Database Management Systems

Term Project

SM Weather Information

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1. Introduction:

1.1. Importance of Data Integration in Database Management:

Data Integration is the problem of providing uniform access to multiple, autonomous, heterogeneous and structured data sources. This project is required to: 1) Determine the relevant sources to the query 2) Break down the query into sub-queries for the sources and 3) Get the answers from the sources, filter them if needed and combine them appropriately. This is known as On Demand Integration in real-time. The current project integrates data from three data sources (local schema) and outputs weather information as a single global schema to the users. Search results shown as output are the integrated results from the different api's used to give the user a complete and thorough report of the weather. User can also see details of latitude & Longitude of the location, Sunrise and Sunset time for that location.

1.2. Data Sources:

SM Weather Information Project uses data from the following data sources:

a. Openweather.com: Using the Current weather data API the site gets the necessary information from different response groups (ItemAtributes, Weather) and returns a JSON data type that holds all the information used for display. The data used from this site for global schema is as follows: Climate condition, Maximum and Minimum Temperature, Wind Speed, Humidity and Wind Direction.

b. Breezometer.com: Information taken from the Breezometer API V1 is received in JSON format. The data that is used is: Dominant, Pollutant, Canonical name, Dominant pollutant description and text.

c. Sunrise-sunset.org: Information taken from Sunrise-sunset API is received in JSON format. This data source contains the following attributes: Sunrise, Sunset, day length.

2. Environments used:

The goal of the project is to access and integrate data from three web-based databases. For this project we utilized the Web based approach. We decided to use JSON object because of its ease of use and has a much smaller footprint than XML. We used HTML and CSS for the frontend design. This allows an easy prototyping and helps if we are not strong in web design. The front end of website runs on JavaScript. We choose this to take the load off from the server because the idea is to make this something people can use even on light weight servers. The APIs are called using Jquery and AJAX service calls.

jQuery is a cross-platform JavaScript library designed to simplify the client-side scripting of HTML. It is free, open-source software using the permissive MIT License.

Ajax is a set of Web development techniques using many Web technologies on the client side to create asynchronous Web applications.
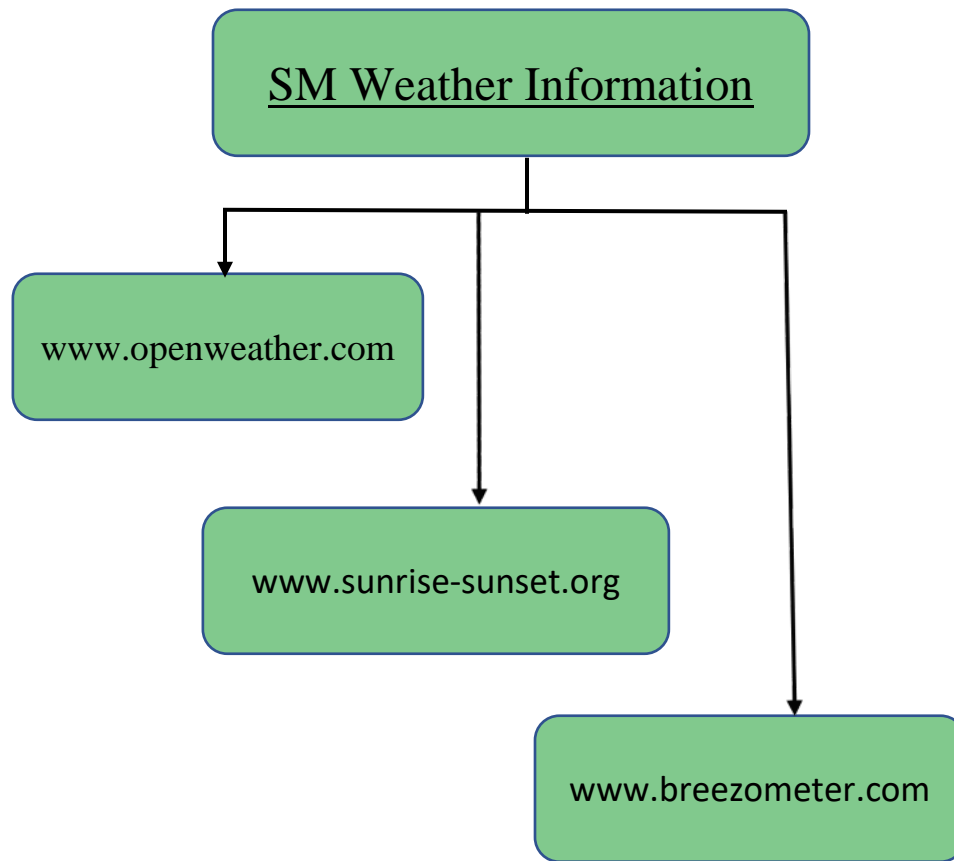
3. Project Model:

Fig 1: Model of the project depicting local schema and global schema.

4. Schema Description:

   4.1. Local Schema:

   Openweather.com:

   S1(weather.main, weather.description, weather.icon, main.temparature, main.humidity, main.temp_min, main.temp_max, wind.speed, wind.deg)

Breezometer.com:

S2(dominant_pollutant_canonical_name, dominant_pollutant_description, random_recommendations)

Sunrise-sunset.org:

S3(sunrise,sunset, uv, elevAngle, hAngle)

4.2. Global Schema:

The user of SM Weather Search Engine Project gathers information from external sources based on the elements queried. The definition of the global schema and the description of its attributes are discusses below as follows:

Weather (weather, description, temperature, Humidity, max_temparature, min_temparature, coord.lon, coord.lat, wind_speed, wind_direction, dom_pollutant, air_quality, recommendations)

Following are the descriptions of the attributes displayed on the website:

Weather: Condition of weather.

Description: Description of the weather condition.

Temperature: Temperature in Celsius.

Humidity: Humidity at the location.

Max_temparature: Maximum temperature at the location.

Min_temparature: Minimum temperature at the location.

Wind_speed: Wind speed at location.

Wind_direction: Wind direction at location.

Dom_pollutant: The main air pollutant at selected location.

Air_quality: Air quality at selected location.

Recommendations: Suggestions about the weather condition in simple language for user to understand how to be prepared for the weather today.

5. Limited Source Capabilities:

Source capability templates are used to describe the usage of attributes that query the object. The major adornments of these capabilities are as follows:

f: may or may not specify

u: cannot be specified

b: must be specified

c[S]: specified from a list S

o[S]: optional, chose from S

Following is the description of the implementation of these adornments in SM Weather Information Project:

5.1. <u>Openweather.com:</u> In this local schema, we can query the schema based on location name to retrieve the data. Weather, temperature, wind details are part of the result.

S1(weather.main, weather.description, weather.icon, main.temparature,

       b   **b**   **f**   **b**

main.humidity, main.temp_min, main.temp_max, wind.speed, wind.deg)

    f   **b**   **b**   **b**   **f**

5.2. <u>Breezometer.com:</u> In this local schema, we can query the schema based on location name to retrieve the data. Air pollution details and recommendations are part of the result.

S2(dominant_pollutant_canonical_name, dominant_pollutant_description,

                        b   **f**

random_recommendations)

          b

5.3. <u>Sunrise-sunset.org:</u> In this local schema we can query the schema based on product name to retrieve the data. Sunrise time, sunset time, UV, elevation angle, hAngle are part of result.

S3(sunrise, sunset, uv, elevAngle, hAngle);

        b   **b**   **b**   **f**   **f**

6. **SM Weather Search Engine Usage:**

6.1. Software Requirements:

   i. Server: WAMP

   ii. IDE: Notepad++

   iii. Browser : Google Chrome

6.2. Screenshots:

The following screenshot is the homepage of the Project. Here the user can type his search term and find the weather and pollution details of the location.
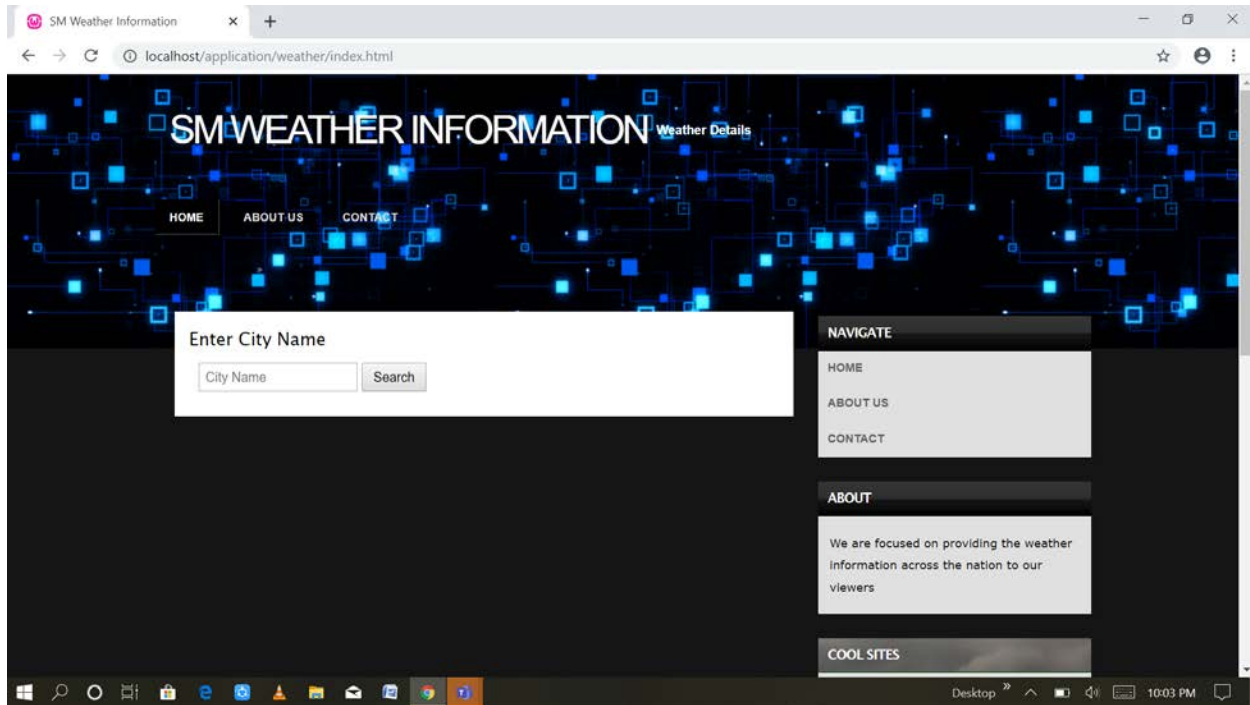
Fig 2: Homepage of SM Weather Information page.

The following is the screenshot of the displayed details for an example. Corpus Christi is used in this picture.
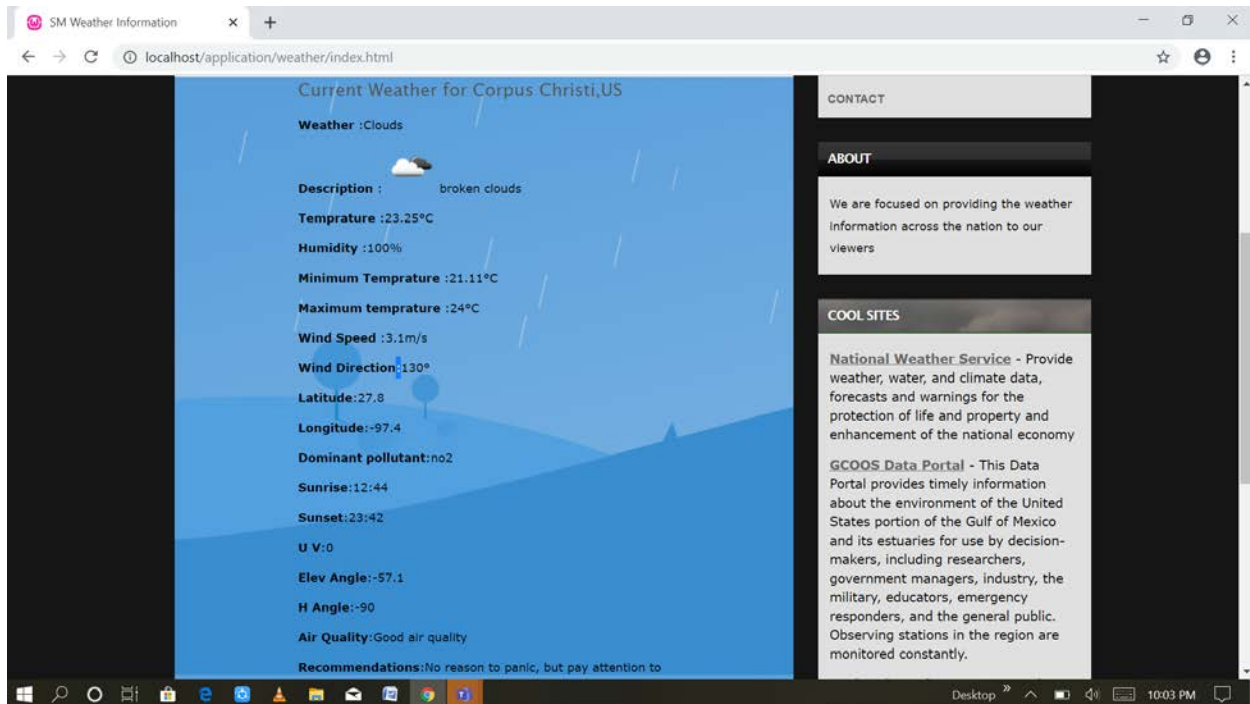

Fig 2: Screenshot after weather details information retrieval.

7. Conclusion & Future Work:

SM Weather Information integrates openweather.com, breezometer.com and sunrise-sunset.org into an easy to use search engine. The current search engine is a bit restricted to limited records and limited data processing. Currently it does what it needs to do, by searching three sites and retrieving data from them and displaying them in a clear and concise manner. For future work, we would like to include more entry fields for the user to give for control to the user and also include area details for tourists, etc.