WEATHER APP USING AR

A Weather Application for Mobile Phone using Augmented Reality

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Abstract: Weather applications enable users to get instant alerts regarding weather conditions. It's a service that informs users what kind of weather to expect in the coming hours, days, and weeks. The existing system shows the weather conditions and how the weather is going to be in a few hours or so in a text based manner. The proposed App is not just a simple weather app, rather it's more like an AR based weather app that will enable digital information to be superimposed and integrated into our physical environment. The idea is to display the selected area in a 3D manner and quickly have a look at the weather conditions. The suggested solution, unlike existing applications, does not display the weather only in text format, it also allows the user to see the different weather conditions in a more realistic way. For example, if it's going to rain in some places, one can watch rain pouring over those places with a bunch of clouds hovering around in the sky, based on the weather forecast. And that's not all; the proposed software will have a plethora of different simulations for various weather situations in order to provide the most accurate and thorough experience possible. These are going to be achieved using augmented reality, which is an enhanced version of the real physical world that is achieved through the use of digital visual elements delivered via technology.

Index Terms - Augmented Reality, Weather Updates, Weather Simulation.

I. INTRODUCTION

Augmented Reality (AR) enhances physical world through the use of computer generated visual elements. Augmented reality continues to develop and become more relevant among a wide range of applications. The suggested Weather app employs augmented reality to present users with a more engaged experience. Using AR technology, 3D effects are simulated that provide an enhanced experience for the user on getting weather information. The AR foundation, a Unity library package, was used to construct this app. Using weather API provider, weather information is retrieved and the user can get to know the weather conditions visually in their own environment. Weather data is displayed as three-dimensional objects on top of a three-dimensional map that can be displayed against any plane surface (desk, table, or floor). The proposed method makes use of Google Maps SDK to obtain a 3D representation of the locations chosen based on their latitude and longitude. The weather information for the given location is gathered using the Open-Meteo API. 3D objects such as rainy and overcast effects are rendered using this information. At last all objects that are rendered are merged using unity AR session.

II. RELATED WORKS

Augmented reality has been one of the most advanced and outgrowing technology of recent times, but it has more than a decade long research and development to become what it is today. AR is now being used extensively in location-based systems. There are a plethora of games and apps that leverage location-based AR to enhance the user's experience. However location based AR contributes to the immerse experience it has its own problems too[3].

The beginnings of mobile augmented reality can be traced back to the early 2000s. Back then, the concept of mobile AR was still a new and uncharted territory. The Mobile Augmented Reality System (MARS) back then required a personal computer (laptop) needed to be carried around in order to render the visual elements[3]. Mobile Augmented Reality now-a-days just require our smartphone to render complex visual elements[4].

One of the many industries that augmented reality has the potential to revolutionize is education. The immersive nature of Augmented Reality can aid in keeping young minds focused. Augmented Reality offers a wide range of applications in this discipline, including interactive shape learning for children aged 2 to 3, interactive coloring books[3] and so on. Recent events have demonstrated that online education is possible, and it will not take long for animated cartoon characters to instruct children in augmented reality. Augmented Reality can also help students doing research works to simulate and visualize complex algorithms, DNA structures, internal working of vehicle engines etc. in real-time in real world. Hsiao, H. S. et al. used Manipulative Augmented Reality (MAR) a branch of Augmented Reality to create an Augmented Reality system that helps students to understand weather[5].

In the year 2008 Heinrich, M et al. published their work “An augmented reality weather system” in which the authors proposed a system that simulates weather in the real world. This wearable augmented reality system allows users to simulate weather like rain, snow and hail irrespective of the real weather[6]. Another noticeable work from the year 2008 which is related to weather
is the "Image geo-mashups: the example of an augmented reality weather camera" done by Gliet, J et al. This is a mixed reality system which combines geo-referenced data and perspective image to create a augmented reality weather camera\cite{9}. Meister, P et al. had done and published their work in 2021 titled "Using Three-Dimensional Augmented Reality to Enhance General Aviation Weather Training". In this work they created a General Aviation training system which incorporates 3-Dimensional Augmented reality to simulate thunderstorm\cite{9}.

Creating Augmented Reality systems maybe both a fun and a tough undertaking. But with the right tools, developing an augmented reality system can be easy. Chen, Y. et al. published their work "An overview of augmented reality technology" in Journal of Physics in the year 2019\cite{3}. In this journal authors had given an overview of Augmented reality and also briefly explained the tools that are available to create Augmented reality applications, the use of AR in different applications.

It is safe to say that Augmented reality and Virtual reality will drive the next force of internet evolution. There are so many research done in the field of augmented reality and it is very obvious that this technology will see many future enhancements.

III. EXISTING SYSTEM

The current system provides a weather report in the form of text data. The data for weather report is shown to the user with current weather of the locations. They can check the weather report of different locations. The temperature of the location is shown with the degree in either Celsius or Fahrenheit. The Weather information shown in a text based format.

IV. PROPOSED SYSTEM

The proposed system aims to share weather data on a three-dimensional map. The 3-Dimensional map is a way of sharing the weather information with some computer generated 3D objects. 3-D map or image enhances the interactivity for the users. The 3-D image or map consists of cloud Effects, Rain Effects according to the temperature and Weather information data on user selected location.

![Proposed system model for weather simulation](fig 4.1)

V. IMPLEMENTATION

The overall proposed system is divided into four modules. The division is made based on development strategies. The first module consists of converting given location to latitude and longitude. The second module consists of determining the weather information based on the latitude and longitude. The third module consists of converting weather information into a 3-Dimensional image. The fourth module consists of rendering those 3-D image into the map and displaying the map to the user.

A. GEOCODE STORAGE

The latitude and longitude of a particular place is stored as a string in an array of strings. The strings are formatted in a way that it will readily be available to use in the API. These coordinates are utilised in later stages to retrieve weather information using the latitude and longitude coordinates.

B. FETCHING WEATHER INFORMATION

Weather information for the selected place is fetched from the Open-Meteo API. The UnityEngine Networking package is used in order to use the UnityWebRequest function. UnityWebRequest function is used to call the Open-Meteo API. The Open-Meteo API will respond by sending a JSON file which consists of the weather information.

C. FETCHING 3D DATA

The 3D data of the selected place is fetched using the help of Google Maps SDK for unity. In order to fetch the 3D data from the Google maps SDK an API key is needed. Also some APIs like Semantic Tile API are need to be enabled. The Google Maps SDK takes API into the Map Service script and Latitude, Longitude values into the basic script. The load map function is used to load the map to the scene.
D. RENDERING IN AR

The rendering of 3D objects in the real world is done through the use of AR Foundation framework provided by Unity. With the use of ARCore XR plug-in the 3D objects are rendered in the real world. The plane will need to be detected before any objects can be placed. The detected plane is used as a surface for the 3D objects.

VI. RESULTS AND DISCUSSION

The Proposed system will have Simulations for different types of the climate. The simulation for climates like Rain can vary according to the intensity of rain. Some of the simulations are attached below.

The fig 6.1 represents the "Partly Cloudy" climate, fig 6.2 represents the "Moderate Rainy" climate.

The Proposed system's working has been shown in the images attached below. The system being an Android application, the application needs access to camera for the proper working. Once the application is opened the application starts detecting for the plane as shown in the fig 6.3. The "Select State" button reveals an Indian Map as shown in fig 6.4 from which the user can select the state.

Selecting the state reveals the state map as shown in fig 6.5. The users can select the state by clicking on the name of the state this action will reveal the "Select a Place" panel as shown in the fig 6.6. In the "Select a Place" panel user can select the place for knowing the weather information of that place.

After selecting the place the user can view the weather information for the selected place in text manner on the top right corner of the phone screen. Now the user when clicks on the screen the Selected place will be rendered as 3D object in real world as shown in the fig 6.7.
fig 6.7 Selected Place rendered in AR

VII. CONCLUSION

In this Paper the proposed system shows how Augmented reality technology can enhance the way we perceive weather information. The weather information is fetched in real time and imposed as 3D models. The Weather API provider collaborates with National Weather Services to provide Open weather data with a resolution of 11 to 2 KM. In future the proposed system can be improved by implementing an Dynamic world map where the users can select place from the map which is then rendered in Augmented Reality. Textures can also be used to improve the look of the 3D models.

REFERENCES