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Weather Forecasting and Its Visualisations Using AI

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***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. The system is flexible enough to visualize current data. It also presents multiple weather scenarios to visualize weather data. 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. This article aims to present a web-based interactive visualization and analytical platform for weather data. The weather data used in the platform consists of near-surface 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 a interactive web-based visualization and analytical platform consist of 5 main layers .The bottom layer provides HPC and data resources, which is especially important 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 for further analysis:•Model output: outputs of weather prediction models;•Satellite images: multispectral satellite images covering the territory of Armenia;•In-situ data: meteorological stations observations, as a base to analyze 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. The Integrated Rule-Oriented Data System (iRODS) provides a middleware between the physical data storage systems and the user interface. As soon as data 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 SYNOP(surface station reports observations). SYNOP reports are typically sent every three hours, which consists of groups of numbers describing 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 that seem made for AR of course, with augmented reality, weather forecasts gain a much broader canvas to work with, instead of simply replacing the bright blue or green 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, including outdoors, and technology makes it possible

for forecasters to interact with the graphics and maps 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

Weather forecasting and it's Visualization using Augmented Reality is the prediction of what the atmosphere will be like in a particular place by using technology and scientific knowledge to make weather observations. In other words, it's a way of predicting things like cloud cover, rain, snow, wind speed, and temperature before they happen

Tools Used for Weather Forecasting:

Weather forecasters use all kinds of tools to achieve this goal. We have instruments called barometers to measure air pressure, radar to measure the location and speed of clouds, thermometers to measure temperature, and computer models to process data accumulated from these instruments. However, to this day, humans with good experience can still do a better job at predicting the weather than computer models alone because humans are often involved in picking the most appropriate model for a situation.

The main ways we can forecast the weather include looking at current weather conditions, tracking the motion of air and clouds in the sky, finding previous weather patterns that resemble current ones, examining changes in air pressure, and running computer models

Types of Weather Forecasting:

There are four main types of weather prediction we're going to discuss in this lesson: short-range, medium-range, long-range, and hazardous weather forecasting. Short-range forecasts are predictions made between one and seven days before they happen. Medium-range forecasts are usually given between one week and four weeks in advance. Long-range forecasts are given between one month and a year in advance. The further into the future you're trying to predict, the harder it is to be sure. Longer-range forecasts are only useful if the forecaster says how likely 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 Tuesday with a 90% level of confidence. Short-range forecasts are far more accurate than medium- or long-range ones.

Importance of Weather Forecasting:

There are various uses of weather forecasting in day-to-day life, it can be as simple as deciding whether to take an umbrella with you on your work or to deciding your outfit. Following are some of the places where weather forecasting plays a major role: Seasons and nature play a major role in agriculture and farming. When it comes to the farming of various fruits, vegetables, and pulses, temperature is extremely important. Farmers didn't have a better understanding of weather forecasts before, so they had to rely on estimates to do their jobs. They do, however, sometimes suffer losses as a result of inaccurate weather forecasts. Farmers will now get all of their forecasts on their smartphones, thanks to advances in technology and the use of unique weather forecasting mechanisms. Of course, education in this area is critical, but the majority of the farmer community at this point understands the fundamentals, making it simple for them to use the features. It aids food grain transportation and storage. It aids in the handling of cultural operations such as harrowing, hoeing, etc. It aids in the implementation of livestock protection initiatives. Weather Forecasting is crucial since it helps to determine future climate changes. With the use of latitude, we can determine the probability of snow and hail reaching the surface. We are able to identify the thermal energy from the sun that is exposed to a region. Climatology is the scientific study of climates, which in simple words mean weather conditions over a period. A bunch of studies within atmospheric sciences also takes the help of the variables and averages of short-term and long-term weather conditions accumulated. Climatology is different from meteorology and can be divided into further areas of study. Different approaches to this segment can be taken. Currently, our primary research goal is to motivate and help the development of efficient and effective measures of Environmental activities.

TESTING

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 rain, 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.

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