IOT BASED COMPLETE HOME AUTOMATION

GUIDE: Dr.PurnaChand Nalluri

(Dept Of ECE)

TEAM MEMBERS:

Ashita Satpathy-17BEC7039

Tathagat Banerjee-17BCE7100

Rohit Bhargav Peesa-17BEC7024

Manjari Bisht-17BCE7075

Nagarjuna Mandalapu-17MIS7162

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Abstract

We made a completely automated home using various sensors and two major growing technologies Internet of Things, Machine Learning which addresses many of the issues in a home in the present day to day life. Our house has a safety alarm which blows siren when your house catches fire or if there is some gas leakage inside the home, we made the lights inside the house glow only when there is darkness. We have reduced the effort of watering your plants and pets as it is automated, we calculate temperature and humidity inside your house and mail it to you along with a forecast of weather the next day which would be mailed to your Email every day. We also reduced your effort on deciding which fertilizer you have to use for your plants we have made a model which takes inputs from your soil and surrounding in home to determine the best fertilizer to be used for better growth of your plants using machine learning and CNN's which would also be mailed to you once in a month along with cost and image of fertilizer. We also have a classifier which detects the face of the person entering and also whether he is carrying any dangerous weapons or not using deep learning and CNN's.

Introduction

Home Automation System is a wireless home appliance control system accessed by a remote device such as mobile phone(Android or IOS) to allow a homeowner to control, monitor and coordinate home appliances, without changing the home infrastructure. Here, the advantages of our Home Automation System will be like It saves time and where as in a long purpose it will also saves money. It is self-maintenance system. That It means no workers are required for maintenance of this system. It makes the life very easy and simple.

Background

At First, I want to describe about System Design. Home Automation is a system which is controlled by a remote system such as a cell phone like , Android or IOS Mobile. It is build around a microcontroller ,with adjoining relays for interfacing with AC devices. There will be sensors for the system to operate automatically according to weather conditions. In case of emergency such as fire, the user or an organization such as Fire Department should be notified. Also, Home Automation will have a database of information about the users and appliances. It will also have a Website that connected to the above Database.

Problem Definition

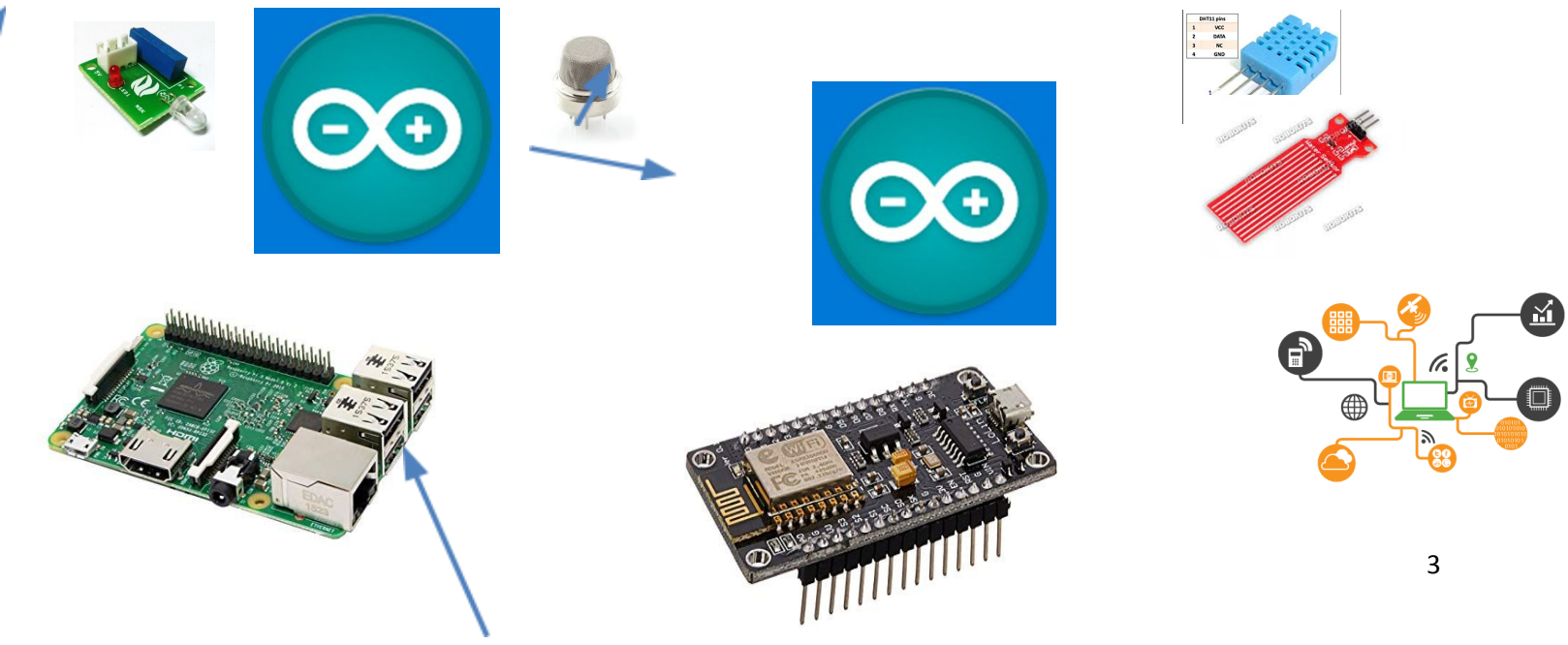
We have many problems in a house majorly not always we are in the home and cannot water plants, pets every day, we need few safety measures because any time gas may leak in-house and some object in the house can catch fire. We cannot depend on news, weather station for weather report and forecast. We need to know who is entering the house and leaving the house and if they possess any dangerous weapons as now a day's crime rate has gone high. We cannot frequently get our soil tested and select a fertilizer to be used it and the shopkeeper may sell it at a cost higher then market rate if we don't know it's cost. If we forget to turn off the lights and fans in the house and go out or if we switch on lights even during daytime leading lot of power wastage.

Objective

Our aim was to make a complete safe home which solves all the problems we mentioned earlier namely fire and gas safety, watering of pets and plants, save power and human effort using IoT and ldr sensor, not depend on the news for weather forecast and soil testers to know about fertilizer that has to be used. Last but the main safety measure to know about who is entering the house, who is leaving the house and whether they carry any weapons or not is it safe or not which are solved by machine learning and CNN's. After we make a product we need to have a user manual and a complaint box for the issues raised by users of our product for which we need a web page and database.

Methodology

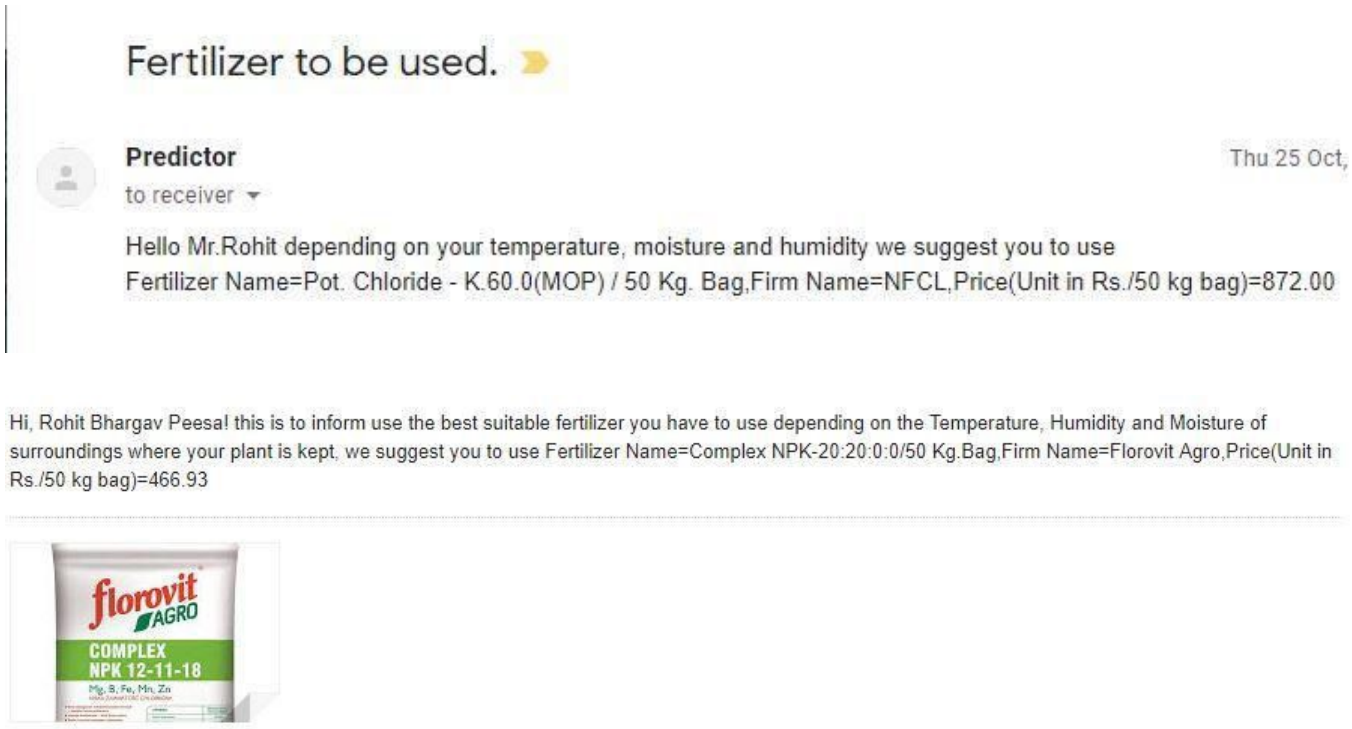
The main intention of this project is for controlling various electrical loads remotely over internet using Internet Of Things (IOT). The smart phone android application with user configurable GUI front end can be used for real-time scenario. The digital control based home automation system is intended to control remotely using landline connection. In this project, home appliances can be controlled through landline by dialing the specific number for the specific load. This dial can be done from a home phone or even by dialing home number from outside also.



Results

We have successfully a home where we have installed cameras and circuitry which includes Arduino, Nodemcu and sensors later used that data to predict weather forecast using machine learning and mailed them to user, also used it to predict the best suitable fertilizer for the plant using CNN's.

Output of fertilizer predictor:



Conclusion

We have played various roles as good team players, learnt and applied our knowledge in sensors to make our engineering clinics project as a real-time application project of a safe home which has various advantages of automated gardening and water for pets, lights which glow as soon as the room gets dark,

we can switch them off even if we forget with the help of IoT. We have used machine learning and CNN's for fertilizer prediction, weather forecast and face, weapons detections for the safety of members inside the house

Future Scope

We can add a GSM module and send a message instead of honking a buzzer. We can plan for having a chimney in the kitchen, we can add an automated garage system, safety measurements like earthquake detection. We can also add more machine learning algorithms and CNN's and classify various other things in house like name of the person entering the house, check his mood and play songs using IoT and natural language processing, have a fingerprint lock for house, face detection lock for house with neural networks, voice recognition entry inside house using machine learning. We even can add a burglar alarm as a safety measure.

References:

- https://www.youtube.com/watch?v=nUHizmtyt74
- https://www.youtube.com/watch?v=UCMVkOg2JC8
- https://www.youtube.com/watch?v=ESB-USNnAlg
- https://www.youtube.com/watch?v=QfNvhPx5Px8
- https://www.youtube.com/watch?v=cAICT4Al5Ow
- https://www.youtube.com/watch?v=BIf_mpnsZvY
- https://www.tutorialspoint.com/python/python_sending_email.htm
- https://keras.io/getting-started/sequential-model-guide/
- https://keras.io/layers/convolutional/

APPENDIX-I:

Website Image of a Home Automation System:

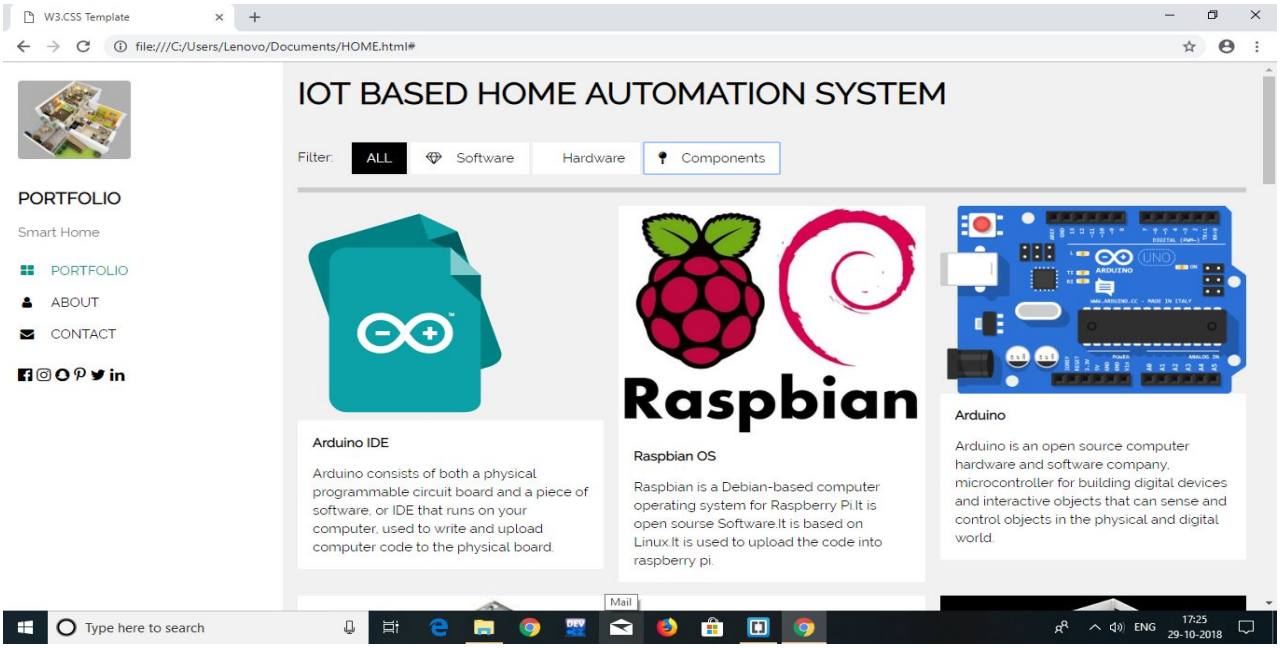
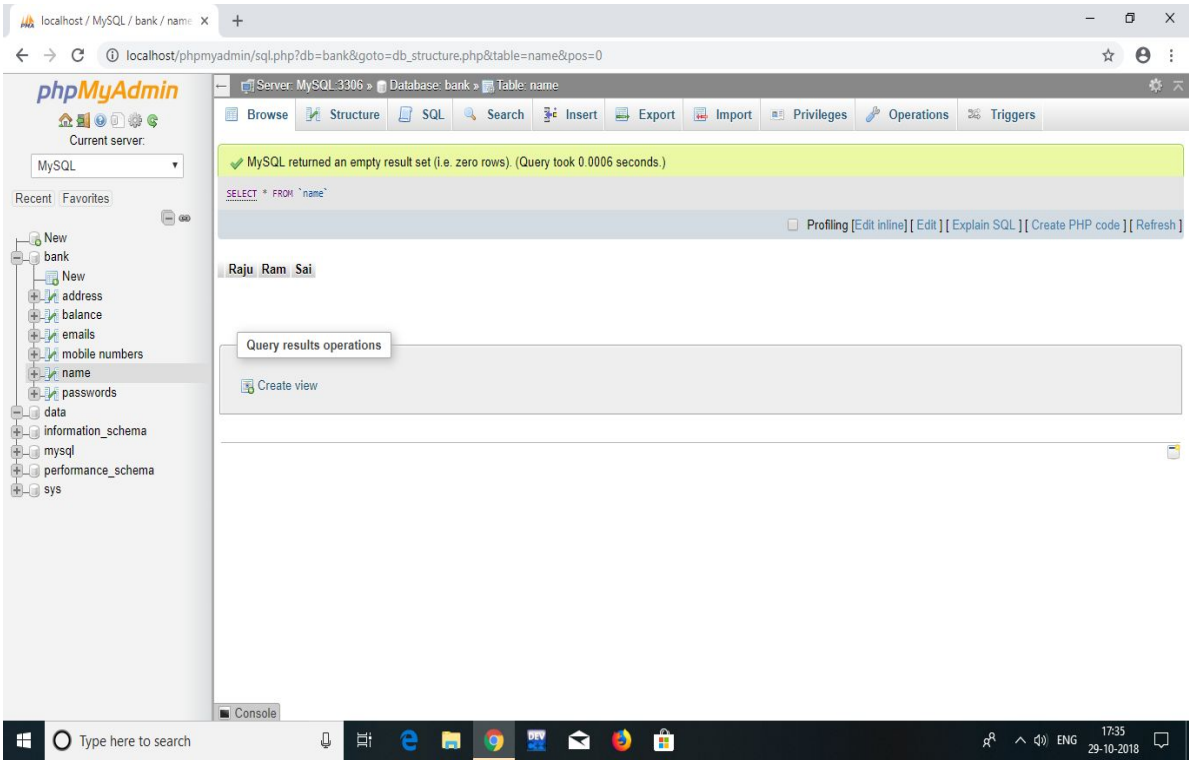


Image of Home:

Image of Database of users:



APPENDIX-II

Codes:

Webpage:

```
<!DOCTYPE html>

<html>

<title>W3.CSS Template</title>

<meta charset="UTF-8">

<meta name="viewport" content="width=device-width, initial-scale=1">

<link rel="stylesheet" href="https://www.w3schools.com/w3css/4/w3.css">

<link rel="stylesheet" href="https://fonts.googleapis.com/css?family=Raleway">

<link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/4.7.0/css/font-awesome.min.css">

<style>

body,h1,h2,h3,h4,h5,h6 {font-family: "Raleway", sans-serif}

</style>

<body class="w3-light-grey w3-content" style="max-width:1600px">

<!-- Sidebar/menu -->

<nav class="w3-sidebar w3-collapse w3-white w3-animate-left" style="z-index:3;width:300px;" id="mySidebar"><br>
```

```
 <div class="w3-container">
  <a href="#" onclick="w3_close()" class="w3-hide-large w3-right w3-jumbo w3-padding w3-hover-grey" title="close menu">
   <i class="fa fa-remove"></i>
  </a>
  <img
src="https://image.winudf.com/v2/image/Y29tLmhvbWVkZXNpZ24uaG9tZWZsb29wbGFuc19zY3JlZW5zaG90c18yXzJkOWU1MmM5/screen-2.jpg?h=355&fakeurl=1&type=.jpg" style="width:45%;" class="w3-round"><br><br>
  <h4><b>PORTFOLIO</b></h4>
  <p class="w3-text-grey">Smart Home</p>
 </div>
 <div class="w3-bar-block">
  <a href="#portfolio" onclick="w3_close()" class="w3-bar-item w3-button w3-padding w3-text-teal"><i class="fa fa-th-large fa-fw
w3-margin-right"></i>PORTFOLIO</a>
 <div class="w3-panel w3-large">
  <i class="fa fa-facebook-official w3-hover-opacity"></i>
  <i class="fa fa-instagram w3-hover-opacity"></i>
 </div>
</nav>
<!-- Overlay effect when opening sidebar on small screens -->
<div class="w3-overlay w3-hide-large w3-animate-opacity" onclick="w3_close()" style="cursor:pointer" title="close side menu" id="myOverlay"></div>
<!-- !PAGE CONTENT! -->
<div class="w3-main" style="margin-left:300px">
 <!-- Header -->
 <header id="portfolio">
  <a href="#"><img
src="https://image.winudf.com/v2/image/Y29tLmhvbWVkZXNpZ24uaG9tZWZsb29wbGFuc19zY3JlZW5zaG90c18yXzJkOWU1MmM5/screen-2.jpg?h=355&fakeurl=1&type=.jpg" style="width:65px;" class="w3-circle w3-right w3-margin w3-hide-large w3-hover-opacity"></a>
  <span class="w3-button w3-hide-large w3-xxlarge w3-hover-text-grey" onclick="w3_open()"><i class="fa fa-bars"></i></span>
  <div class="w3-container">
  <h1><b>IOT BASED HOME AUTOMATION SYSTEM</b></h1>
  <div class="w3-section w3-bottombar w3-padding-16">
   <span class="w3-margin-right">Filter:</span>
   <button class="w3-button w3-black">ALL</button>
   <button class="w3-button w3-white"><i class="fa fa-diamond w3-margin-right"></i>Software</button>
   <button class="w3-button w3-white w3-hide-small"><i class=" w3-margin-right"></i>Hardware</button>
   <button class="w3-button w3-white w3-hide-small"><i class="fa fa-map-pin w3-margin-right"></i>Components</button>
  </div>
  </div>
```

```
 </header>

    <img src="https://www.arduino.cc/en/pub/skins/arduinoWide/img/Icon_download-01.svg" alt="Arduino IDE" style="width:70%" class="w3-hover-opacity">

    <div class="w3-container w3-white">

      <p><b>Arduino IDE</b></p>

      <p>Arduino consists of both a physical programmable circuit board  and a piece of software, or IDE that runs on your computer, used to write and upload computer code to the physical board.</p>

    <img src="https://zdnet3.cbsistatic.com/hub/i/r/2017/07/05/6067ea21-0075-4813-ba7d-1445cab17c26/resize/570x428/13df318a807b8eddaea2f9fb07f34003/001.jpg" alt="Norway" style="width:100%" class="w3-hover-opacity">

    <div class="w3-container w3-white">

      <p><b>Raspbian OS</b></p>

      <p>Raspbian is a Debian-based computer operating system for Raspberry Pi.It is open sourse Software.It is based on Linux.It is used to upload the code into raspberry pi.</p>

      <p>Arduino is an open source computer hardware and software company, microcontroller for building digital devices and interactive objects that can sense and control objects in the physical and digital world.</p>

   <div class="w3-third w3-container w3-margin-bottom">

    <img src="https://www.waveshare.com/media/catalog/product/cache/1/image/800x800/9df78eab33525d08d6e5fb8d27136e95/s/e/sensors-pack_l_5.jpg" alt="Norway" style="width:100%" class="w3-hover-opacity">

    <div class="w3-container w3-white">

      <p><b>Sensors</b></p>

      <p>Here,In this project some sensors like Fire sensor,Moisture Sensor,Smoke Sensor,MQ-2 gas Sensor...etc are used for security Purpose and these helps in detecting and responsing to the environment.</p>

    </div>

   </div>

   <div class="w3-third w3-container">

    <img src="http://tp-advisors.com/upload/h/home-design-3d-3d-home-designs-layouts-apps-on-google-play-interesting-decoration.jpeg" alt="Norway" style="width:100%" class="w3-hover-opacity">

    <div class="w3-container w3-white">

      <p><b>3D-Home Design</b></p>

<p>The 3D Home is build using the foam sheets and Glue Gun and where all the parts were installed and fixed.Then we will demonstrate them using Internet of Things(IOT).</p>

    </div>

   </div>

 </div>

 <!-- Pagination -->

 <div class="w3-center w3-padding-32">

   <div class="w3-bar">

    <a href="#" class="w3-bar-item w3-button w3-hover-black">«</a>
```

```
    <a href="#" class="w3-bar-item w3-black w3-button">1</a>
  <div class="w3-container w3-padding-large" style="margin-bottom:32px">
   <h4><b>About The Project</b></h4>
    <p>Home Automation using IOT and Arduino. The main objective of this project is to build a smart home device which can be used to control the home appliances via internet.This establishes the internet connection to the system and all the home appliances can in turn be connected and controlled by internet.To facilitate the wireless connectivity with the system, the Arduino Uno will be embedded with a WiFi module. This establishes the internet connection to the system and all the home appliances can in turn be connected and controlled by internet.
</p>
    <hr>
    <div class="w3-grey">
     <div class="w3-container w3-dark-grey w3-padding w3-center" style="width:95%">95%</div>
    </div>
    <div class="w3-grey">
     <div class="w3-container w3-dark-grey w3-padding w3-center" style="width:85%">85%</div>
    </div>
       <label>Message</label>
       <input class="w3-input w3-border" type="text" name="Message" required>
     </div>
     <button type="submit" class="w3-button w3-black w3-margin-bottom"><i class="fa fa-paper-plane w3-margin-right"></i>Send Message</button>
    </form>
  </div>
<!-- End page content -->
</div>
<script>
// Script to open and close sidebar
function w3_open() {
    document.getElementById("mySidebar").style.display = "block";
    document.getElementById("myOverlay").style.display = "block";
}
function w3_close() {
    document.getElementById("mySidebar").style.display = "none";
    document.getElementById("myOverlay").style.display = "none";
}
</script>
</body>
</html>
```

Complaint box

```
<!DOCTYPE html>
<html lang="en">

 <head>

   <meta charset="utf-8">
   <meta name="viewport" content="width=device-width, initial-scale=1, shrink-to-fit=no">
   <meta name="description" content="">
   <meta name="author" content="">

   <title>New Age - Start Bootstrap Theme</title>

   <!-- Bootstrap core CSS -->
   <link href="vendor/bootstrap/css/bootstrap.min.css" rel="stylesheet">

   <!-- Custom fonts for this template -->
   <link href="vendor/fontawesome-free/css/all.min.css" rel="stylesheet">
   <link rel="stylesheet" href="vendor/simple-line-icons/css/simple-line-icons.css">
   <link href="https://fonts.googleapis.com/css?family=Lato" rel="stylesheet">
   <link href="https://fonts.googleapis.com/css?family=Catamaran:100,200,300,400,500,600,700,800,900" rel="stylesheet">
   <link href="https://fonts.googleapis.com/css?family=Muli" rel="stylesheet">

   <!-- Plugin CSS -->
   <link rel="stylesheet" href="device-mockups/device-mockups.min.css">

   <!-- Custom styles for this template -->
   <link href="css/new-age.min.css" rel="stylesheet">

 </head>

 <body id="page-top">

   <!-- Navigation -->
   <nav class="navbar navbar-expand-lg navbar-light fixed-top" id="mainNav">
     <div class="container">
       <a class="navbar-brand js-scroll-trigger" href="#page-top">The Complaint Box</a>
            <button class="navbar-toggler navbar-toggler-right" type="button" data-toggle="collapse" data-target="#navbarResponsive"
aria-controls="navbarResponsive" aria-expanded="false" aria-label="Toggle navigation">
         Menu
         <i class="fas fa-bars"></i>
       </button>
       <div class="collapse navbar-collapse" id="navbarResponsive">
         <ul class="navbar-nav ml-auto">
           <li class="nav-item">
             <a class="nav-link js-scroll-trigger" href="#download">Download</a>
           </li>
           <li class="nav-item">
             <a class="nav-link js-scroll-trigger" href="#features">Features</a>
           </li>
           <li class="nav-item">
             <a class="nav-link js-scroll-trigger" href="#contact">Contact</a>
           </li>
         </ul>
       </div>
     </div>
   </nav>


   <section class="features" id="features">
     <div class="container">
       <div class="section-heading text-center">
         <h2>To improve the quality of Lifestyle</h2>
```

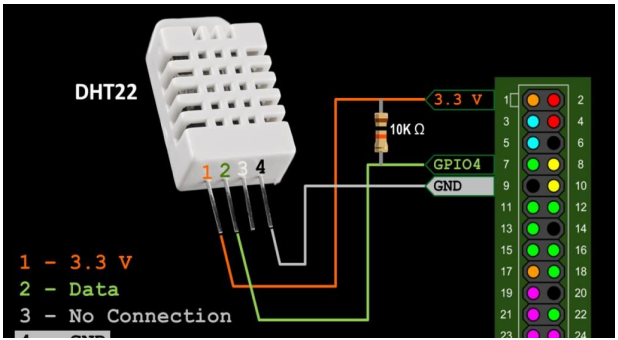
```
        <p class="text-muted">Our new featured app is a great platform for the users as well as for the private sector companies to help maximize their sales on the basis of the reviews given by the customers!</p>
        <hr>
       </div>
       <div class="row">
        <div class="col-lg-4 my-auto">
         <div class="device-container">
          <div class="device-mockup iphone6_plus portrait white">
           <div class="device">
            <div class="screen">
             <!-- Demo image for screen mockup, you can put an image here, some HTML, an animation, video, or anything else! -->
             <img src="img/demo-screen-1.jpg" class="img-fluid" alt="">
            </div>
            <div class="button">
             <!-- You can hook the "home button" to some JavaScript events or just remove it -->
            </div>
           </div>
          </div>
         </div>
        </div>
        <div class="col-lg-8 my-auto">
         <div class="container-fluid">
          <div class="row">
           <div class="col-lg-6">
            <div class="feature-item">
             <i class="icon-screen-smartphone text-primary"></i>
             <h3>Free App</h3>
             <p class="text-muted">Free application for customers!</p>
            </div>
           </div>
           <div class="col-lg-6">
            <div class="feature-item">
             <i class="icon-badge text-primary"></i>
             <h3>Awarded</h3>
             <p class="text-muted">Preffered by customers worldwide!</p>
            </div>
           </div>
          </div>
          <div class="row">
           <div class="col-lg-6">
            <div class="feature-item">
             <i class="icon-bubbles text-primary"></i>
             <h3>New Assistant</h3>
             <p class="text-muted">Always ready to help assistant!</p>
            </div>
           </div>
           <div class="col-lg-6">
            <div class="feature-item">
             <i class="icon-lock text-primary"></i>
             <h3>Completely Secure</h3>
             <p class="text-muted">Feel free to connect on the most secure platform!</p>
            </div>
           </div>
          </div>
         </div>
        </div>
       </div>
      </div>
     </section>

     <section class="cta">
      <div class="cta-content">
       <div class="container">
        <h2>Stop waiting.<br>Take your first step.</h2>
        <a href="#contact" class="btn btn-outline btn-xl js-scroll-trigger">Let's Get Started!</a>
       </div>
```

```
  </div>
  <div class="overlay"></div>
</section>

<section class="contact bg-primary" id="contact">
  <div class="container">
    <h2>We
      <i class="fas fa-heart"></i>
      new friends!</h2>
    <ul class="list-inline list-social">
      <li class="list-inline-item social-twitter">
        <a href="#">
          <i class="fab fa-twitter"></i>
        </a>
      </li>
      <li class="list-inline-item social-facebook">
        <a href="#">
          <i class="fab fa-facebook-f"></i>
        </a>
      </li>
      <li class="list-inline-item social-google-plus">
        <a href="#">
          <i class="fab fa-google-plus-g"></i>
        </a>
      </li>
    </ul>
  </div>
</section>

<footer>
  <div class="container">
    <p>&copy; Complaint Box 2018. All Rights Reserved.</p>
    <ul class="list-inline">
      <li class="list-inline-item">
        <a href="#">Privacy</a>
      </li>
      <li class="list-inline-item">
        <a href="#">Terms</a>
      </li>
      <li class="list-inline-item">
        <a href="#">FAQ</a>
      </li>
    </ul>
  </div>
</footer>

<!-- Bootstrap core JavaScript -->
<script src="vendor/jquery/jquery.min.js"></script>
<script src="vendor/bootstrap/js/bootstrap.bundle.min.js"></script>

<!-- Plugin JavaScript -->
<script src="vendor/jquery-easing/jquery.easing.min.js"></script>

<!-- Custom scripts for this template -->
<script src="js/new-age.min.js"></script>

</body>
</html>
```

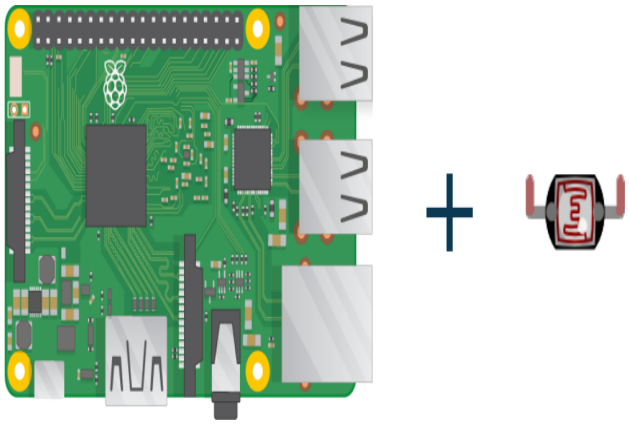
```
#include <dht.h>

dht DHT;

#define DHT11_PIN 7

void setup(){

Serial.begin(9600);

void loop()

 int chk = DHT.read11(DHT11_PIN);

Serial.println(DHT.temperature);

Serial.println(DHT.humidity);

delay(1000);}
```

```
const int ldr_pin = 7;

const int led_pin = 13;

void setup() {

   pinMode(ldr_pin,INPUT);

   pinMode(led_pin,OUTPUT);

   Serial.begin(9600);}

void loop() {

  if( digitalRead( ldr_pin ) == 1){

     digitalWrite( led_pin,HIGH);}

  else{

     digitalWrite( led_pin , LOW);}

  Serial.println( digitalRead( ldr_pin ));

  delay(100);}
```

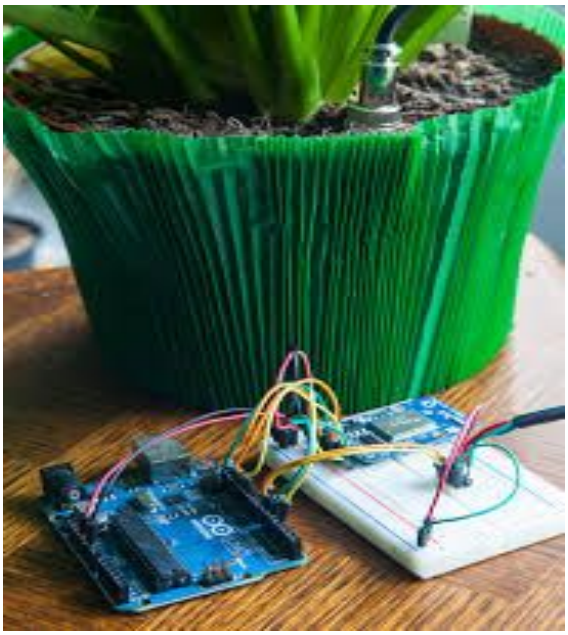
DHT



LDR



Gardening



```
int ACTUATEURPUMP = 13;
int screen = 0;
int val;
void setup(){
  pinMode(ACTUATEURPUMP,OUTPUT);
  pinMode(BUTTON,INPUT);}
void loop(){
  val = digitalRead(BUTTON);
  if(val == LOW){
  digitalWrite(ACTUATEURPUMP,
  else{
  digitalWrite(ACTUATEURPUMP,
  delay(100);}
```

Gas


```
int gaz=0;
int screen = 0;
int screenValue = 0;
void setup() {
  pinMode(buzzer,OUTPUT);
  Serial.begin(9600);}
void loop() {
  screenValue = analogRead(screen);
  Serial.println(screenValue, DEC);
  if(screenValue > 200) {
    digitalWrite(buzzer, LOW);}
  else {
    digitalWrite(buzzer, HIGH); }}
```

Fire

```
import os
import numpy as np
from keras.models import Sequential
from keras.layers import Activation, Dropout, Flatten, Dense
from keras.preprocessing.image import ImageDataGenerator
from keras.layers import Convolution2D, MaxPooling2D, ZeroPadding2D
from keras import optimizers
from keras import applications
from keras.models import Model
img_width, img_height = 150, 150
train_data_dir = 'data/train'
validation_data_dir = 'data/validation'
datagen = ImageDataGenerator(rescale=1./255)
batch_size = 32
train_generator = datagen.flow_from_directory(
    train_data_dir,
    target_size=(img_width, img_height),
    batch_size=batch_size,
    class_mode='binary')
validation_generator = datagen.flow_from_directory(
    validation_data_dir,
    target_size=(img_width, img_height),
    batch_size=batch_size,
    class_mode='binary')
model = Sequential()
model.add(Convolution2D(32, (3, 3), input_shape=(img_width, img_height,3)))
model.add(Activation('relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Convolution2D(32, (3, 3)))
model.add(Activation('relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))
model.add(Activation('relu'))
model.add(MaxPooling2D(pool_size=(2, 2)))
```

```
model.compile(loss='binary_crossentropy',
              optimizer='rmsprop',
                                        metrics=['accuracy'])
epochs = 30
train_samples = 2048
validation_samples=832
model.fit_generator(train_generator, steps_per_epoch=train_samples,
epochs=epochs,
validation_data=validation_generator,
validation_steps=validation_samples)
model.save_weights('models/basic_cnn_30_epochs.h5')
model.evaluate_generator(validation_generator, validation_samples)
train_datagen_augmented = ImageDataGenerator(
    rescale=1./255,
    shear_range=0.2,
    zoom_range=0.2,
    horizontal_flip=True)
train_generator_augmented                    =
train_datagen_augmented.flow_from_directory(
    train_data_dir,
    target_size=(img_width, img_height),
    batch_size=batch_size,
    class_mode='binary')
model.fit_generator(
    train_generator_augmented,
    steps_per_epoch=train_samples // batch_size,
    epochs=epochs,
                        validation_data=validation_generator,
model.add(Convolution2D(64, (3, 3)))
    validation_steps=validation_samples // batch_size,)
model.save_weights('models/augmented_30_epochs.h5')
model.evaluate_generator(validation_generator, validation_samples)
```

Predictor code