

## **Solar Walk: A 3D Solar System Exploration**

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### **Abstract**

This research project entitled “Solar walk: A 3D Solar System Exploration” was developed for the students to investigate a wide vision about our Solar System. This virtual tour focuses mainly on giving an overview to introduce Solar System and on viewing each planet’s information. Virtual tour is important because it can provide a method to understand the world around us and helps us to produce better results. Its purpose is to stand as a model instead of real one. This virtual tour model can help us gain knowledge about the different planets in our Solar System that are not seen by our naked eyes.

Further, this study focuses on the Solar System where the users can choose which planet they want to virtually see. The users can also view its description by clicking the buttons and then it will display the planet and the description will appear beside it.

**KEYWORDS:** *Virtual tour, 3D, Solar System, 3D Solar System, Solar walk 3D.*

## **1.0 INTRODUCTION**

### **1.1 Project Context**

A virtual tour is usually a collection of panoramic images that are played in sequence to view like a moving video with added sound and text effects, or a virtual tour may use models in place of real-life video and images. A virtual tour is designed to give the viewer a more life-like 3D view of the location being presented in the tour. [6]

Virtual tour is important because it can provide a method to understand the world around us and helps us to produce better results. Its purpose is to stand as a model instead of real one.

This proposal project entitled “Solar Walk: A 3D Solar System Exploration” will be a model which can be used to investigate a wide vision about our Solar System.

This virtual tour model can help us gain knowledge about the different planets in our Solar System that are not seen by our naked eyes.

Through this virtual tour, it can help the users to improve their knowledge about the above mentioned topic.

There are buttons that are available to use by the users to view the planets and its descriptions. As the users launch the application, there are buttons that are displayed including: Let’s Get Started, Take a Tour, Planet’s Information, Sun and Moon and Exit button.

- **Take a Tour** – in this button, you can have a tour in the solar system to view the planets in 3D and it also includes narrated information about each planets.
- **Planet’s Information** – you can use this button to view different planet structure and narrated description about each planets. For example: its discovery, named for, diameter, orbit, and day.
- **Sun and Moon** – you can use this button to view sun and moons structure and narrated description about it. For example: Moon’s size, mass, gravity, temperature and atmosphere; Sun’s mass, radius, mean density, rotational period, surface temperature, and chemical composition.
- **Credits** – you can use this button to view the developers of the system application.
- **Exit** – you can use this button to exit the entire application.

## 1.2 Purpose and Description of the Project

This study focuses mainly on giving an overview to introduce Solar System and on viewing each planet’s information. The study shows each different information about each planet.

Further, this study focuses on the Solar System where the Grade 5 students can choose which planet they want to virtually see. The users can also view its description by clicking the buttons and then it will display the planet and the description will appear beside it.

The 3d models of planets that the author used is a space graphic toolkit for Unity 3d. The authors have the permission from the developer of the space graphic toolkit to use it. Adobe Photoshop, Unity 3d, Space Scape, Text to speech are the software that are needed to make this project.

## 1.3 Scope and Limitation of the Project

This virtual tour is a pc-based application which the user can interact with the planets which are designed based on its real structures. This pc-based application requires 64 bit, Windows 7 Operating System and above with screen resolution 1366 x 768. It contains audio,

text and animation. It can be accessed by the intended users like students and teachers or professors.

This study has limited features. Its contents are not editable by the users. Its screen size cannot be minimized or maximized. The planets can't be zoomed-in to see its surface and inner core.

#### **1.4 Objectives of the Study**

This study aims:

1. To create a virtual tour application that will help the Grade 5 students to understand how the planets in the Solar System looks like.
2. To design a virtual tour application that gives the users information about the different planets and a more life-like 3D view of the Solar System.
3. To help the intended users specially the Grade 5 students to better understand and appreciate the Solar System.

## **2.0 REVIEW OF RELATED LITERATURE**

### **2.1 Related Literature**

The Virtual Solar System (VSS) course described in this paper is one of the first attempts to integrate three-dimensional (3D) computer modelling as a central component of an introductory undergraduate astronomy course. Specifically, this study assessed the changes in undergraduate university students' understanding of astronomy concepts as a result of participating in an experimental introductory astronomy course in which the students constructed 3D models of different astronomical phenomena. In this study, we examined students' conceptual understanding concerning three foundational astronomical phenomena: the causes of lunar and solar eclipses, the causes of the Moon's phases, and the reasons for the Earth's seasons. Student interviews conducted prior to the course identified a range of student alternative conceptions previously identified in the literature regarding the dynamics and mechanics of the Solar System. [1]

The solar system is made up of the sun and everything that orbits around it, including planets, moons, asteroids, comets and meteoroids. It extends from the sun, called Sol by the ancient Romans, and goes past the four inner planets, through the Asteroid Belt to the four gas giants and on to the disk-shaped Kuiper Belt and far beyond to the giant, spherical Oort Cloud and the teardrop-shaped heliopause. Scientists estimate that the edge of the solar system is about 9 billion miles (15 billion kilometers) from the sun. For millennia, astronomers have followed points of light that seemed to move among the stars. The ancient Greeks named these planets, meaning "wanderers." Mercury, Venus, Mars, Jupiter and Saturn were known in antiquity, and the invention of the telescope added the Asteroid Belt, Uranus, Neptune, Pluto and many of these worlds' moons. The dawn of the space age saw dozens of probes launched to explore our system, an adventure that continues today. The discovery of Eris kicked off a rash of new discoveries of dwarf planets. [4]

The Gordon Conference on Origins of Solar Systems brings together a diverse group of scientists to discuss research at the frontier of understanding how planets and planetary systems form. Invited speakers from the fields of astronomy, astrophysics, cosmochemistry, planetary science, and geochemistry will present their latest findings. Discussions will also focus on the promise of new laboratory techniques, astronomical facilities, and spacecraft missions, including ALMA, Herschel, and HST, to make transformational discoveries that will have lasting impact on the field over the next decade. Particular topics of discussion will include: what meteorites tell us about the birth environment of our Solar System and planetary building blocks, how asteroids and icy bodies record the accretion epoch of the Solar System history, new observational and theoretical constraints on gas and dust in protoplanetary and debris disk systems, and how the properties of exoplanets are determined and what they tell us about how those planets formed. [2]

Ever since the discovery of Pluto in 1930, kids grew up learning about the nine planets of our solar system. That all changed starting in the late 1990s, when astronomers began to argue about whether Pluto was a planet. In a highly controversial decision, the International Astronomical Union ultimately decided in 2006 to call Pluto a “dwarf planet,” reducing the list of “real planets” in our solar system to eight. But many kids (and adults) cling to the notion of nine planets. Regardless of your view, here’s the order of the eight larger planets, starting nearest the sun and working outward through the solar system: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune. [3]

Our Solar System is composed of far more than just the Sun and the major planets! Likewise, it extends much further than the orbit of Neptune, the farthest major planet! Millions of smaller objects populate two major bands: the Asteroid and Kuiper Belts! And, far beyond these, billions (and perhaps trillions) of worldlets may exist in that great repository of comets, the Oort cloud! A planet’s status as Inferior or Superior depends on the size of its orbit. The Inferior Planets, Mercury and Venus, are those with smaller orbits than Earth’s; the Superior Planets are those with larger orbits. Likewise, Earth thus is often called the Reference Planets. [5]

## **2.2 Related Studies**

The study entitled “Tour the Solar System” is an interactive model of the solar system that could prove to be highly addictive. With one click, you can visit Saturn, Venus, or the other planets and then spin and explore them in three dimensions. The interface uses NASA calculations to precisely position all celestial bodies. [7]

This is similar to the virtual tour made by the authors because the author’s project focuses on planets, moon and sun which the users can virtually see the models and its information but their virtual tour includes constellation that the author’s project don’t have.

The project entitled “A tour of the solar system” is a web-page interactive virtual tour which consist panoramic images of sun, planets and comet with descriptions. [8]

The similarities of this project to the author’s project is both consist of planets and information but this project consists of panoramic images unlike the author’s project that consist 3D models of planets.

The project entitled “Solar system” is also a web-based interactive virtual tour which consist panoramic images of sun, planets, asteroids, comet and satellite with information’s.

The planets have animation which are automatically rotating. This project also consist of panoramic images unlike the author's project that consist of 3d models of planets. [9]

The similarities of this project to the author's project is both consists of planets and information but this project consist of panoramic images like in the other research literature that are mentioned. The panoramic images are used as buttons and move when the user click to other image of planets. But the planets cannot be zoom-in.

The study entitled "Celestia" is a free real-time space simulation that lets you visually experience our universe in three dimensions. Celestia was the initial inspiration and creation of Mr. Chris Laurel, a Seattle, WA computer programmer who in 2001, decided to write a free software program to be made available to everyone on the world-wide-web that would place you in control of a virtual reality world of the universe. His vision and dedication gave birth to a program that is unlike any other space simulation program in existence. Celestia doesn't confine you to the surface of the Earth as do many other programs. [10]

It is similar to the study that the authors made because the simulation that the authors developed also let the users to visually experience our universe in three dimensions and doesn't confine you to the surface of the Earth as do many other programs but not in world-wide-web but in a pc-based application where you can control a virtual reality world of the universe.

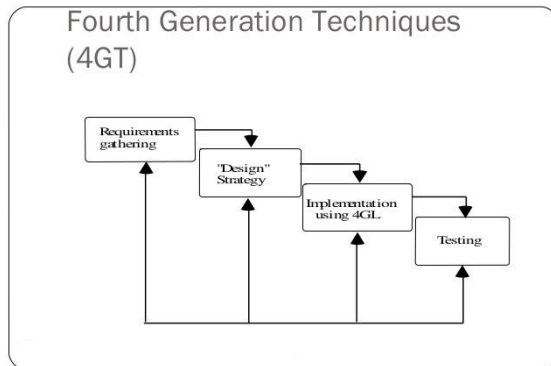
The study entitled "E-learning on Stars and Galaxies" is an application focused on the following topics: Stars, Birth of Stars, Death of Stars, Planet, The Sun, Galaxy, Milky Way, Constellations, Major Constellations and Zodiac Signs. It covers the exploration of the Solar System, the discovery of planets orbiting other stars, the birth life and violent death of stars and the creation of the Universe itself. [11]

It is similar to the study because they also includes planets and the sun in their application. This application can visually show the nature and wonders of stars and galaxies like the authors project which can also view the planets, asteroids, and sun in 3D.

### **3.0 METHODOLOGY**

#### **3.1 Research Design**

## The Fourth Generation Techniques (4GT)



**Figure 1. 4GT Model**

### Requirements gathering

In requirements gathering phase, the developer gathered system requirements like: what software was appropriate to be used that could make 3D applications; who will use the application; what Operating System can run the application; what devices would be used to run the application.

### Design strategy

In design strategy phase, the designer designed the application based on what will be appreciated by the user. The designer used editing software like Photoshop to edit images like in the main menu window, to make the design more elegant and beautiful. The designer also searched some images for them to have a based design.

### Implementation

In the implementation phase, the developer implemented the application by developing meaningful documentation and conducting thorough testing of the application.

### Testing

The final phase is the Testing. In this phase, the system is tested by the Grade 5 students from Batangas East Elementary School. The students appreciate and understand how the solar system look like. The developer gathered some opinions that would help to improve their project.

### Research Participants

The participants in this study include Mrs. Janice Echaluze Velasquez and Mrs. Luisa Macatangay, their professors who guided the authors all throughout the process, and to the Grade 5 students who tested the application, and finally, their classmates who gave their suggestions and opinions for the improvement of the author's project.

## **Research Gathering Procedure**

The researchers submitted their proposed topic to their adviser and the dean checked it. Upon the approval of the topic, the researchers formulated the objectives of the study and started researching for the related literature, did some tutorials to easily understand and what software to do. They gathered information from the internet, browsed other books and theses in the library that broaden the idea they need.

After that, the researchers proceeded making the Methods like Gantt chart, Diagram of Model used, and Flowchart. The researchers took images for the screen shots with description. They also collected the references and make curriculum vitae. After all the procedures, the authors submitted it for checking.

After the completion of the activities, the researchers prepared themselves for the mock defense and the pre-oral defense.

After the pre-oral defense, the researchers proceeded in finishing their capstone documents and system application for the upcoming final defense. They added abstract, summary, conclusion and recommendation. They also changed its format.

After the completion of their capstone documents and system application, the researchers prepared themselves for the final defense.