Weather Forecasting and Its Visualizations Using AI

Aruna R[1], Vasuki S[2], Dhanya M R[3], Divya V[4], Gopika G S[5], Harini M[6], Haritha P[7]
[1,2,3,4,5,6,7]*Department of Computer science engineering, SNS College of Technology, Sathy Road, SNS kalvi nagar, Vazhiyampalayam, Coimbatore, Tamil Nadu, 641035*

ABSTRACT- Since the beginning of human civilization, the visualization and forecasting system for users has been developed to help them to visualize historical temporal weather data in their respective region. So, our system is designed with the goal to supplement the productivity of already available website of meteorological department. It is flexible enough to visualize present data. Multiple weather scenario can be visualized. So, we have implemented two types of weather forecasting system. Short term weather forecasting has been done to predict the daily forecast and long-term forecasting uses linear regression for predicting the weather trends. The system is designed in such a way that it can present data in user-friendly and comprehensible graphical formats and plots using virtual reality. The results for long term forecasting show that in next ten years rain fall will decrease effectively in the areas, an increase in the humidity has been observed after carefully reading the forecasted plots. It presents a web-based interactive visualization and analytical platform for weather data. Atmospheric elements including air temperature, pressure, relative humidity, wind and precipitation.

The visualization and analytical platform have been implemented. The platform gives Hydro meteorological and Monitoring Service analytical capabilities to analyze the in-situ observations, model and satellite image data per station and region for a given period

DEFINE

Our suggestion for the problem is to provide an interactive web-based visualization and analytical platform consist of 5 main layers .The bottom layer provides HPC and data resources, it is useful for the digital models and satellite image processing. The resources of the Ae-infrastructure are used, which is a complex national IT infrastructure consisting of both communication and distributed computing infrastructures. The datasets layer combines three types of data platforms: Model output: outputs of weather prediction models; Satellite images: multi-spectral satellite images covering the territory of Armenia; In-situ data: meteorological stations observations, as a base that used to verify the deviation values with other model outputs and satellite images. The Data management layer provides intelligent tools to transfer raw data to data analytics layer. Between the physical data storage systems and the user interface, (iRODS) act as a middle ware. When it reaches data analytics layer, it is processed and only several indexes are left from huge amount of initial raw data. Finally, the top layer and final destination of already processed data is visualization layer, where the outcome indexes are transformed to more user-friendly graphs or tables. Moreover, the advantages of Google Maps are used to map these indexes with their real location on the map. Datasets. Observational datasets provide from various weather stations obtained with codes (surface station reports observations). It reports are typically sent every three hours, it includes general weather information, such as the temperature, sea level pressure, visibility, wind direction and speed, etc.

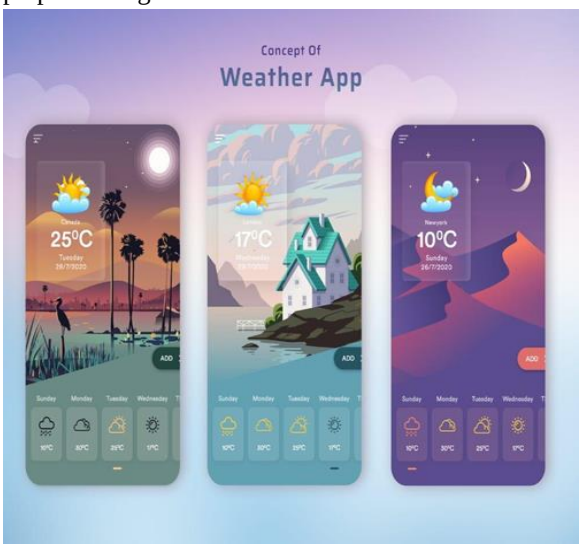
IDEATE

Various Proposed solutions

1.Augmented reality and weather forecasts seem like a perfect pairing — since that advent of chrome key, weather forecasts have relied heavily on digital effects and graphics-rich with data driven storytelling techniques .Weather forecasts gain a broader canvas to work with, instead of simply replacing the color wall behind the forecaster with a graphic feed from a computer.

2.Graphics, through augmented reality and virtual reality, can be inserted digitally in almost any shot and to interact with the maps and graphics in new and exciting ways to help add visual interest and differentiation to their broadcasts. The major technical features implemented Are: particle system, sound,

visual features, weather render and image preprocessing.



3.AR Weather was developed in C++ under the Linux operating system. As with Tinsmith, the graphics were developed with OpenGL. Additional functionality was provided with the following libraries: GLSL , Devil and Open AL. The AR Weather simulation is realized with a 3D particle system, and the three different types of precipitation can all be realized with the same particle system. We implemented a custom particle system in AR-Weather for graphics hardware found in notebook class computers.

4.Precipitation can be simulated in 2D or 3D. A 2D Simulation of precipitation would simply involve overlaying the weather on the captured video image and providing a better performance than a 3D simulation. However, a 2D simulation does not support all viewing angles for our simulation. In case of rain, when the user is viewing straight Ahead, the raindrops are falling down in front of their eyes. When the user looks straight up into the sky, the raindrops should be falling towards their face, but on the video would Continue to move from the top of the display down to the bottom of the display.

PROTOTYPE

We use Weather forecasting and it has Visualization using Augmented Reality for the prediction of what the atmosphere will be in a particular place by using Scientific knowledge and Technology for weather observations. In short, it is a way of predicting a cloud cover and climatic conditions such ad rain, snow, wind speed, and temperature before they happen

Tools Used for Weather Forecasting:

To achieve this goal Weather forecasters use all kinds of tools: To Measure temperature we use thermometer ,radar which is used to measure the location and speed of clouds, to measure air pressure we use barometers, computer models to process data accumulated from these instruments. However, to this day, predicting the weather by human is still better than the weather predicted by the computer models alone because humans are often involved in picking the most appropriate model for a situation.

There are some main ways we can forecast the weather which involves , tracking the motion of air, looking at current weather condition and clouds in the sky, finding the past weather patterns that resembles the examining changes in air pressure, current ones and running computer mod

Types of Weather Forecasting:

We are going to discuss the four main types of weather prediction long-range, medium-range, short-range, and hazardous weather forecasting.

Short-range forecasts is a type of weather forecasting where between one and seven days before they happen the predictions are made . Usually between one week and four weeks in advance medium - range forecast are given .Between one month and a year in advance Long -range forecast are given. The further into the future you're trying to predict, the harder it is to be sure. Longer-range forecasts are useful only if he or she believes it is that the prediction is accurate. This is called a level of confidence. For example, a forecaster may predict rain next Monday with a 70% level of confidence. Short-range forecasts are better and more accurate than long- or medium-range ones.

Importance of Weather Forecasting:

Weather forecasting has various uses in day-to-day life, it can be as simple as deciding your outfit or to take an umbrella. Following are some of the places where weather forecasting plays a major role: Nature and seasons play a major role in farming and agriculture. When it comes to the farming of various vegetables, pulses and fruits temperature is very important. Farmers didn't understand the weather forecasts before, so they had to rely on the estimated

jobs. sometimes they suffer losses as a result of inaccurate weather forecasts. It will be helpful for the farmers to get all of their forecasts in smart phones. Thanks to the use of unique weather forecasting mechanisms and advance in technology. Of course, education is critical in this area, but the majority of the farmer community at this point understands the fundamentals, making it simple to use the features. It aids food grain transportation and storage. It helps in handling the harrowing, hoeing, etc. It also helps in the implementing livestock protection initiatives. Weather forecasting is used to determine future climate changes. latitude, used to detect the probability of snow and hail reaching the surface. We can identify the thermal energy from the sun of exposed region. The scientific study of climates, which means weather conditions over a period is called as climatology. Studies within atmospheric sciences also takes the help of averages of long-term and short-term weather conditions accumulated and variables. Both Meteorology and Climatology is different from each other and can be divided into further areas of study. Different kinds of approaches can be taken to this segment.

TESTING

AR Weather AR Weather simulates a change from a sunny or cloudy day to one that is raining, snowing, or hailing We are not attempting the removal of the real occurring weather conditions first. We attained our idea to changing from real falling snow into augmented rain. Our solution needs to be found to remove the actual weather conditions before rendering an augmented type of weather. In the case of clouds, they are already visible when it is raining, snow, hail, or fog is occurring. This is not a trivial task and outside of the scope of this paper. To ensure the weather simulation system is completely independent of the real-world weather conditions, the natural weather would need to be automatically detected and removed. Even if the visual task of removing a real precipitation could be achieved, another unpleasant part of the weather with falling precipitation would still be left: The user would still get wet in rain or snow. Our Implementation section provides the major technical features implemented are: particle system, sound, visual features, weather rendering and image preprocessing. We implemented a custom particle system in AR Weather for graphics hardware found in notebook class computers. Precipitation can be simulated in 2D or 3D. A 2D simulation of precipitation would simply involve overlaying the weather on the captured video image and providing a better performance than a 3D simulation. However, a 2D simulation does not support all viewing angles for our simulation. In case of rain, when the user is viewing straight ahead, the raindrops are falling down in front of their eyes. When the user looks straight up into the sky, the raindrops should be falling towards their face continue to move from the top of the display down to the bottom of the display.

CONCLUSION

We contributed the notion of mobile environmental monitoring and presented a thorough description of its process and workflow. We presented a novel 3D mobile AR platform, which enables a re-searcher to visualize and interact with data in-context, integrated in an infrastructure covering wireless sensor acquisition/management to mobile visualization. Our solution targets real-time access to sensor data, simulation results, and the physical world, while providing dedicated tools for analysis and comparison. Collaborative aspects were addressed, by providing annotations, view-sharing and audio communication. Overall, on-site AR environmental monitoring can be regarded as a promising field. We expect that it will mature in next years and position itself among the fundamental techniques of environmentally aimed scientific inquires.

REFERENCE

[1] King, G.R.; Piekarski, W.; Thomas. ARVino– outdoor augmented reality visualisation of viticulture GIS data. In: B. Werner, editor, Proceedings of the 4th IEEE/ACM international symposium on mixed and augmented real-ity, pp 52–55. IEEE Computer Society, 2005.

[2] E. Kruijff, E. Mendez, E. Veas, and T. Gruenewald. On-Site monitoring of environmental processes using mobile augmented reality (HYDROSYS). In envip 2010, 2010.

[3] M. Lehning, I. V¨olksch, D. Gustafsson, T. A. Nguyen,M. St¨ahli, and M. Zappa. ALPINE3D : a detailed model of mountain surface processes and its application to snow hydrology. Hydrol Process, 2128(May 2005):2111–2128,2006.

[4] C.-R. Lin and R. B. Loftin. Application of virtual realityin the interpretation of geoscience data. In Proceedings of the ACM symposium on virtual reality software and tech-nology 1998 VRST 98, pp 187–194. ACM Press, 1998.
[5] G. E. Liston and M. Sturm. A snow-transport model forcomplex terrain. J Glaciol, 44(148):498–516, 1998.
[6] L. Mitas and H. Mitasova. Distributed soil erosion simulation for effective erosion prevention. Water ResourRes, 34(3):505–516, 1998.
[7] C. Mitterer, H. Hirashima, and J. Schweizer. Wet-snow instabilities: comparison of measured and modelled liq-uid water content and snow stratigraphy. Ann Glaciol,52(58):201–208, 2011.