PROJECT REPORT

ON

"WEATHER.IO APP"

A Project Report Submitted in Partial fulfillments of Requirements for the Award of the Degree

of

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

Submitted To

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CHAPTER 1

INTRODUCTION

Weather forecasting is the application of science and technology to predict the state of the atmosphere for a given location. Ancient weather forecasting methods usually relied on observed patterns of events,also termed pattern recognition. For example, it might be observed that if the sunset was particularly red,the following day often brought fair weather. However, not all of these predictions prove reliable.

1.1 Overview A brief description about your project

In this project, we will build an app that will find the device's location coordinates(longitude and latitude). Then we will send this data to the API via an **API key**(which we will see later). The API will send us a **JSON** from which we will extract the required data that is the temperature and city of the location.

A weather app is a digital application designed to provide users with real-time weather information and forecasts. It is a convenient and user-friendly tool that enables individuals to access weather data from their smartphones, tablets, or computers. These apps have become increasingly popular due to their ability to help people plan their daily activities, make informed travel decisions, and stay prepared for various weather conditions.

Weather apps draw data from multiple sources, including meteorological organizations, weather stations, satellites, and other weather monitoring systems. The information is then processed and presented in a visually appealing and easily understandable format. Users can access a range of weather-related data, such as current temperature, humidity, wind speed, atmospheric pressure, precipitation chances, and extended forecasts for several days ahead.

Key features of weather apps may include:

1. **Real-time Weather Updates**: The app displays the current weather conditions in the user's location or any other specified location.

2. **Hourly and Daily Forecasts**: Users can view forecasts for the next few hours or days to plan their activities accordingly.

3. **Interactive Maps**: Weather apps often include interactive maps that show weather patterns, radar images, and satellite data.

4. **Weather Alerts**: The app may provide severe weather alerts and warnings to keep users informed about potentially dangerous conditions.

5. **Customizable Locations**: Users can set multiple locations to monitor the weather in places they care about, like their home, workplace, or travel destinations.

1.2 Purpose The use of this project. What can be achieved using this:

The Weather.io is a web application that provides real-time weather information for a specified location. It utilizes the OpenWeatherMap API to fetch weather data and displays it in a user-friendly interface. Users can search for a location by city name and receive detailed weather information, including temperature, humidity, wind speed, and weather conditions.

There are several reasons why weather forecasts are important. They would certainly be missed if they were not there. It is a product of science that impacts the lives of many people.

 The following is a list of various reasons why weather forecasts are important:
1. Helps people prepare for how to dress (i.e. warm weather, cold weather, windy weather, rainy weather)
2. Helps businesses and people plan for power production and how much power to use (i.e.power companies, where to set thermostat)
3. Helps people prepare if they need to take extra gear to prepare for the weather (i.e. umbrella, rain coat, sun screen)
4. Helps people plan outdoor activities (i.e. to see if rain/storms/cold weather will impact outdoor event)
5. Helps curious people to know what sort of weather can be expected (i.e. a snow on the way, severe storms)
6. Helps businesses plan for transportation hazards that can result from the weather (i.e. fog, snow, ice, storms, clouds as it relates to driving and flying for example)
7. Helps people with health related issues to plan the day (i.e. allergies, asthma, heat stress)
8. Helps businesses and people plan for severe weather and other weather hazards (lightning, hail, tornadoes, hurricanes, ice storms)

9. Helps farmers and gardeners plan for crop irrigation and protection (irrigation scheduling, freeze protection).

Functionality

Locations can be added or removed by pressing the list icon in the bottom right corner of the application, which allows the user to type in the city's name, ZIP Code or postal code or airport code. For each city, the app will display the current, highest, and lowest temperatures, a 10-day forecast, UV index, time of sunrise and sunset, current wind direction and speed, rainfall measurements, current humidity, outdoor visibility range, and barometric pressure. In some locations, the app will also display an air quality report and show next-hour precipitation when raining or snowing.

iOS 14 introduced support for severe weather warnings, allowing a user to receive notifications for government-issued severe weather events such as tornadoes, flash flooding, strong winds, and snow storms. With iOS 15, a weather map can be accessed from the bottom left of the application which can display the temperature, air quality, and a multi-day precipitation forecast.

Pre-Requisites

To complete this project, you will need:

- A code editor (such as Visual Studio Code, Sublime Text, or Atom)
- A web browser
- An internet connection
- HTML, CSS or Bootstrap, and JavaScript knowledge
- OpenWeatherMap API key (sign up at https://openweathermap.org/ to obtain one)

Languages used

HTML

The Hypertext Markup Language or HTML is the standard markup language for documents designed to be displayed in a web browser. It can be assisted by technologies such as Cascading Style Sheets (CSS) and scripting languages such as JavaScript. Web browsers receive HTML documents from a web server or from local storage and render the documents into multimedia web pages. HTML describes the structure of a web page semantically and originally included cues for the appearance of the document.

CSS

CSS stands for Cascading Style Sheets. It is a style sheet language which is used to describe the look and formatting of a document written in markup language. It provides an additional feature to HTML. It is generally used with HTML to change the style of web pages and user interfaces. It can also be used with any kind of XML documents including plain XML, SVG and XUL. CSS is used along with HTML and JavaScript in most websites to create user interfaces for web applications and user interfaces for many mobile applications.

JavaScript

JavaScript is a dynamic computer programming language. It is lightweight and most commonly used as a part of web pages, whose implementations allow client-side script to interact with the user and make dynamic pages. It is an interpreted programming language with object-oriented capabilities.

CHAPTER 2

LITERATURE SURVEY

2.1 Existing problem Existing approaches or method to solve this problem

2.1 Problem Statement

Weather prediction is a useful tool for informing populations of expected weather conditions.Weather prediction is a complex topic and poses significant variation in practice. We will attempt to understand and implement a weather prediction application using the linearregression.

It is important to exactly determine the rainfall for effective use of water resources, crop productivity and pre-planning of water strucure.

Problem and Existing Technology

The traditional forecast process employed by most NMHSs involves forecasters producing text-based, sensible, weather-element forecast products (e.g. maximum/minimum temperature, cloud cover) using numerical weather prediction (NWP) output as guidance. The process is typically schedule-driven, product-oriented and labour-intensive. Over the last decade, technological advances and scientific breakthroughs have allowed NMHSs' hydrometeorological forecasts and warnings to become much more specific and accurate.

As computer technology and high-speed dissemination systems evolved (e.g. Internet), National Weather Service (NWS) customers/partners were demanding detailed forecasts in gridded, digital and graphic formats. Traditional NWS text forecast products limit the amount of additional information that can be conveyed to the user community. The concept of digital database forecasting provides the capability to meet customer/partner demands for more accurate, detailed hydrometeorological forecasts. Digital database forecasting also offers one of the most exciting opportunities to integrate PWS forecast dissemination and service delivery, which most effectively serves the user community.
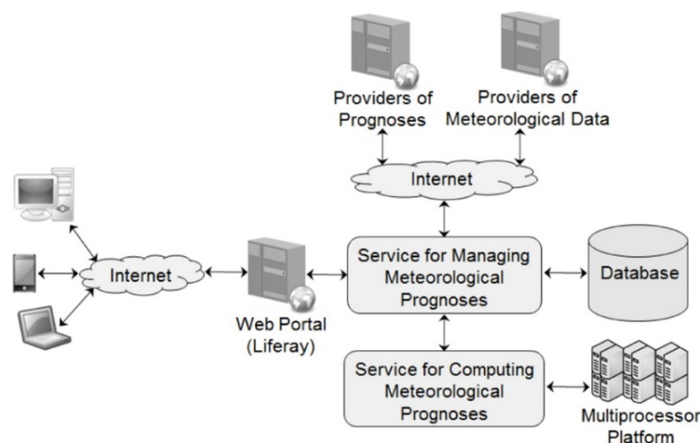
1. **Accuracy Issues**: Despite advancements in weather prediction models and data sources, weather forecasts are not always 100% accurate. Users may experience discrepancies between the forecasted weather and the actual conditions.

2. **Data Variability**: Weather data availability and accuracy can vary between different regions and locations. Some areas may have fewer weather stations or sensors, leading to less reliable forecasts for those specific regions.

3. **Limited Short-term Precision**: While weather apps generally provide accurate forecasts for the coming days, they may face challenges in predicting extremely short-term weather changes, such as sudden rain showers or thunderstorms.

4. **Battery and Data Usage**: Weather apps often require continuous data updates and location services, leading to increased battery usage and data consumption on mobile devices.

5. **User Location Accuracy**: Weather apps heavily rely on users' location data to provide accurate forecasts. However, errors in location services or when users travel to new areas can result in inaccurate weather information.

6. **Inconsistent User Interface**: Different weather apps may have varying user interfaces and design styles, leading to a lack of standardization and making it harder for users to switch between apps seamlessly.

7. **Overloaded with Advertisements**: Some free weather apps generate revenue through advertisements, which can lead to a less enjoyable user experience due to the frequency and intrusiveness of ads.

8. **Lack of Accessibility Features**: Weather apps may not always be fully accessible to users with disabilities, such as visual impairments, which can limit their usability for certain individuals.

Proposed solution

4.1 Persistence forecasting Persistence forecasting is the easiest method of forecasting which assumes a continuation of the present. It relies upon today's conditions to forecast the weather when it is steady state, such as during the summer season in the tropics. This method of forecasting strongly depends upon the presence of a stagnant weather pattern. It can be useful in both short-range forecasts and long-range forecasts. Persistence forecasts are used by local forecasters in determining such events as the time of the arrival of a thunderstorm that is moving toward their region. Persistence forecasts do not account for changes that might occur in the intensity or in the path of a weather system, and they do not predict the formation. Because of these limitations and the rapidity with which weather system change in most geographical regions, persistence forecasts break down after twelve hours, or a day at most.

4.2 Climatology forecasting Whereas persistence forecasting is most accurate over short periods (before factors for change have had time to operate), the best estimate of the weather a long time ahead is the average value of past measurements there at that time of day and year. Climatology forecast relies on the observation that weather for a particular day at a location does not change much from one year to the next. As a result, a long term average of weather on a certain day or month should be a good guess as the weather for that day or month. The most obvious climatology forecast in this part of the world (Nigeria) is, "Cold in December, warm in July (the popular July break)". One does not need to be a meteorologist to make that forecast. Today's numerical forecast methods still use climatological statistics as a "reality check". There make sure that the computer models are not going off the deep end, climatologically speaking.

4.3 Looking at the sky Along with pressure tendency, use of the sky condition is one of more important weather parameters that can be used to forecast weather in mountainous areas. Thickening of cloud cover or the invasion of a higher cloud deck is indicative of rain in the near future. Morning fog portends fair conditions, as rainy conditions are preceded by wind or clouds, which prevent fog formation.

CHAPTER 3

THEORITICAL ANALYSIS

3.1 Block diagram Diagrammatic overview of the project.
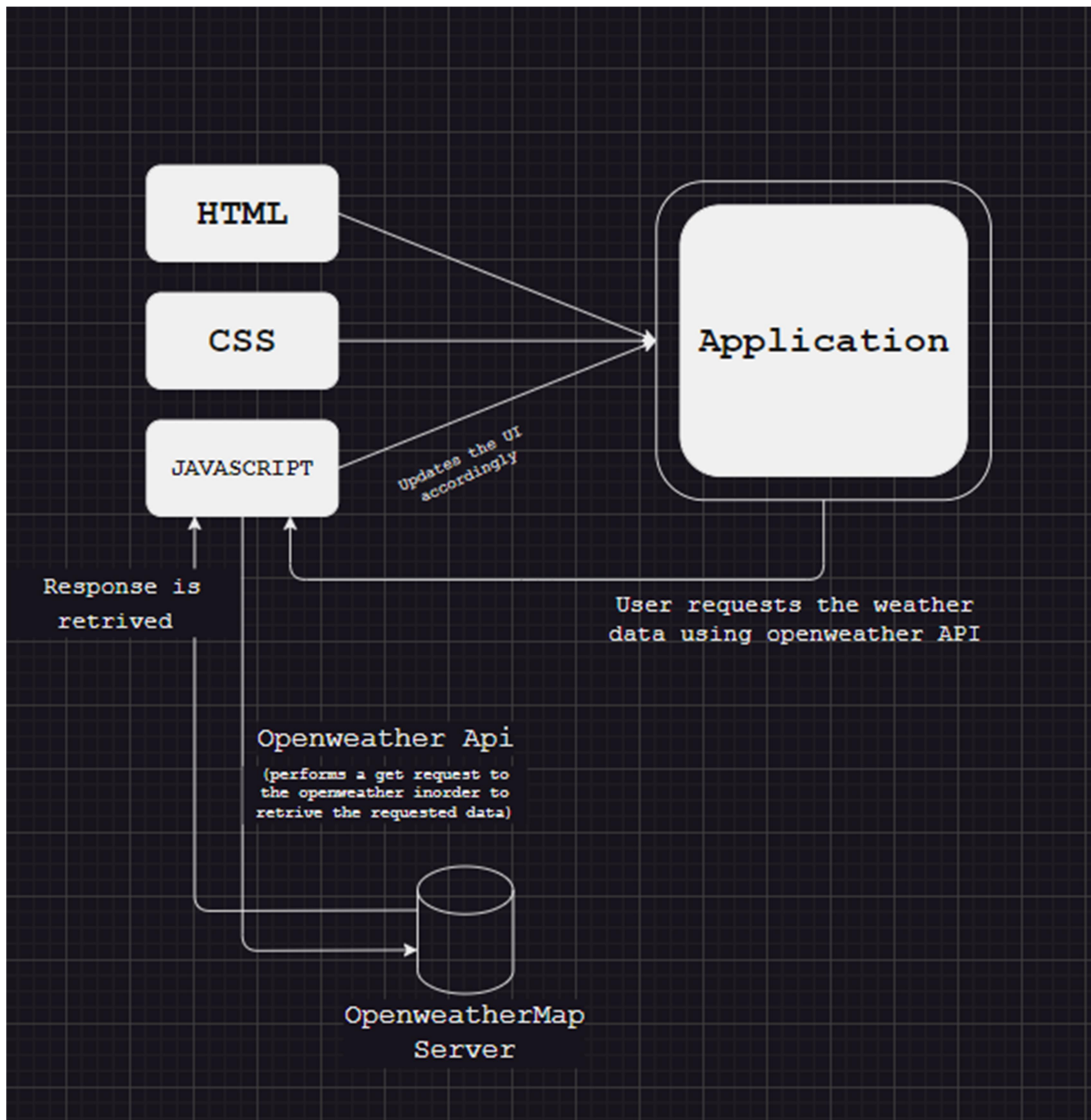
As you can see in the diagram above, a standard client-server architecture has three parts:

- **Web service repository:** This is a library of web services built to serve external requests for information. The served information is usually a little piece of information, like a number, a word, some variables, etc. For example, a flight number, a package tracking number, the status of an order (one letter), etc. This library is usually documented in great detail since external applications will call the functions it contains.
- **Web service controller:** This module communicates the information in the web service repository with the service requesters. When an external service requester calls a certain function from the web service repository, the web service controller interprets the call and looks for the function in the web server repository. Then it executes the function and returns a value to the requester.

- **Database server:** This server contains the tables, indexes, and data managed by the core application. Searches and insert/delete/update operations are executed here.
- **Service requesters:** These are external applications that request services from the web service repository through the internet, such as an organization requesting flight information from an airline or another company asking the package carrier for the location of a package at a given moment.

1.2 Hardware / Software designing Hardware and software requirements of the project

2.9.4 Hardware Requirements
The system requires a database in order to store persistent data.
2.9.5 Software Constraints
The development of the system will be constrained by the availability of required software such as web servers, dataset and development tools.

Set up the project structure

Create a new project folder for the Weather App.
Inside the project folder, create the following files/folders:
1.   index.html
2.   style.css
3.   script.js

HTML

HTML (Hypertext Markup Language) is the standard markup language used to create and structure content on the World Wide Web. It is the foundation of almost all webpages and is used to define the structure and layout of a web document, including text, images, links, multimedia, and more.

HTML documents consist of a series of elements represented by tags. Each tag is enclosed within angle brackets <>. The basic structure of an HTML document includes the following elements:

1. `<!DOCTYPE html>`: This declaration is used to specify the version of HTML being used. For modern web pages, the HTML5 doc type is used.

2. `<html>`: The root element that wraps the entire HTML document.

3. `<head>`: Contains meta-information about the document, such as the title, character set, and links to external resources.

4. `<title>`: Defines the title of the webpage, which is displayed in the browser's title bar or tab.

5. `<body>`: Contains the visible content of the webpage, including text, images, links, and other media.

HTML elements can have attributes that provide additional information about the element. Attributes are specified within the opening tag and are used to modify the behavior or appearance of the element.

HTML is often combined with CSS (Cascading Style Sheets) to control the appearance of the content, and JavaScript to add interactivity and dynamic behavior to web pages. Together, these technologies form the foundation of modern web development.

CSS

CSS (Cascading Style Sheets) is a style sheet language used to control the presentation and layout of HTML documents. It allows web developers to define how the HTML elements should be displayed on the screen, paper, or other media types.

CSS works by applying styles to HTML elements, specifying how they should look and behave. Styles are defined using rules that consist of a selector and a set of properties and values. The selector targets one or more HTML elements to which the styles should be applied, and the properties and values determine the appearance of those elements.

CSS can be applied to HTML documents in three main ways:

1. **External CSS**: In this method, CSS rules are defined in a separate external file with a `.css` extension. The HTML document links to this external file using the `<link>` element in the `<head>` section.

2. **Internal CSS**: With internal CSS, the styles are placed directly within the `<style>` element in the

3. **Inline CSS**: Inline CSS is applied directly to individual HTML elements using the `style` attribute.

CSS can control various aspects of web design, including colors, fonts, margins, padding, positioning, and responsiveness for different screen sizes. It supports selectors for targeting elements based on their tag name, class, ID, attributes, and more.

CSS is an essential part of modern web development as it allows developers to separate the presentation from the content, making it easier to maintain and update the design of a website.

Java Script

JavaScript is a high-level, interpreted programming language primarily used for creating interactive and dynamic functionality on websites. It is a core technology of web development and allows developers to add interactivity, validate data, manipulate the DOM (Document Object Model), and perform various tasks on web pages.

JavaScript can be used both on the client-side (in web browsers) and the server-side (with the help of platforms like Node.js). In the context of web development, it is mainly used on the client-side to enhance user experience and provide real-time interactions.

Here are some key features and use cases of JavaScript:

1. **DOM Manipulation**: JavaScript allows you to interact with the Document Object Model (DOM) of a web page. You can dynamically change HTML elements, update their content, style, and attributes, create new elements, and handle events like clicks and form submissions.

2. **Event Handling**: JavaScript can respond to user actions, such as mouse clicks, keyboard input, or touch events. You can attach event listeners to HTML elements to trigger specific actions when certain events occur.

3. **Asynchronous Programming**: JavaScript supports asynchronous programming through callbacks, promises, and async/await. This is crucial for handling tasks like fetching data from servers, handling user input, and avoiding blocking the main thread.

4. **AJAX (Asynchronous JavaScript and XML)**: JavaScript is commonly used to make asynchronous HTTP requests to the server without reloading the entire page. This allows for dynamic content updates and smoother user experiences.

5. **Data Validation and Manipulation**: JavaScript is used to validate user input on forms, manipulate and process data before sending it to the server, and perform calculations on the client-side.

6. **Animations and Effects**: JavaScript can create animations, transitions, and visual effects on web pages, enhancing the overall user interface.

Chapter 4

OUTPUT

4.1 Final findings (Output) of the project along with screenshots.
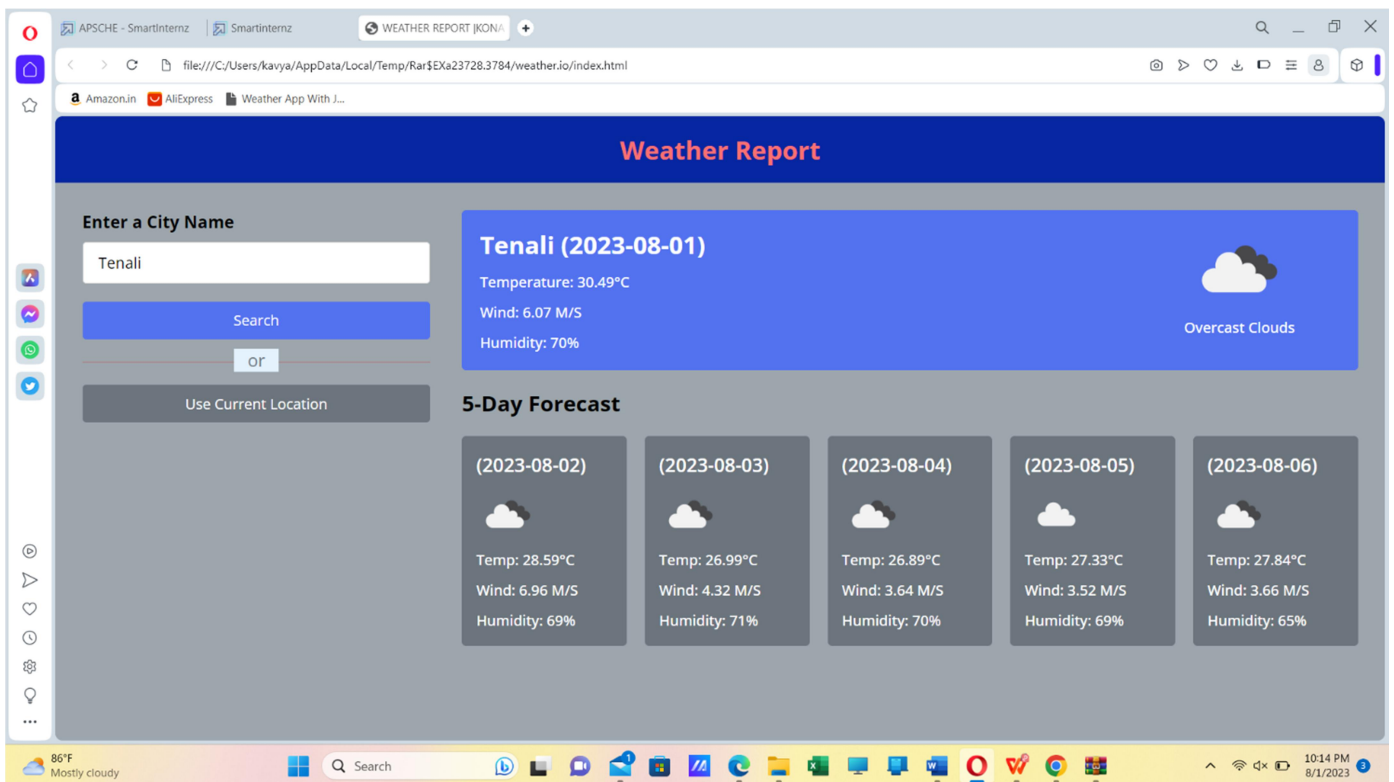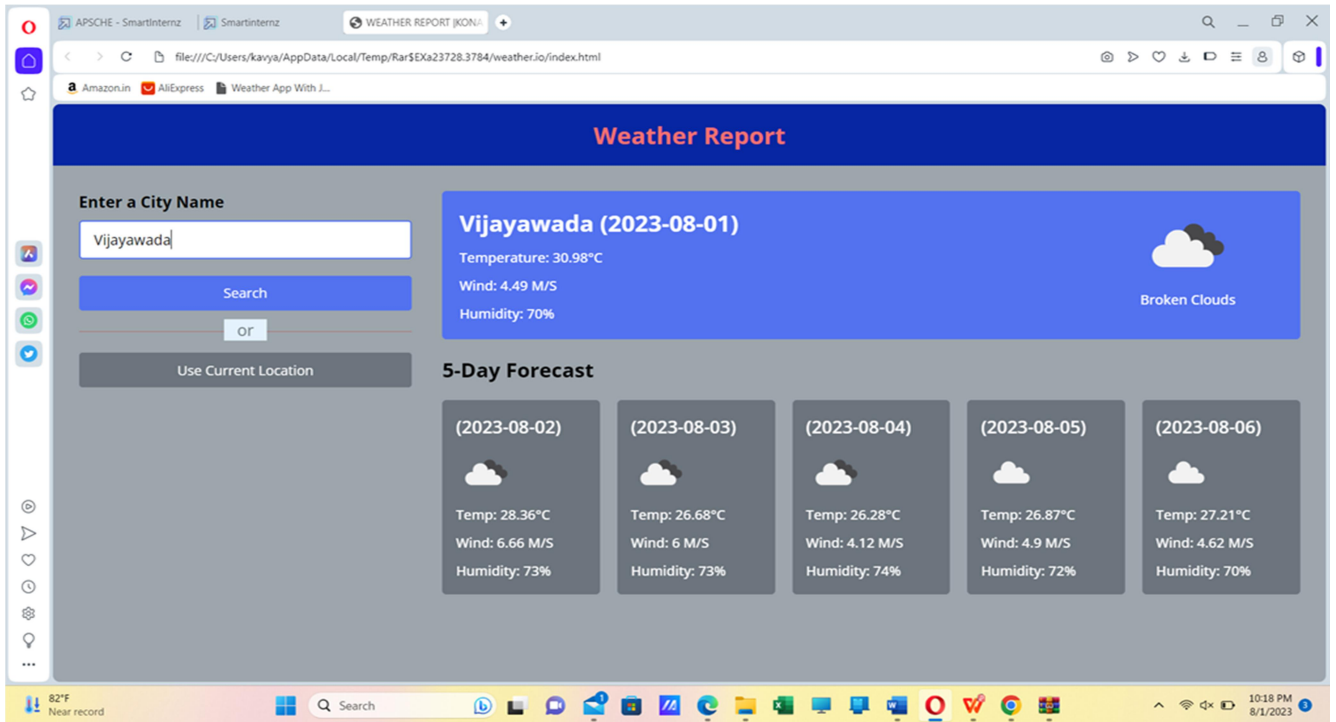
Weather Report

Enter a City Name

Guntur|

Search

or

Use Current Location

Guntur (2023-08-01)

Temperature: 30.42°C

Wind: 6.04 M/S

Humidity: 64%

Overcast Clouds

5-Day Forecast

(2023-08-02)

Temp: 28.55°C

Wind: 6.99 M/S

Humidity: 68%

(2023-08-03)

Temp: 27.26°C

Wind: 5.35 M/S

Humidity: 68%

(2023-08-04)

Temp: 27.00°C

Wind: 3.71 M/S

Humidity: 69%

(2023-08-05)

Temp: 27.40°C

Wind: 3.68 M/S

Humidity: 68%

(2023-08-06)

Temp: 28.01°C

Wind: 4.33 M/S

Humidity: 64%

Chapter 5

ADVANTAGES & DISADVANTAGES

5.1 List of advantages and disadvantages of the proposed solution

advantages

- Instant information availability
- Improved Weather forecast
- Easy Flow of Information
- Widget Support
- Interactive Maps for better weather information
- Free availability

Disadvantages

- weather is extremely difficult to forecast correctly
- it is expensive to monitor so many variables from 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
- Confusing Terminology: The terminology used in weather forecasting can be confusing, making it difficult for some people to understand the predictions.
- Reliance on Technology: Weather forecasting relies heavily on technology, and if the technology fails or is unavailable, accurate predictions cannot be made.
- Limited Reach: Weather forecasts are not available for many remote or sparsely populated areas, making it difficult for people in these areas to prepare for severe weather.

Chapter 6:

APPLICATIONS

6.1 The areas where this solution can be applied
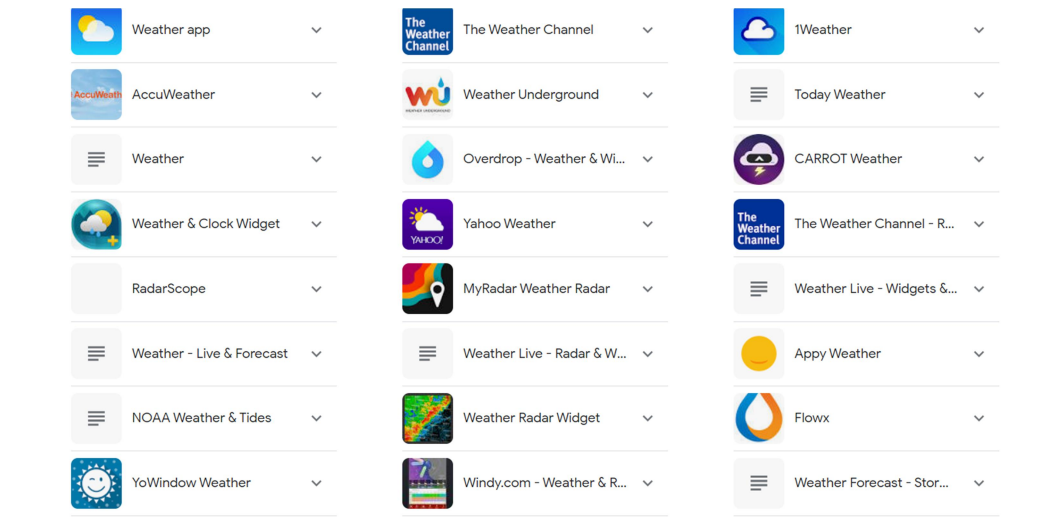
Chapter 7:

CONCLUSION

7.1 Conclusion summarizing the entire work and findings.

Now a day's there is a big demand of different types of applications, which is because IT has become the main part of our New World. There is a big need of different applications. People want application for every specific task from work to entertainment. We have developed the application "Weather WebApp" which works easy on any given web browser. The application has been tested and found to be working as per the given criteria. It can be safely concluded that the application possesses a highly efficient UI system and is working properly and meeting to all the requirements of the user. The application gives the user maximum flexibility in the types of touch and other device movements.

Chapter 8

FUTURE SCOPE
- Enhancements that can be made in the future.

- Every project whether large or small has some limitations no matter how diligently developed. In some cases, limitations are small while in other cases they may be broad also. The new system has got some limitations.

- Major areas where modifications can be done are as follows:
    - Our system does not have weather information for foreign countries or cities.
    - There is no provision for complaint handling so further it can be added.

The advancement of our ability to predict the weather and climate has been the core aspiration of a global community of scientists and practitioners, in the almost 150 years of international cooperation in meteorology and related Earth system sciences. 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. Nevertheless, further improvements in accuracy and precision, higher spatial and temporal resolution, and a better description of uncertainty are needed for realizing the full potential of forecasts as enablers of a new level of weather and climate-informed decision-making.