Trimble Virtual World

Student Projects Catalog

Introduction:

Trimble Ltd. is a global technology company, with over 11,000 employees, that specializes in providing advanced positioning solutions, software, and services. With its headquarters in Colorado, USA, Trimble serves a wide range of industries, including construction, agriculture, transportation, and geospatial. The company's innovative solutions enable professionals to enhance productivity, efficiency, and safety in their operations.

Trimble's product portfolio encompasses precision GPS and GNSS receivers, laser and optical products, 3D scanning and imaging systems, as well as software solutions for data collection, analysis, and visualization. With a strong commitment to technological advancements, Trimble continues to shape industries with its cutting-edge positioning technologies.

Intro to the TVW game:

Virtual World is a gamification solution developed by Trimble, aiming to simulate the world of construction and geospatial activities. The game takes two main forms:

- Open World: In this mode, users engage in an adventure or RPG-style game set in various environments, such as construction sites or city blocks. Users can choose their "weapon" from options like GPS or total stations and leave markers on the site. They undertake tasks and quests to learn about surveying or construction. This aspect of the game primarily targets students and learners.
- Quest Builder: Users play a city-building game where their role is to create quests and share them with students and learners. They can utilize provided tools and import customized assets to construct worlds. Importantly, users can implement events and instructions without requiring coding knowledge.

While the game is still in the Early Experience program, it has garnered a global community. Several universities are incorporating Virtual World into their curricula, and distributor partners are showcasing the game at prominent construction and technology expos in locations like Las Vegas, San Diego, Santiago, and Christchurch.

YouTube video link

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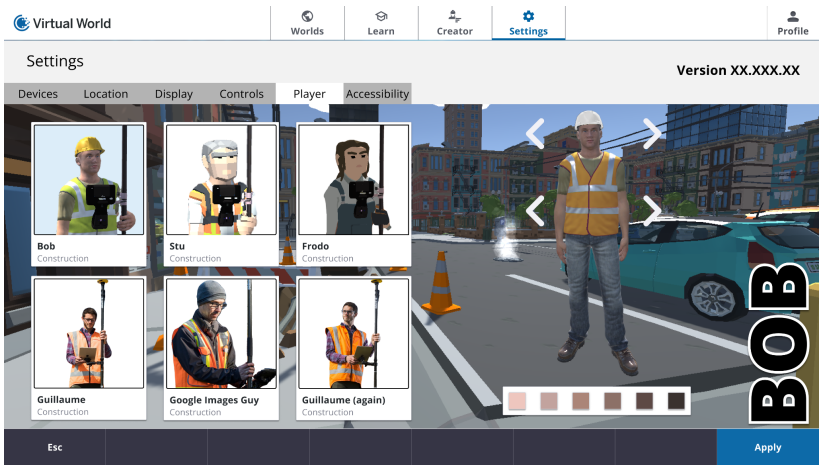
*Some projects would require some knowledge or desire to learn about Unity game engine and C#

Customised Characters:



A significant aspect of the gameplay in the Virtual World is its adventure or RPG-style elements. Players assume the role of a character in the open world or embark on specific quests. Currently, the assignment of characters is dependent on the world being played, with three options available.

However, to make the game more personalised and engaging, Trimble aims to enhance the capability for users to customize their own characters and define their identities. This customization will be implemented as part of their user profile. As part of this project, the hired individual will collaborate with the UX designer to provide input on character editing and creation features. Their expertise will be required to advise on the appropriate level of detail to be implemented and contribute to the creation of character customization options.

The objective is to offer players a more immersive and individualized experience within the Virtual World game. By allowing users to create and shape their own characters, the game becomes more personal and tailored to their preferences, enhancing their overall engagement and enjoyment.

Project Objectives *(executive summary of four practical, achievable deliverables)*	
1	**Learn and explore about our user**: Our game is distributed globally and to a lot of different users, from students and professional workers with a broad range of ethnicities and gender
2	**Voice of User:** spend time with our experienced users and get their feedback about what they would expect for their characters. What level of customisation they would expect as a minimum and best case
3	**Concepts:** Come up with multiple concepts suggesting different approaches. This is about exploring the potential and getting a round of feedback from users
4	**Tests:** come up with some creative ideas to iterate quickly and refine toward an production implementation

Redesign the gameplay (UX dev):

The Virtual World game is presently a desktop solution, with gameplay primarily conducted using a keyboard or an Xbox controller. However, as the game has progressed through numerous rounds of exploration and testing, it has outgrown its original control and gameplay mechanisms. The team now possesses a comprehensive understanding of all the necessary functionalities that users require.

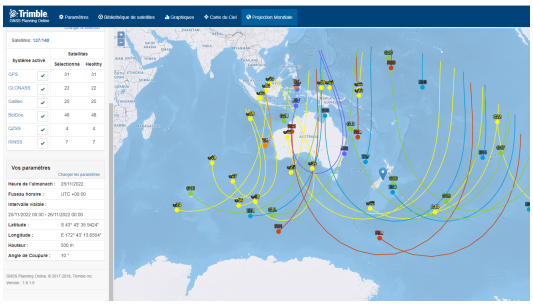
At this stage, the project necessitates the expertise of an individual who can leverage this understanding to propose several concepts for game controls. Given that Trimble is considering expanding the game to multiple platforms, such as touch pads and arcade machines, it is an opportune time to explore and develop new control options.

The assigned individual will have the opportunity to present concepts and ideas that enhance the gameplay experience and align with the diverse platforms being targeted. This could involve reimagining control schemes, incorporating intuitive touch-based interactions for touch pads, or considering novel control mechanisms suitable for arcade machines.

The aim is to optimize user engagement and provide seamless and enjoyable gameplay across various platforms. By incorporating innovative and appropriate game control concepts, Trimble aims to enhance the accessibility, appeal, and flexibility of the Virtual World game for a wider range of players.

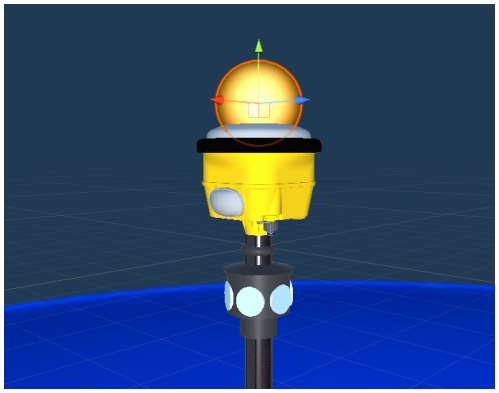
Project Objectives *(executive summary of four practical, achievable deliverables)*	
1	**Explore current functionality**: Explore the game and gain insights into how users interact with each function. Additionally, take the time to explore and understand users' setups and their intended usage of the game.
2	**Conceptualization:** This phase is about exploring the potential of different game control ideas and obtaining feedback from users. Encourage user involvement and collect their feedback to refine the concepts.
3	**Prototype**: Try out some of your key ideas, code, share with he internal team -- get feedback
4	**Integrate:** Include the new controller system into a production release of Virtual World

GNSS simulation enhancement:



Trimble is at the forefront of developing advanced GNSS sensors that offer centimeter-level precision worldwide. However, the current implementation of the Virtual World game lacks the inclusion of realistic noise and error in the data, resulting in an inaccurate representation of the real-world conditions.

The objective of this project is to enhance the simulator and make it more realistic by providing a diverse set of satellite data based on time and location. This information can be obtained from Trimble's existing GNSS planning website, www.gnssplanning.com. As GNSS signals constantly change and the skyplot varies over time, incorporating this dynamic aspect into the simulator will bring it closer to reality.



Additionally, the current GNSS signal used in the game is perfect and devoid of any noise. To improve the realism, the project aims to introduce noise to the signal, which will introduce variations in positioning precision.

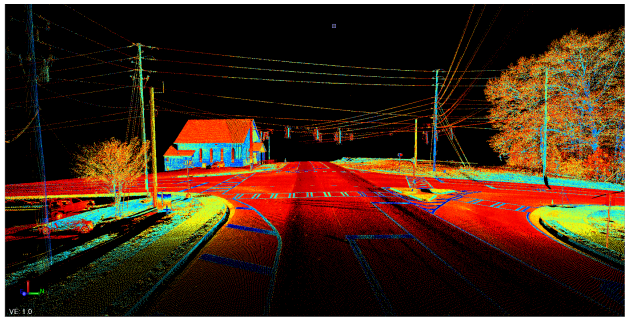
By enhancing the GNSS simulator with realistic satellite data and noise, Trimble seeks to create a more authentic and accurate experience within the Virtual World game.

Project Objectives *(executive summary of four practical, achievable deliverables)*	
1	**Learn**: explore about the current GNSS emulator in Virtual World, capability scope
2	**GNSS Location:** review and propose an implementation plan to generate a skyplot specific to the current location of the game user. Implement solution.
3	**GNSS Noise in signal:** review and propose an implementation plan to generate some noise in the GNSS signal. Implement solution.
4	**GNSS Time:** review and propose an implementation plan to have a dynamic skyplot changing over time. Implement solution.

Laser Scanning Sensor component:

Trimble is a leader in the development of 3D scanning technology and 3D modeling solutions, which play a vital role in the construction industry and the creation of digital assets. These technologies are highly valuable and require training for both students and professionals to effectively utilize them.

Virtual World has already incorporated GNSS simulation and Total Station capabilities and is now expanding to include scanning capabilities beyond the current SX12. To achieve this, a component needs to be built to enable protocol-level communication between the game and the field application. This project presents an opportunity to gain expertise in developing educational games and simulating sensors with high fidelity. Additionally, you will have the chance to explore cutting-edge technology like the new Trimble's X9 scanner, which enables the creation of point clouds and facilitates 3D modeling.



By working on this project, you will delve into the intersection of game development and educational purposes while simulating advanced sensor technology. This hands-on experience will enable you to acquire knowledge about state-of-the-art scanning technologies and their application in the construction industry.

Project Objectives *(executive summary of four practical, achievable deliverables)*	
1	**Protocol**: Understand the command protocol of the X9 scanner
2	**Comparison:** Analyse, compare protocol differences between the SX12 and X9
3	**Model:** Construct a fully animated X9 mimicked 3D model
4	**Integration:** Design, plan, execute component implementation phases into the Virtual World sensor simulation subsystem

Digital Twin builder:

To put it simply, a surveyor is like a creator. They have the ability to recreate the real world in a digital format, which some gamers might refer to as being a true metaverse creator. In the construction industry, this concept is known as the Digital Twin. Just imagine scenes like Call of Duty's depiction of Amsterdam or the representation of New York in Flight Simulator, high detail with all the assets existing in the scene.

In our project, we aim to incorporate survey functionality into the game, enabling our characters to build their own Digital Twin. This will involve combining elements from city builders like City Skyline and the creative aspects of RPGs like Minecraft. Your task will be to develop a tool to let the user create a comprehensive library of components, similar to an inventory. It would be preferable to build this library using assets sourced from the Sketchup 3D Warehouse. Additionally, you will need to implement functionality that allows users to select their desired assets and place them in front of their characters.

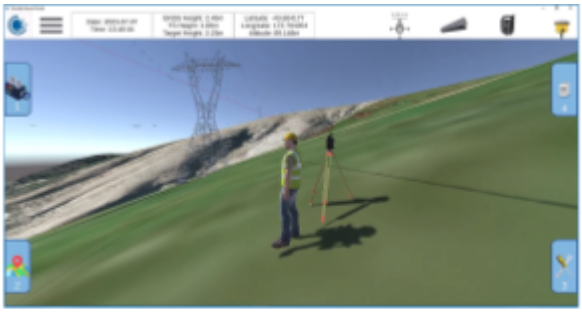
By undertaking this project, you will contribute to the creation of a unique experience where users can unleash their creativity and build their own digital worlds. The incorporation of survey functionality will provide a realistic touch to the game, enabling users to bring their Digital Twin to life.

Project Objectives *(executive summary of four practical, achievable deliverables)*	
1	**Inventory**: Develop an inventory component which could be saved with the user's profile
2	**Builder**: develop functionality to select and place an asset from a user at run time
3	**Save:** the game needs to be saved to the cloud using Trimble Connect cloud
4	**Team collaboration**: learn to work with a team and develop components in a collaborative way

Earth map as a world:

Our customers operate in various locations worldwide, including remote areas like Antarctica. The scope of their needs is vast, and even with an unlimited number of worlds, we cannot cover all their requirements. In the construction sector, projects often focus solely on the future development without incorporating crucial contextual information. To create an immersive experience, it is essential to bring in contextual information, and this is where open data and 3D tiles play a significant role.

Your task will involve implementing the functionality to allow users to select any location on Earth and automatically teleport the player to that chosen location. Once there, they will have the ability to commence building and enhancing the virtual world using our Quest Builder tool. This feature enables users to bring in real-world contextual information and integrate it seamlessly into their projects.



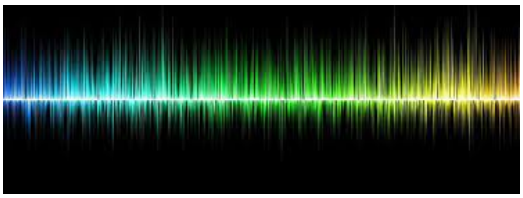
Power line in the Port hills

By incorporating open data and leveraging 3D tiles, we can provide users with a more immersive and realistic experience. Users will have the opportunity to work with real-world geographical data, which enhances the accuracy and authenticity of their virtual world. Your work will contribute to enabling users to create highly contextualized and engaging environments that align with their specific needs and project requirements.

Project Objectives *(executive summary of four practical, achievable deliverables)*	
1	**Explore**: Investigate tools sets on the market for technical and content, free and paid for data services
2	**Share**: Share the pros and cons analysis with the team, gather feedback
3	**Prototype**: Build a prototype world of a given world location. Compare manual vs. automated results
4	**Integrate**: Include the maps system into a production release of Virtual World, including usage logging

Sound and Voice play:

A good immersive game is complemented by appropriate sound elements. Consider the footsteps of characters, the ambient noise of a city, or the sounds of an excavator on a construction site. These are the components that our virtual world currently lacks. To ensure a truly immersive experience, we need to implement 360-degree sound.



Your task will involve exploring our existing virtual world and leveraging your creativity to enhance it with immersive sound effects. These sounds should be integrated into the prefabricated elements so that they play seamlessly when users require them. It is also crucial to provide users with the ability to toggle these sounds on and off, allowing them to focus on their work when needed.

Furthermore, the Virtual World enables users to create quests, but the instructions are currently text-based. To enhance the user experience, we aim to provide the option to convert these text instructions into audio format. Your role will involve exploring text-to-voice capabilities and finding ways to integrate this functionality seamlessly within the game.

By incorporating immersive sound effects and audio instructions, you will contribute to enhancing the overall user experience within the Virtual World. This project allows you to leverage your creativity to bring the virtual environment to life and provide users with a more engaging and immersive gaming experience.

Project Objectives *(executive summary of four practical, achievable deliverables)*	
1	**Tech**: Investigate the technology to create Unity sounds
2	**Sounds**: Determine what sounds will work, in which aspects of Quest game play
3	**Prototype**: Build a prototype sound enhanced Quest
4	**Integrate**: Include the full sound system into a production release of Virtual World