GLA UNIVERSITY,MATHURA

Project Synopsis: Weather Forecasting

TOPIC: MINI PROJECT SYNOPSIS ON Weather Forecasting

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INDEX

This Index is a reference for synopsis only

INTRODUCTION :-

This guide will walk you through the process of creating an interactive weather forecast application using HTML, CSS, and JavaScript. Users will be able to access current weather conditions and forecasts for any location around the world.

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.

About the Project:

The weather forecast app will have a simple and user-friendly interface. Users can input a location in a search bar, and the app will show the current weather conditions for that area. I used the OpenWeather API to retrieve weather information based on the user's location input. The app also offers extra information, including temperature, humidity, wind speed, a weather icon depicting the current conditions, and a background image of the searched location.

Primary Reason to Choose This Project

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)

The Main Objective of the Project

The objective of a weather forecasting project is to provide timely and accurate information about upcoming weather conditions. This helps in several ways:

1. Public Safety: By predicting severe weather events like storms, hurricanes, and heavy rainfall, authorities can take necessary precautions to protect lives and property.
2. Agriculture: Farmers can plan their activities, such as planting and harvesting, based on weather forecasts to optimize crop yields and reduce losses.
3. Transportation: Weather forecasts are crucial for the aviation, maritime, and road transport sectors to ensure safety and efficiency.
4. Daily Planning: Individuals can plan their daily activities, such as commuting and outdoor events, based on weather predictions.
5. Disaster Management: Early warnings of natural disasters enable better preparedness and response, minimizing the impact on communities.

Overall, the goal is to enhance decision-making across various sectors and improve public well-being

Scope Of the Project

Timeframes

Short-term forecasting: Typically covers hours to a few days ahead. It's crucial for immediate planning and response (e.g., daily weather reports).

Geographical Coverage

- Local forecasts: Focus on specific regions or cities, providing detailed information relevant to local residents.
- Regional forecasts: Cover larger areas, often used by businesses and governments for planning purposes.

Techniques and Technologies

- Numerical Weather Prediction (NWP): Utilizes mathematical models of the atmosphere to forecast weather based on current conditions.
- Remote Sensing: Involves satellite imagery and radar data to monitor weather patterns and phenomena in real-time.

Working Methodology Of the Project;

Data Collection

- Observational Data: Collect data from weather stations, satellites, radars, buoys, and aircraft. This includes temperature, humidity, wind speed, atmospheric pressure, and precipitation.

Data Processing

- Quality Control: Clean and validate the collected data to ensure accuracy.
- Data Assimilation: Integrate various data sources to create a coherent snapshot of the current atmospheric state.

Numerical Weather Prediction (NWP)

- Model Selection: Choose appropriate numerical models that simulate atmospheric processes (e.g., global or regional models).

Simulation and Forecasting

- Running the Models: Execute the numerical models, which use complex mathematical equations to simulate future atmospheric conditions based on current data.

Interpretation of Results

- Output Analysis: Analyze model outputs, including temperature, precipitation, and wind forecasts.

Details About the Hardware and the Software System

Requirements: -

Supported Operating system: -

Windows , Linux (Ubuntu Server, CentOS, etc.) ,Docker

Software Required:

Visual Studio Code: Lightweight, customizable, and supports numerous extensions.

Hardware Requirements: -

For Android Studio and Intelli j: -

- RAM: 8 GB or more for better performance, especially for large projects.
- Disk Space: SSD with 10 GB or more for the IDE and additional space for project files.
- CPU: 64-bit CPU with at least 2 cores.

For Eclipse: -

- RAM: 8 GB or more for optimal performance, especially for larger projects.
- Disk Space: SSD with at least 10 GB or more for faster load times and better performance.
- CPU:
- 64-bit CPU with at least 2 cores; a multi-core processor is preferred.
- Java Runtime Environment (JRE): Ensure you have an up-to-date JRE (Java 8 or later) installed.

Listing Out testing technology

Frontend and Backend: -

Frontend

- HTML/CSS: Basic structure and styling of web applications.
- React.js: Popular library for building user interfaces.
- Vue.js: Lightweight alternative for UI development..
- Tailwind CSS: Utility-first CSS framework for custom designs.

Backend

- Node.js
- Express.js

Module Description:

1.User Authentication Module

- Description: Manages user registration, login, and authentication processes.
- Key Features:
  - User registration with email verification.
  - Login and logout functionality.
  - Password recovery and reset options.
  - Role-based access control (admin and user roles).

2. Weather Data Retrieval Module

- Description: Interfaces with external weather APIs to fetch real-time weather data and forecasts.
- Key Features:
  - Integration with APIs (e.g., OpenWeatherMap, WeatherAPI).
  - Caching mechanism to store frequently accessed data.
  - Error handling for API failures and fallback options.

3. Data Processing Module

- Description: Processes and transforms the raw data retrieved from the weather APIs for use in the application.
- Key Features:
  - Parsing and formatting of weather data (e.g., temperature, humidity, forecasts).
  - Data aggregation for historical weather analysis.
  - Implementation of algorithms for data analysis (e.g., predicting trends).

4. User Dashboard Module

- Description: Provides a graphical interface for users to view weather information and forecasts.
- Key Features:
  - Display current weather conditions and forecasts.
  - Interactive maps for visual representation of weather data.
  - Customizable user preferences (e.g., units of measurement, location settings).

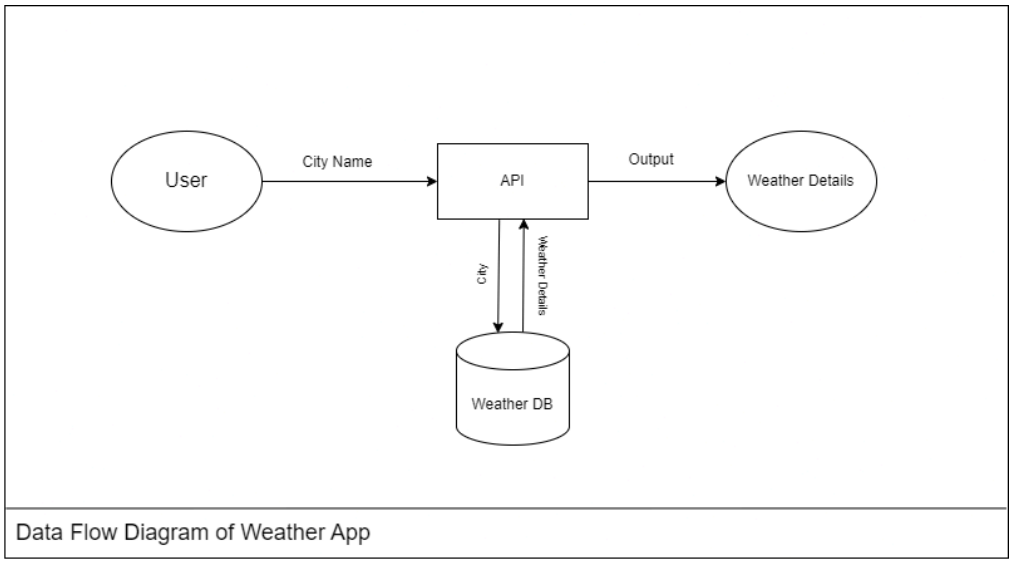
5. Notification Module

- Description: Sends notifications to users about significant weather changes or alerts.
- Key Features:
  - Real-time alerts for severe weather conditions (e.g., storms, floods).
  - Push notifications for mobile users.
  - Email notifications for user preferences.

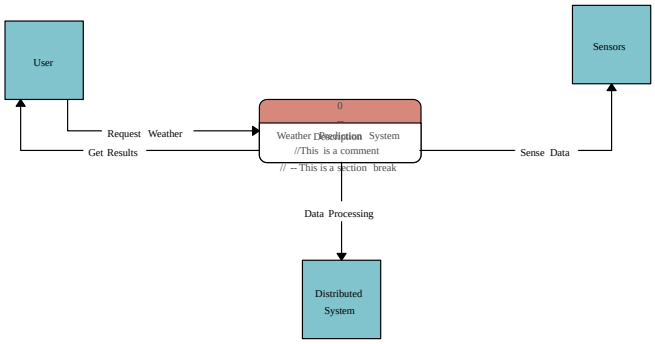
Data Flow Daigrams

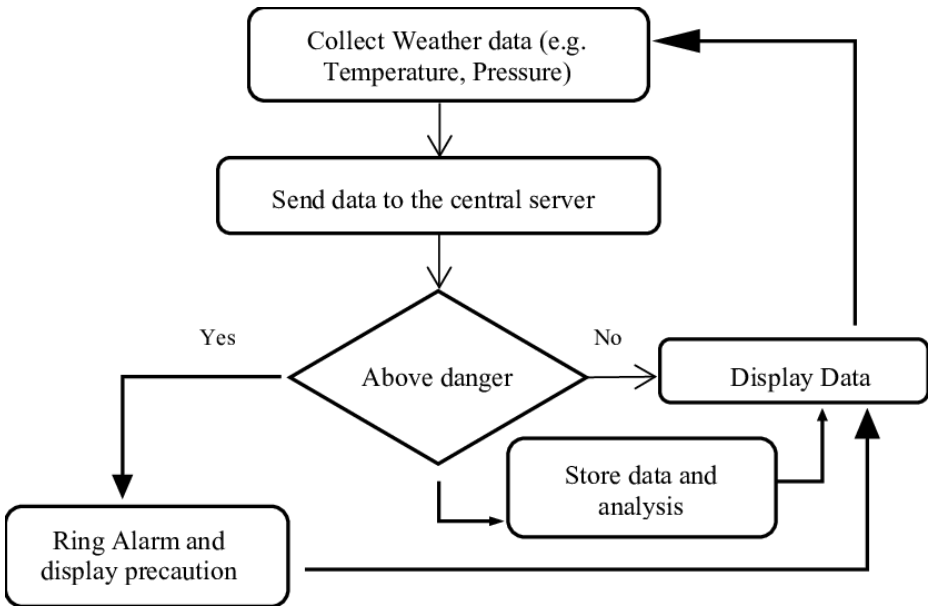
DFD: - A data flow diagram (DFD) illustates how data is processed by a system in terms
of inputs and outputs. As its name indicates its focus is on the flow of information, where data comes from, where it goes and how it gets stored.

0 Level DFD: - 1 level DFD: - 2 level DFD



Data Flow Diagram of Weather App





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