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Megh and Sarita – Educational App Development

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Abstract: *Augmented Reality superimposes virtual objects over real world environment. Educators know that learning deepens, not just through reading and listening, but also through creating and interacting. Visual novel is a trending form of gaming and storytelling. It has as turned out to have a high level of user engagement. This project aims to enhance current educational system using these technologies. These applications provide with creatively designed modules for better learning through Augmented reality models, simulation experience and a journey with the help of a visual novel. This project can enhance learning, creativity and retention among students. Our applications will also foster intellectual curiosity among students making them smarter. We aim to change the conventional way of education and open a new opportunity towards a smart classroom. The aim of this project is to make the contents of a geography textbook available in an interactive visual format using Augmented Reality, Simulation and visual novel.*

Keywords: Unity, Education, App Development, Geography, Rivers, Clouds

I. INTRODUCTION

Megh: Students find it difficult to study about clouds as it requires a lot of imagination and teachers, having limited materials for the same, are facing problems in making students understand the concept. The concept of clouds is a very intricate and confusing topic for the students. Learning about a cloud requires a student to know how the cloud looks, the meaning of the Latin name of the cloud so that the name of a cloud can be identified by looking at it, the type of precipitation each type of cloud causes, the regions in which the cloud is commonly found, the altitude at which the cloud is formed and at what parameters a high, mid or low cloud is formed. The names of the clouds being in Latin, it is hard to memorize the names and identify the corresponding cloud by name. The name of cloud being the base of further cloud related topics, confusion in this makes the student lose interest in the complete topic. This application provides creatively designed modules for an experience-based learning of the concept of clouds and about the heritage and culture of various destinations on the map alongside the 10 major rivers of India. The user will be able to see the models of clouds augmented in the real world and will be able to learn about the meaning of their names and type of precipitation they cause. A 360-view of the actual photo of the clouds can also be seen. In addition, the user will learn about the types of clouds found in the six main regions of Earth namely - Equatorial, Temperate, Polar, Mountain, Ocean Surface and Desert in the form of augmented models of regions and the corresponding clouds found in the regions. Formation of low, medium and high-altitude clouds can be learned by changing parameters like surface temperature and relative humidity in a simulation-like format.

Sarita: In addition, rivers are an important part of the geography of any region. Most of the civilization of India is developed around the major rivers of India. Hence, a student ought to know the location of the rivers, their sources and the major destinations along the rivers. India being a huge and diverse country, students find it confusing to memorize all the spots clearly and hence find it difficult to plot it on the map. Plotting rivers and the destinations along the rivers on the map has always been confusing for the students. Since rivers are one of the most essential components of the geography of a region, it is important for a student to know about the river and how cultures have grown around the river. Hence, the need for a supplementary resource to help students in learning and help the teachers in teaching these concepts has emerged. The user will be able to experience an adventure by traversing the waters of some of the major rivers in India through the application of Gaming in it in the form of a story which would be the ideal way to keep the user invested in the app while learning. The type of gaming that will be used here is something which is referred to as a Visual Novel in the industry alongside a game where the user will traverse the rivers with a boat while taking notice of the type of terrain and the environment that exists besides the major rivers of India. There will be a 360- view available in the various destinations alongside 1-minute documentaries about the various aspects related to the respective places namely History, Politics, Society, Environment, Education and Culture. There will be an opinion-based module where the app would collect data from the user regarding

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what the user would do in certain situations which they would be provided with, in order to create Environmental Awareness among the audience. The user will be evaluated with respect to each module in the app at various points indifferent ways.

II. LITERATURE SURVEY

The existing models that are used in education field currently are as follows:

1. Imagina Books: the book and the augmented reality mobile application are the two pillars of this experience. The application scans the book and shows its diagrams in 3D. The book is available for sale and the app is available on play store.
2. Quiver Education - AR colouring book: AR colouring experience app from Quiver that lets you turn your colouring pages into interactive, educational AR experiences that engage and inspire. Quiver Education content is designed around topics as diverse as biology, geometry, the solar system, and many more. Colouring pages and the app are linked to display the coloured object in a 3D form.
3. Magicbook: Magicbook created handheld argument display. Here, each individual user has their own handheld display for view of scenes. It converts the images into three-dimension virtual models with the help of the module.

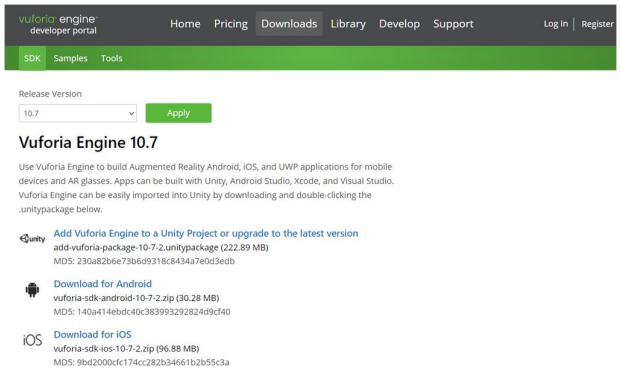
The above models are something that have existed previously in the market for Education through the use of Augmented Reality which is something we wish to do in Megh.

While on the other hand Sarita is something which is an application, the first of its kind. The use of Visual Novel and Gaming in education while providing the user with hours of content which would help in the betterment of the current education system.

III. DEVELOPMENT TOOLS

Unity: Unity 3D is the development platform. It is a 3D game engine which is popularly used for games and VR/AR applications development. C# is used for scripting in Unity. We have developed the entirety of both Megh and Sarita in Unity where the majority of the app development happened in Unity 3D for Megh and Unity 2D for Sarita while incorporating various other systems inside it.

Vuforia: Vuforia Engine is an SDK for creating Augmented Reality apps. Developers can easily add advanced computer vision functionality to any application, allowing it to recognize images and objects, and interact with spaces in the real world. This has been used in simulating Augmented Reality images and terrains over the Megh app and has helped us immensely in development as we tried other options which failed to meet functionality for low end devices as these applications are supposed to be distributed for supplementary education in both rural and urban areas and it should support the devices with the lowest specs while functioning is what we decided upon Vuforia as a basis for our development.



Fungus: Fungus is an SDK purchased from Unity Asset Store to assist with the development of the river's module with its C# scripts and QoL features which have sped up our work by providing standard UI and prefabs alongside scripts which once can use to play Audios, Background music and display dialogue text. Using Markers in the scenes to transform the Camera's Position, Scale and Rotation vectors to help with navigation in the module. A flowchart is used to call variables and other functions in Blocks in Fungus. This is an asset which we have basically incorporated at the core of our Sarita app which completely handles the flow and working of the Visual Novel part of the app which is the main content of this application.

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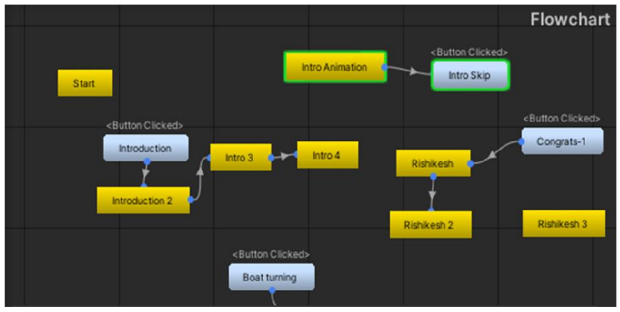
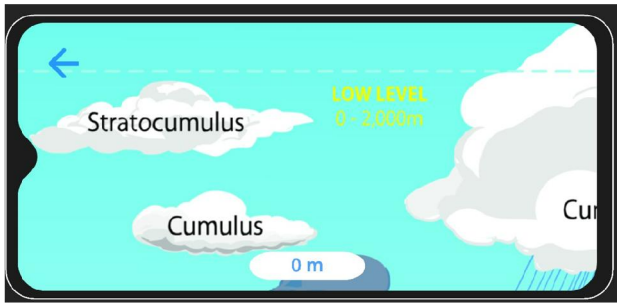


About the Applications

Megh: There are 4 modules dedicated to teaching and 5th module is for evaluation of the knowledge gained in the first 4 modules

Know The Heights



Here the student will be able to memorise the altitudes at which different clouds are formed. The user can scroll up, down and sideways to view the clouds at different altitudes.

Make your Cloud

In this module the user can move the sliders and make different clouds. When the sliders reach the exact measurements, an animation of the cloud formed can be seen.

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Know the Clouds

This module tells the users about different features of the clouds like:- Shape, rain, meaning of their Latin names. You will also find an interesting feature of 360 view of the clouds in real world.

Peep into the Regions

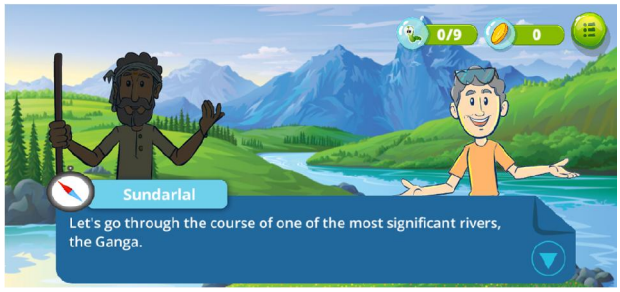
Clouds formed in six different regions of India can be seen in this module. Augmented Reality is an exciting feature of this module which gives an immersive experience of the regions. A feature of 360 viewing is added in case you cannot use the AR feature.

Test Your Knowledge

Fly the plane through the clouds and experience game based evaluation. When your plane passes through the checkpoints, you will get to answer a question about what you learned in the previous modules.

Sarita: There are 4 main parts which the entire content in Sarita is divided into. The following are the main components which make up the entire content that is encompassed in the app that is Sarita.

Story and the Journey



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The interaction and conversation between our 2 guides through this journey, Sundarlal and Sakha, will be used as the means for learning. You will go on a journey to explore the rivers Ganga and Yamuna while learning about the cities and the river itself.

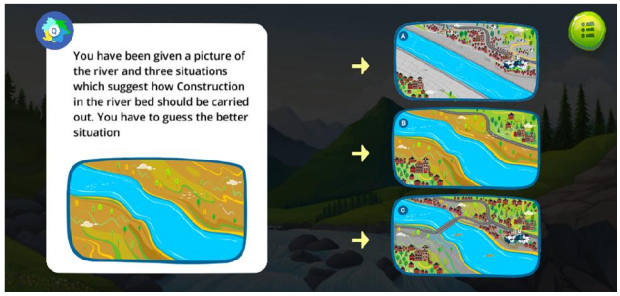
360 Views

360 degree Google Street views will appear in every city and place you visit and give you the experience of actually visiting the cities.

Documentaries

Various mini-documentaries appear in every destination you visit on the following topics:
History
Culture
Politics
Society
Education
Environment

Know Your River



This module will aim to create a sense of Environmental Awareness regarding rivers. To make the user understand what conditions are the best for a river to flourish and maintain the ecosystems that it carries.

User Interface and User Experience

Megh and Sarita extensively depend on how engaging the Interface and Experience of the user is. This motivates the students to use the app and in turn gain knowledge. However good the content may be, unless and until the presentation is appeasing enough, the students will not be willing to make use of the app. In Megh, high quality 3D models are used for an immersive experience in the regions module. The interface is designed in a way that will make it easy to use yet interesting.

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Sarita is like a story book developed into an app. Hence the prime focus is for the user to get an experience of a story when the app is used. It should take the user away from his place and at the banks of the rivers. The designing of the Sarita app is done using a combination of the Adobe Creative Cloud. Adobe Creative Cloud provides apps, web services, and resources for all your creative projects — photography, graphic design, video editing, UX design, drawing and painting, social media, and more. The clouds apps used for this project are:-

Premiere Pro:- for video editing and sounds.

Illustrator:- for the graphics.

Photoshop:- for images and texture optimisation.

Animate/Flash:- for the animations.

IV. FUTURE WORK

Since the scope of the Megh app has been covered, there is no plan for any future work in the app. However, Sarita still has scope for addition of modules and features. More features are planned to be added to enhance the user experience, enlarge the content provided through the app and help the content reach a more diverse population. Currently Sarita contains the textual dialogues in only English language. Also, the audio is available only in English and Marathi languages. More languages can also be considered in future scope. For example, adding text in Marathi, including Hindi as a language option, etc. Sarita only has two rivers in the present scope namely, Ganga and Yamuna. We are also going to add other major rivers of India like Indus, Brahmaputra, Tapi, Krishna, etc. In Addition, there are plans to collaborate with the teachers of different states and add rivers according to their geographical locations. Know your Rivers is designed using real world problems of rivers across India. As of now, it only has four selective questions. However, more questions will be added to this module as a plan for the future by studying more river related environmental problems.

V. CONCLUSION

The first application aims to facilitate learning about clouds and rivers of India with the help of creatively designed modules using Augmented Reality, simulation and visual novel. Each module in this app serves a unique purpose and hence, is specifically designed keeping a target in mind. This project is desirable because it demonstrates how AR and different methods of gaming can be clubbed together for the purpose of spreading knowledge. In addition, it is very helpful for teachers to teach hard concepts by providing a resource that enhances the learning experience for students.

This application allows the user to view augmented models of clouds, learn the meanings of their Latin names, see a 360 view of the real photos of the clouds, know the type of precipitation from each cloud and see the animation of the precipitation. In addition, the user can view six regions of the Earth in AR and know the types of clouds found in those regions augmented on the regions. The user can also simulate the formation of low, mid and high clouds by changing the parameters of temperature and humidity. The user will be evaluated based on what he has learned in the above modules through a game in a MCQ format.

In the second application, Sarita, the user will be able to learn about the major rivers of India based on social, environmental, educational, political, cultural and historical aspects. This experience will be given through a journey along the course of the river. The information will be conveyed in the form of dialogues, documentaries and question answers. The user will be shown a 360 view at every destination along the river. In addition, the user will be asked situation-based questions which will help in building environmental awareness amongst the learners. At this stage, the application provides enough features to serve the objective of this project. Yet, some future works can be made to implement new features and scale the application to incorporate more topics

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