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RAISe LAB

Unifying the Science Classroom: Using Game Software to Explore Mars

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Introduction and Problem Statement

The human brain can process visual data 60,000 times faster than text. Over 90% of the data transmitted to the brain is visual. The vast majority of the teaching of science relies on processing verbal information. How can educators use the visual processing network of our brain to improve teaching and learning?

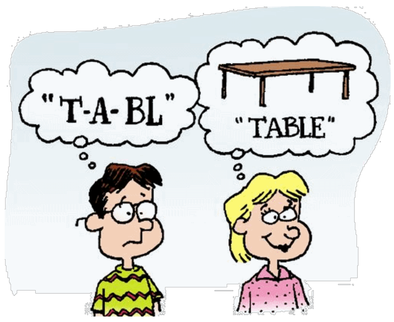

Figure 1: The brain has evolved an elaborate mechanism to process visual information quickly.

Objective

This project aims to utilize the Unity Game Engine to convey and support the teaching and learning of science. The objective is to create a 3D tour of Mars with a high scientific value and compatible for a robotic rover.

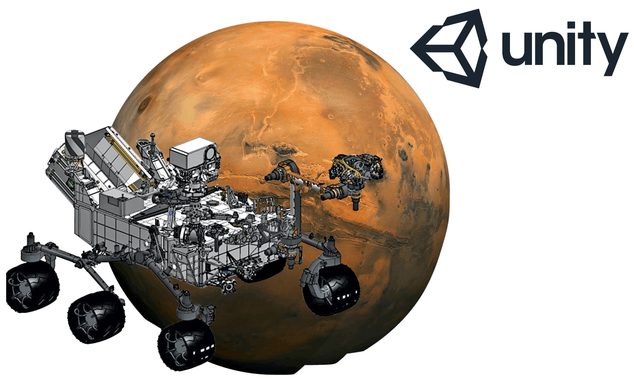

Figure 2: Unity game engine was introduced in 2008 and can be used to create 3D VR, AR simulations and other experiences.

Designing an Authentic Environment

To be useful in the science classroom, we need to recreate authentic landscapes, acquired from images of satellites and other sources. With these images we can create realistic 3D renderings that are highly accurate.

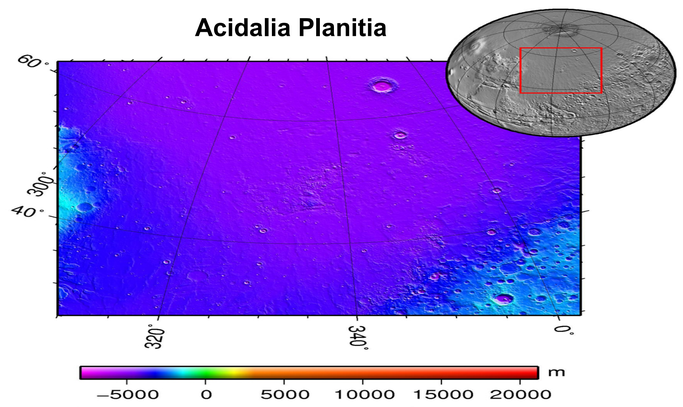

Figure 3 *Acidalia Planitia* is part of the northern plains of Mars, at a latitude of 44 degrees north.

Converting 2D data into a 3D landscape requires a method to accurately determine the high and low points: height mapping. Dark pixels in the image are assigned a “floor” and lighter pixels represent higher elevations.

Figure 4. Disrupted sediments in the *Acidalia Planitia* of Mars. The freezing and thawing of subsurface ice is a mechanism that could have caused these sediments to be disturbed.

3D Tour of *Acidalia Planitia* Mars

A game object in the form of a Mars Rover can be created to navigate the surface with a camera mounted on it. Using C# coding scripts, it is possible to move the object using keyboard letters or arrow keys.

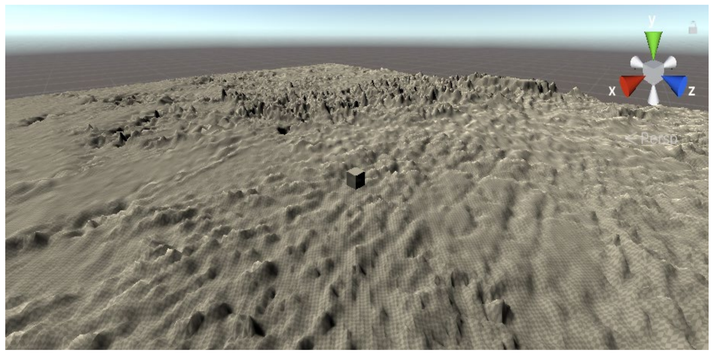

Figure 5: A view of the landing site as rendered in Unity.

Evaluation and Analysis

Unity platform can act as an exoplanet GIS tool. The selected site has high interest due to the sedimentary rock, clear evidence of water flow and potential for *in situ* resource utilization. Nonetheless, the landscape produced within Unity reveals the terrain is not compatible with rover mobility. Therefore *Acidalia Planitia* is not a candidate for landing a rover.

Future Work

The next step in this project involves using a virtual reality headset to explore the landscapes. It is also possible to build “mock” construction sites for potential colonies. From a teaching standpoint, putting students into the “driver seat” whereby they create their own realistic environment based on authentic data offers exciting learning opportunities.

References

Mars Exploration Program NASA/JPL/University of Arizona [Digital Images]. (2020, April 17).Retrieved July 24, 2020 from https://mars.nasa.gov/resources/24974/disrupted-sediments-in-acidalia-planitia/

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