

```
    nr = nine_no_dot
  return nr


# functie ce afișează temperatura pe digit
# formatul este xy.z
#primul digit ramane nefolosit
def display(temperature):
  x = math.floor((temperature *10) /100)
  a = afla_nr(x)
  y = ((temperature * 10) / 10) % 10
  b = afla_nr(y)
  z = (temperature * 10) % 10
  c = afla_nr(z)
  i = 1000


  i = 50
  while i>0:
    i = i-1
    if temperature < 0:
      Digit(1) #dacă temperatura e negativă, se activeaza ledul din mijloc
pentru a arata semnul minus
      shift(g)
      time.sleep(0.0000001)
    Digit(2) #se afișează cifra zecilor
    shift(a)
    time.sleep(0.0000001)
    Digit(3) #se afișează cifra unităților
    shift(b)
    time.sleep(0.0000001)
    shift(dot)  #se afiseaza punct
    time.sleep(0.0000001)
    Digit(4) #se afișează zecimea
    shift(c)
```

```
    time.sleep(0.0000001)


def printfile (str): # functie afișare fișier temperatura +umiditate
    file = open("file.txt","w")
  file.write(str)
  file.close()



def readfile(): #functie citire fisier
  file =open("file.txt","r")
  str = ''
  str += file.read()
  file.close()
  return str



def temp_print(temp): #funcție scriere în fisier separat temperatura, pentru a
outea fi citita si afisata pe digit
  file = open("temp.txt", "w")
  file.write(temp)
  file.close()


try:
  while True:
    file = open("temp.txt", "r") #citire temperatura din fisier
    temp = ''
    temp +=file.read()
    temperature = float(temp)
    display(temperature) #apel functie afisare temperatura pe display
    file.close()
except KeyboardInterrupt:
  pass
```

```
GPIO.cleanup()
```

**Start.py**

```
import RPi.GPIO as GPIO

GPIO.setmode(GPIO.BCM)

port = 21 #alege pin 21 ca pin de iesire

GPIO.setwarnings(False)

GPIO.setup(port, GPIO.OUT) #seteaza pinul 21 ca pin de ieșire

GPIO.output(port, GPIO.HIGH) #pune pinul pe HIGH pentru a aprinde becul
```

**Stop.py**

```
import RPi.GPIO as GPIO

GPIO.setmode(GPIO.BCM)

port = 21 #alege pinul 21 ca pin de ieșire

GPIO.setwarnings(False)

GPIO.setup(port, GPIO.OUT) #seteaza pinul 21 ca pin de ieșire

GPIO.output(port, GPIO.LOW) #pune pinul pe LOW pentru a stinge becul
```

**Senzor_temp.py**

```
import RPi.GPIO as GPIO
import Adafruit_DHT #import librărie pentru luarea de la senzor a temperaturii
și a umiditatii
import time
import math as math
import threading


GPIO.setmode(GPIO.BCM)


type = Adafruit_DHT.DHT11


dht11 = 25 #conectare senor la raspberry pi, pinul 25
GPIO.setup(dht11, GPIO.IN)




def printfile (str):  #funcție scriere în fișier temperatura și umiditate
    file = open("file.txt","w")
  file.write(str)
  file.close()



def readfile(): #funcție citire din fișier
  file =open("file.txt","r")
  str = ''
  str += file.read()
  file.close()
  return str



def temp_print(temp): #funcție scriere în fișier temperatura
  file = open("temp.txt", "w")
  file.write(temp)
```

```
 file.close()


try:


 while True:
   humidity, temperature = Adafruit_DHT.read_retry(type, dht11) #luare de la
senzor a temperaturii si umiditatii
   if humidity is not None and temperature is not None:
     temp_print(str(temperature)) #scriere temperatura în fișier, de unde va fi
citită pentru senzor
     buffer = ' Temperature = ' + str(temperature) + '\t' + 'Umiditate = ' +
str(humidity)
     printfile(buffer) #scriere temperatura și umiditate în fișier



except KeyboardInterrupt:
 pass


GPIO.cleanup()
```

**App.py**

```
from flask import Flask,
render_template,flash,url_for,session,request,logging,redirect
from http import cookies
import time
import os


from wtforms import Form,StringField,TextAreaField,validators
```

```
import RPi.GPIO as GPIO
import Adafruit_DHT
import time
import math as math
import threading

GPIO.setmode(GPIO.BCM)

type = Adafruit_DHT.DHT11

dht11 = 25
GPIO.setup(dht11, GPIO.IN)



app = Flask(__name__)



def read_temp():
  # citeste temperatura de la senzor
  humidity, temperature = Adafruit_DHT.read_retry(type, dht11)
  temp = str(temperature)
  return temp

def read_umid():
  # citește umiditatea de la senzor
  humidity, temperature = Adafruit_DHT.read_retry(type, dht11)
  umidit = str(humidity)
  return umidit



class CheForm(Form):
  email = StringField('Email',[validators.Length(min =1,max=50)])
```

```python
# se primește adresa de email de pe interfața apoi se scrie în fișier

@app.route("/",methods = ['GET','POST'])

def home_1():

  form = CheForm(request.form)

  if request.method == 'POST' and form.validate():

    mesaj = form.email.data

    printfile(mesaj)
```

```
    return redirect(url_for('home'))
  return render_template('register.html',form=form)


@app.route("/home")
def home():
  return render_template('index.html')


@app.route("/temp",methods = ['GET','POST'])
def temp():
  temperatura = read_temp()
  if request.method == 'POST' :
    # pornire script de scriere pe display
    cmd = "python3 digit_temp.py"
    os.system(cmd)
```

```
    return redirect(url_for('temp'))
  return render_template('temperatura.html',temperatura=temperatura)

@app.route("/umiditate")
def umiditate():
  # se apelează funcția care returnează umiditatea de la senzor apoi se trimite pe interfața pentru afișare
  umiditate = read_umid()
  return render_template('umiditate.html',umiditate=umiditate)

def printfile (mesaj):
  file = open("email.txt","w")
  file.write(mesaj)
  file.close()

@app.route("/alarma")
```

```
def alarma():
  return render_template('alarma.html')


# se primește adresa de email de pe interfața apoi se scrie în fișier
@app.route("/register",methods = ['GET','POST'])
def register():
  form = CheForm(request.form)
  if request.method == 'POST' and form.validate():
    mesaj = form.email.data
    printfile(mesaj)
```

```
    return redirect(url_for('home'))
  return render_template('register.html',form=form)


@app.route("/alarma-on")
def alarma_on():
  #pentru pornit alarma
  cmd = "sudo python alarma.py"
  os.system(cmd)
  msg = "Alarma a fost pornita!"
  # se trimite mesajul de pornire alarma pe interfata
  return render_template('alarma.html',msg=msg)


@app.route("/alarma-off")
def alarma_off():
  # se opreste alarma
  msg = "Alarma a fost oprita!"
  cmd=" ps aux | grep -ie 'python alarma.py' | awk '{print $2}' | xargs sudo
kill -9"
  os.system(cmd)
  # se trimite mesajul de oprire alarma pe interfata
  return render_template('alarma.html',msg=msg)


@app.route("/led")
def led():
  return render_template('led.html')
```

```
@app.route("/led-on")
def led_on():
  # Ruleaza scriptul de start led
  cmd = 'python3 start.py'
  os.system(cmd)
  msg = "Becul a fost pornit!"
  return render_template('led.html',msg=msg)

@app.route("/led-off")
def led_off():
  # Ruleaza scriptul de stop led
  cmd = 'python3 stop.py'
  os.system(cmd)
  msg = "Becul a fost oprit!"
  return render_template('led.html',msg=msg)

@app.route("/digit_temp")
def temp_digit():
  #Ruleaza scriptul de afisare temperatura
  cmd = "sudo python senzor_temp.py"
  t = threading.Thread(target=os.system, args=(cmd,))
  t.start()
  cmd = "sudo python digit_temp.py"
  t2 = threading.Thread(target=os.system, args=(cmd,))
  t2.start()
  return render_template('temperatura.html')

@app.route("/stop_display")
def stop_display():
  cmd = " ps aux | grep -ie 'python senzor_temp.py' | awk '{print $2}' | xargs
sudo kill -9"
  os.system(cmd)
```

```
 cmd = " ps aux | grep -ie 'python digit_temp.py' | awk '{print $2}' | xargs
sudo kill -9"
 os.system(cmd)
 return render_template("temperatura.html")


if __name__ == '__main__':
 app.run(host="0.0.0.0", debug=True)
```

**Alarma.html**

```
{% extends 'layout.html' %}


{% block body %}
 <center>
 <div class="background">
   <center> <h1> <p face="impact" color='navy'>
     Smart HOME  </p></h1>
     <p color="white" face ="arial"size="3">
     Learn to control the world from anywhere</p>
     </p>
     <br>
   <center>
     <h2>Alarma</h2>
   <p >
     <a class="butoane" href='alarma-on'>ON</a>
     <a class="butoane" href='alarma-off'>OFF</a>
   </p>
   <h3> {{ msg }}</h3>
     <br>
 </div>
```

```
{% endblock %}
```

**_navbar.html**

```
<nav class="navbar navbar-expand-md navbar-dark bg-dark ">
  <div class="container">
    <div class="navbar-header">
    <a class="navbar-brand" href="/home">Smart Home</a>
    <button class="navbar-toggler" type="button" data-toggle="collapse" data-
target="#navbarsExampleDefault" aria-controls="navbarsExampleDefault" aria-
expanded="false" aria-label="Toggle navigation">
    <span class="navbar-toggler-icon"></span>
    </button>
    </div>
  <div class="collapse navbar-collapse" id="navbar">
   <ul class="navbar-nav mr-auto">
    <li><a class="nav-link" href="/temp">Temperatura</a></li>
    <li><a class="nav-link" href="/umiditate">Umiditate</a></li>
    <li><a class="nav-link" href="/alarma">Alarma</a></li>
    <li><a class="nav-link" href="/led">Led</a></li>

   </ul>

   <form class="form-inline my-2 my-lg-0">
    <ul class="navbar-nav mr-auto">
     <li><a class="nav-link" href="/register">Register</a></li>
    </ul>

   </form>
  </div>
  </div>
</nav>
```

**Index.html**

```
{% extends 'layout.html' %}


{% block body %}
  <center>
  <div class="background">
    <center> <h1> <p face="impact" color='navy'>
      Smart HOME  </p></h1>
      <p color="white" face ="arial"size="3">
      Learn to control the world from anywhere</p>
      </p>
      <br>
      <p>
        Smart home technology, also often referred to as home automation or
domotics
         (from the Latin "domus" meaning home), provides homeowners security,
comfort,
         convenience and energy efficiency by allowing them to control smart
devices,
         often by a smart home app on their smartphone or other networked
device.
         A part of the internet of things (IoT), smart home systems and devices
often operate together,
          sharing
        consumer usage data among themselves and automating actions based on the
homeowners' preferences.
      </p>
      <br>
      <img src="./../static/img/p2.jpeg" width= 500 height =300 alt="RB">
      <br>
      <br><br>
    <center>
```

```
  </div>


{% endblock %}
```

*Layout.html*

```
<!DOCTYPE html>
<html>
  <head bgcolor="silver" >
    <meta charset="utf-8">
    <title>FlaskApp</title>
    <link rel="stylesheet" href="{{ url_for('static',
filename='css/style.css') }}">
    <link rel="stylesheet" href =
"https://stackpath.bootstrapcdn.com/bootstrap/4.4.1/css/bootstrap.min.css">
    <style>


    </style>
  </head>
  <body >
    {% include 'includes/_navbar.html' %}
    <div class = "container">
      {% block body %}{% endblock %}
    </div>
    <script src =
"https://stackpath.bootstrapcdn.com/bootstrap/4.4.1/js/bootstrap.min.js"></scrip
t>
  </body>
</html>
```

**led.html**

```
{% extends 'layout.html' %}
```

```
{% block body %}
  <center>
  <div class="background">
    <center> <h1> <p face="impact" color='navy'>
      Smart HOME  </p></h1>
      <p color="white" face ="arial"size="3">
      Learn to control the world from anywhere</p>
      </p>
      <br>
    <center>
      <h2>Led</h2>
      <p>
        <a class="butoane" href='led-on'>ON</a>
        <a class="butoane" href='led-off'>OFF</a>
      </p>
      <h3> {{ msg }}</h3>
      <br>
  </div>

{% endblock %}
```

**Register.html**

```
{% extends 'layout.html' %}

{% block body %}
  <center>
  <div class="background">
    <center> <h1> <p face="impact" color='navy'>
      Smart HOME  </p></h1>
      <p color="white" face ="arial"size="3">
      Learn to control the world from anywhere</p>
```

```
      </p>
      <br>
    <center>
      <h2>Register</h2>
    <p >
      {% from "includes/_formhelpers.html" import render_field %}
      <form method="POST" action="">
        <div id = "input" class="form-group">
          {{ render_field(form.email, class="form-control")}}
        </div>
        <p><input class="btn btn-primary" type="submit" value="Register"></p>
      </form
    </p>

      <br>
  </div>

{% endblock %}
```

***Temperatura.html***

```
{% extends 'layout.html' %}

{% block body %}
  <center>
  <div class="background">
    <center> <h1> <p face="impact" color='navy'>
      Smart HOME  </p></h1>
      <p color="white" face ="arial"size="3">
      Learn to control the world from anywhere</p>
      </p>
      <br>
    <center>
```

```
      <h2>Temperatura</h2>
       <a href="digit_temp">Display</a>
    <a href="stop_display">Stop_display</a>
      <p>{{ temperatura }} °C</p>
      <br>
  </div>

{% endblock %}
```

Umiditate.html

```
{% extends 'layout.html' %}

{% block body %}
  <center>
  <div class="background">
    <center> <h1> <p face="impact" color='navy'>
      Smart HOME  </p></h1>
      <p color="white" face ="arial"size="3">
      Learn to control the world from anywhere</p>
      </p>
      <br>
    <center>
      <h2>Umiditate</h2>
      <p>{{ umiditate }}</p>
      <br>
  </div>

{% endblock %}
```

https://www.hackster.io/ionela-paulafechet/smart-home-b9f445