Model Program Book

Designed & Developed by

APSCHE
ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION
జిజ్ఞాస కార్యవాహిక

SMART INTERNSHIP PROJECT REPORT ON

WEATHER IO – WEATHER APP

Submitted in partial fulfilments of the requirements awarded for the degree

BACHELOUR OF TECHNOLOGY

In

ELECTRONICS AND COMMUNICATION ENGINEERING

Submitted by

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CERTIFICATE

This is to certify that the Summer Internship project work entitled **WEATHER IO-WEATHER APP** is being submitted for partial fulfillment of BACHELOR OF

TECHNOLOGY in Electronics and Communication Engineering to **GIET Engineering College**, Rajahmundry, A.P. affiliated to the JNTUK, Kakinada, is Bonafide work done by NAME: **S VAMSI KRISHNA** bearing Roll. No: 20T91A0436, NAME: **M H N SAI LAKSHMI** bearing Roll. No: 20T91A0427, NAME: **M GOWTHAM** bearing Roll.No:20T91A0428,NAME: **P SANDEEP** bearing Roll.No:20T91A0431, during the academic year 2023-2024 and it has been found suitable for acceptance according to the requirement of university. This results embodied in the community service project report have not been submitted to any other university or institute for the award of degree.

Project Guide **Project Incharge**

Head of the Department

ACKNOWLEDGEMENT

Behind any major work undertaken by an individual

there lies the contribution of the people who helped him to cross all the hurdles to achieve his goal. It gives me the immense pleasure to express my sense of sincere gratitude to- wards my respected guide **Mr. D. RAMESH**, for his persistent, outstanding, invaluable cooperation and guidance. It is my achievement to be guided under him. He is a constant source of encouragement and momentum that any intricacy becomes simple. I gained a lot of invaluable guidance and prompt suggestions from him during entire project work. I will be indebted of him forever and I take pride to work under him.

ABSTRACT:

Whether-IO is an innovative project that aims to streamline and optimize the process of weather data input and output for various applications and industries. Leveraging modern technologies and data integration methods, Whether-IO offers a robust and scalable platform that facilitates the seamless exchange of weather data between different systems, devices, and stakeholders. The primary objective of Whether-IO is to address the challenges associated with accessing, sharing, and utilizing weather-related information effectively. The platform acts as a central hub for collecting, processing, and distributing weather data, enabling organizations, developers, researchers, and individuals to harness this information efficiently.

Keywords: Personalized Weather Forecasts, Hourly and Daily Forecasts, Interactive Weather Maps, Real-Time Data Integration

CONTENTS

1. INTRODUCTION

1.1 Overview :

Weather forecasting is the application of current technology and science to predict the state of the atmosphere for a future time and a given location.

People can download thousands of weather apps on Apple App Store or Android Play Store nowadays. Those apps show about present weather information and weather forecasts, with sleek and gorgeous interfaces. It seems it's unnecessary to design more weather applications, but I designed new one few days ago.

1.2 Purpose:

Weather forecasting is the application of science and technology to predict the conditions of the atmosphere for a given location and time. People have attempted to predict the weather informally for millennia and formally since the 19th century.

Weather forecasts are made by collecting quantitative data about the current state of the atmosphere, land, and ocean and using meteorology to project how the atmosphere will change at a given place.

The inaccuracy of forecasting is due to the chaotic nature of the atmosphere, the massive computational power required to solve the equations that describe the atmosphere, the land, and the ocean, the error involved in measuring the initial conditions, and an incomplete understanding of atmospheric and related

processes. Hence, forecasts become less accurate as the difference between current time and the time for which the forecast is being made increases. The use of ensembles and model consensus helps narrow the error and provide confidence in the forecast.

There is a vast variety of end uses for weather forecasts. Weather warnings are important because they are used to protect life and property. Forecasts based on temperature and precipitation are important to agriculture, and therefore to traders within commodity markets. Temperature forecasts are used by utility companies to estimate demand over coming days.

On an everyday basis, many people use weather forecasts to determine what to wear on a given day. Since outdoor activities are severely curtailed by heavy rain, snow and wind chill, forecasts can be used to plan activities around these events, and to plan ahead and survive them.

2.LITERATURE SURVEY:

There are many research papers that have been published related to predicting the weather. A paper was published on 'The Weather Forecast Using Data Mining Research Based on Cloud Computing This paper proposes a modern method to develop a service-oriented architecture for the weather information systems which forecast weather using these data mining techniques. This can be carried out by using Artificial Neural Network and Decision tree Algorithms and meteorological data collected in Specific time. Algorithm has presented the best results to generate classification rules for the mean weather variables. The results showed that these data mining techniques can be enough for weather forecasting.

2.1 Existing a problem:

1.**Prediction accuracy**:

Weather forecasting is a complex process, and achieving high accuracy for all weather parameters remains challenging. Factors such as chaotic atmospheric behavior, limited data, and computational limitations contribute to forecast uncertainties.

2.Extreme events:

Predicting extreme weather events like hurricanes, tornadoes, and heatwaves with high precision is difficult due to their localized and rapidly changing nature.

3.Data assimilation:

Integrating vast amounts of observational data into numerical models effectively can be problematic, leading to potential inaccuracies in the forecasts.

4.Model limitations:

Numerical weather prediction models have inherent limitations, such as spatial resolution, parameterizations, and uncertainties in initial conditions.

5.Regional variations:

Weather systems can vary significantly across different regions, and forecasting for specific locations may require more localized data and modeling approaches.

6.Communication and understanding:

Presenting complex weather information in a clear and understandable manner to the public can be a challenge for meteorologists and weather agencies.

2.2 Proposed solution:

1.Enhanced data collection:

Increasing the number and quality of weather observations through advanced sensor networks, satellites, and ground-based stations can provide more comprehensive data for weather models.

2.High-resolution models:

Developing and utilizing higher-resolution numerical weather prediction models can improve the accuracy of forecasts, especially for localized events and extreme weather.

3.Ensemble forecasting:

Implementing ensemble forecasting, which involves running multiple simulations with slightly different initial conditions, can provide a range of possible outcomes, helping meteorologists assess uncertainty.

4.Artificial Intelligence and machine learning:

Integrating AI and machine learning algorithms can enhance data assimilation, model performance, and pattern recognition, leading to more accurate predictions.

5.Improved model physics:

Advancing the representation of atmospheric processes in numerical models can lead to better predictions, especially in complex weather scenarios.

6.Collaborative efforts:

Enhancing international cooperation and sharing weather data among meteorological agencies can lead to more comprehensive and accurate global forecasts.

7.Public engagement:

Improving communication strategies to effectively disseminate weather information to the public can help people make informed decisions during weather events.

8.Forecast verification and feedback:

Implementing robust verification procedures and gathering feedback from users can help identify areas for improvement and guide research efforts

3.THEORITICAL CALCULATION:

Theoretical analysis of weather forecasting involves examining the principles, methodologies, and challenges underlying the process. Here are some key aspects of theoretical analysis:

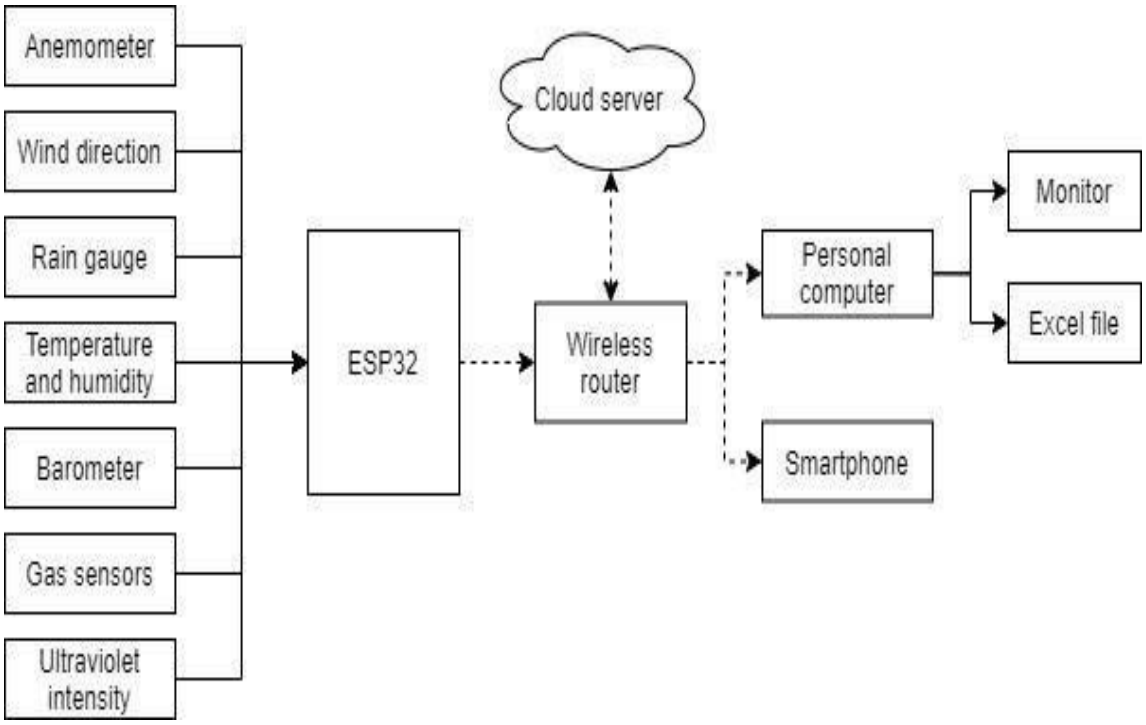
1.**Data assimilation**: Combining observations from various sources with model predictions is crucial for generating accurate forecasts. Data assimilation techniques aim to find the best possible representation of the atmosphere's initial state, reducing errors in the forecasts.

2.**Model parameterization**: Weather models cannot resolve all atmospheric processes due to their limited resolution. Parameterization involves approximating sub-grid-scale to account for their effects on the larger-scale atmospheric dynamics.

3.**Ensemble forecasting**: This approach involves running multiple simulations with slightly perturbed initial conditions or model configurations to account.

4.**Chaos theory**: Weather is a chaotic system, meaning it is highly sensitive to initial conditions. Small changes in the initial state of the atmosphere can lead to significant differences in the forecasted outcomes. This fundamental aspect makes accurate long-term weather prediction inherently challenging.

Block diagram:



Hardware design:

Workflow installed in the field station together with all these sensors starts with the initialization of the pins used, the library, the connection to the sensor, and the connection to Wi-fi. After that, the device is connected to a local Wi-fi network with the SSID and password that has been previously set. After a successful connection, the device will activate the server.

Get into the main program, that runs in an infinite loop to read all sensor data, combine all readings into one string, then send it to the server if there any request from client device.

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Software used:

Code Editor I used for this project is VS Code. It is used to code complex piece of programs and to develop complex projects. Further technologies I used for this project are HTMLS, CSS and JS.

- **HTML:** It is the code for creating web pages, using tags and other commands that a browser reads and converts into the normal web pages that people see.
- **CSS:** CSS is the language for describing the presentation of Web pages, including colours, layout, and fonts.
- **JS:** JavaScript is a text-based programming language used both on the client-side and serverside that allows you to make web pages interactive. It gives web pages interactive elements that engage a user.

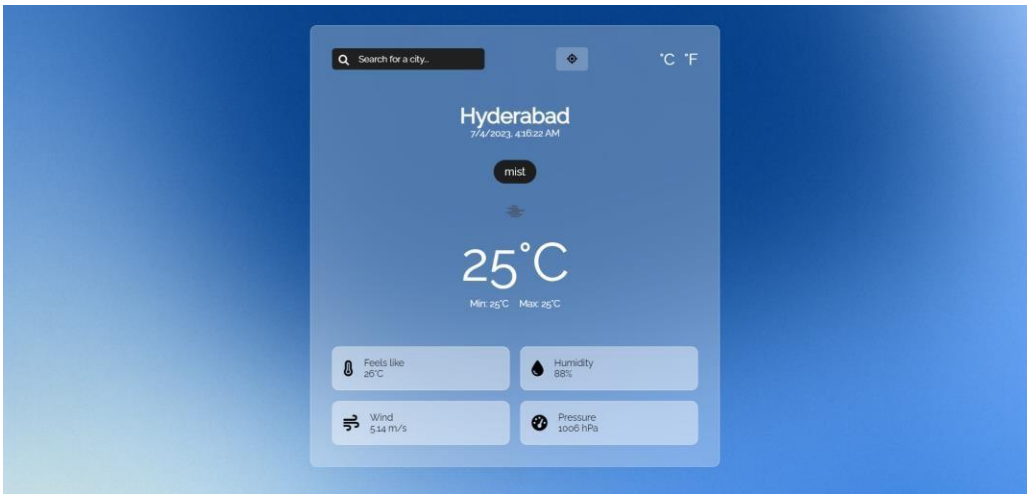
4.RESULTS:

Design and implement the user

interface • Open

index.html in your code editor.

- Set up the basic HTML structure.
- Design the layout and structure of the user interface using HTML elements and CSS classes.
- Apply styles to the UI elements using CSS in style.css.
- Link style.css to index.html.



Connect to the Open Weather Map API

In script.js, define a constant variable to store your Open Weather Map API key.

Create a function to handle API calls and fetch weather data from the Open Weather Map API. Use the fetch () function or an AJAX library to make a GET request to the Open Weather Map API, passing the necessary parameters (e.g., city name).

Handle the API response and extract the relevant weather data.

```
async function fetchWeatherData(city) {
  try {
    const response = await fetch(
      `${baseUrl}?q=${city}&appid=${apiKey}&units=${units}`
    );
    if (!response.ok) {
      throw new Error("Weather data not available.");
    }
    const data = await response.json();
    updateWeatherInfo(data);
  } catch (error) {
    console.log(error);
  }
}
```

```
function updateWeatherInfo(data) {
  cityElement.textContent = data.name;
  datetimeElement.textContent = getCurrentTime();
  forecastElement.textContent = data.weather[0].description;
  iconElement.innerHTML = `<img src="http://openweathermap.org/img/wn/${data.weather[0].icon}.png" alt="Weather Icon">`;
  temperatureElement.innerHTML = `${Math.round(data.main.temp)}&#176;${
    units === "metric" ? "C" : "F"
  }`;
  minMaxElement.innerHTML = `<p>Min: ${Math.round(data.main.temp_min)}&#176;${
    units === "metric" ? "C" : "F"
  }</p><p>Max: ${Math.round(data.main.temp_max)}&#176;${
    units === "metric" ? "C" : "F"
  }</p>`;
  realFeelElement.innerHTML = `<p>${Math.round(data.main.feels_like)}&#176;${
    units === "metric" ? "C" : "F"
  }</p>`;
  humidityElement.textContent = `${data.main.humidity}%`;
  windElement.textContent = `${data.wind.speed} ${
    units === "imperial" ? "mph" : "m/s"
  }`;
  pressureElement.textContent = `${data.main.pressure} hPa`;
}
```

Fetch weather data based on user input

Add an input field and a button to the UI to allow users to enter a city name or zip code.

Add an event listener to the button to trigger the weather data fetch function when clicked. Retrieve the user input from the input field. Call the API function, passing the user input as a parameter.

```
searchForm.addEventListener("submit", (e) => {
  e.preventDefault();
  const city = searchInput.value.trim();
  if (city !== "") {
    fetchWeatherData(city);
  }
  searchInput.value = "";
});
```

Update the UI with the fetched weather data

Create functions to update the UI with the fetched weather data.

Select the necessary UI elements using JavaScript DOM manipulation methods. Modify the UI elements' content or styles to display the weather information dynamically.

Run it using Flask

Using the following code, you can run your application using flask

```
from flask import Flask, render_template

app = Flask(__name__)

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

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

5. ADVANTAGES AND DISADVANTAGES:

Advantages:

- Farmers can know when to plant or harvest their crops
- People can choose where and when to take their holidays to take advantages of good weather
- Surfers known when large waves are expected
- Regions can be evacuated if hurricanes or floods are expected
- Aircraft and shipping rely heavily on accurate weather forecasting
- **Disadvantages:**
- Weather is extremely difficult to forecast correctly
- It is expensive to monitor-so many variables from so many sources
- The computers needed to perform the millions of calculations necessary are expensive
- The weather forecasters get blamed if the weather is different from the forecast
- The terminology used in weather forecasting can be confusing, making it difficult for some people to understand the predictions

6.APPLICATIONS:

- weather forecasting enables you to properly plan your farm operations, such as planting, irrigation, fertilizer application, pruning/weeding, harvesting or livestock mating, since farming and agriculture as a whole chiefly depend on seasons and weather.
- It detects the development and movement of storm systems and other cloud patterns, meteorological satellites can also detect other phenomena such as city lights, fires, effects of pollution, auroras, sand and dust storms, snow cover, ice mapping, boundaries of ocean currents, and energy flows.

7.FUTURE SCOPE:

The demand for weather and climate forecast information in support of critical decision-making has grown rapidly during the last decade, and will grow even faster in the coming years. Great advances have been made in the utilization of predictions in many areas of human activities.

8.CONCLUSION:

Even though the weather app development may seem to be an easy task, it calls for a lot of time, dedication and the right skills. Not only they must be improvised with just a few features and uncomplicated design, but instead location and weather forecast services must be inputted to in order to pave impressive results. So, it is important that you hire a team of competent iPhone or android developers that assist you in building the perfect weather app that matches your expectations..