

Sustainable Cities

Sustainable Cities: Experience the future with VR!

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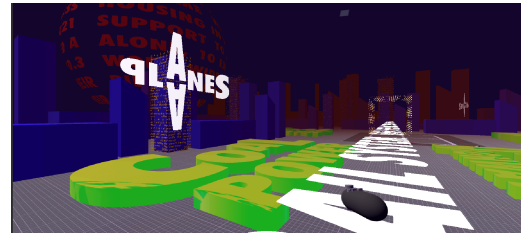


Figure 1. Screenshot of *Sustainable Cities*

1 Abstract

This VR project explores the United Nations Sustainable Development Goal (SDG) 11: Sustainable Cities and Communities. Through a narrative-driven experience, players interact with three key urban challenges - sustainable transportation, pedestrian safety, and public green space. Each challenge is presented as a word puzzle, where solving the puzzle triggers a positive change in the environment. The experience uses immersive audio, environmental storytelling, and customized interactions to raise awareness about the importance of sustainable urban planning. We encourage players to reflect on the environmental impact of a city's infrastructure. By immersing the user with VR, they can have the experience of “building a better future” and learn key elements of sustainable city planning.

CCS Concepts: Computer Graphics and Visualization, Human-Centered Computing, Human-Computer Interaction - HCI, Virtual Reality Systems

Additional Keywords and Phrases: Climate change, Sustainability, Typography, Virtual Reality

2 Introduction

This project is a VR experience designed in the CAVE2 environment that directly addresses SDG 11: **Sustainable Cities and Communities**. The goal focuses on making cities inclusive, safe, and resilient through improving public transport and providing accessible public spaces. By solving interactive word puzzles, the project encourages players to reflect on transportation, infrastructure, and urban planning choices that influence the quality of life in cities.

We were a two person team working on this project. One half of our team is Nate Herrera; a CS+Design student at UIC, who contributed to the design and aesthetics of the project as well as scripting. The second half was Aschynt Pajankar, a CS Student at UIC, who helped with the scripting, debugging and layout.

3 Design Solution and Research Context

This project was designed specifically for the CAVE 2 environment in the Electronic Visualization Laboratory (EVL) at the University of Illinois Chicago. The CAVE 2 is a high-resolution virtual reality environment with 88 3D panels, surround sound, and motion tracking, offering an immersive audiovisual experience [Febretti et al., 2013](5). Built in Unity, the project integrates visual, auditory, and narrative elements. User interactions were implemented using Omicron, a VR input library by EVL, and the project was deployed to CAVE2 using getReal3D, a plugin by Mechdyne Corporation.

3.1 Ideation

Our initial idea for this project was a city builder in which the player could move through 3D space to arrange a commuter friendly city in a tactile manner. We decided this approach would not be the best use of the VR environment considering it would be a top-down view of a city. We developed this concept into a simple interaction in which the player can physically unscramble letters to reveal the solutions to various problems, triggering a change in the environment to literally build a better future.

During our in-class theater/improv session, we acted out the scenes from our storyboards to visualize how the interactions would play out while also narrating the actions. In addition to being able to feel out the motions, we got insight from a UIC Theater faculty member, Jeff Nyhof, further informing our project's design. We got feedback about possible choices the user might make which we had to consider, such as what would happen if the user does not do anything. This made us create audible/visual cues to facilitate interactions. This workshop led us to use words as actors in the scene, not just to tell the user what to think. The text contributes to the tone and feel of the experience. Considering the unique medium of VR; each action, movement, and sound had to be considered when developing the UI.

3.2 Solution

The project presents three structural problems within cities and highlights possible sustainable solutions:

- **Scene 1 (Transportation):** The player helps a character reach the city using a “High Speed Rail,” promoting sustainable mass transit as a better alternative to cars. High-speed rails reduce emissions and connect communities with less carbon footprint than car-based infrastructure.
- **Scene 2 (Pedestrian Safety):** Prompted by a civilian character complaining about their inability to traverse a busy street, the puzzle reveals “Crosswalk” as a solution. The crosswalk appears and cars observe it by slowing down. This scene encourages users to consider the positive impact of walkable infrastructure.
- **Scene 3 (Public Space):** The final solution, “Parks”, introduces greenery and livable space, referencing urban greening projects. Public parks improve air quality, reduce heat, and support mental well-being. Examples like the New York High Line or Singapore’s green corridors show how underused urban land can be repurposed meaningfully.

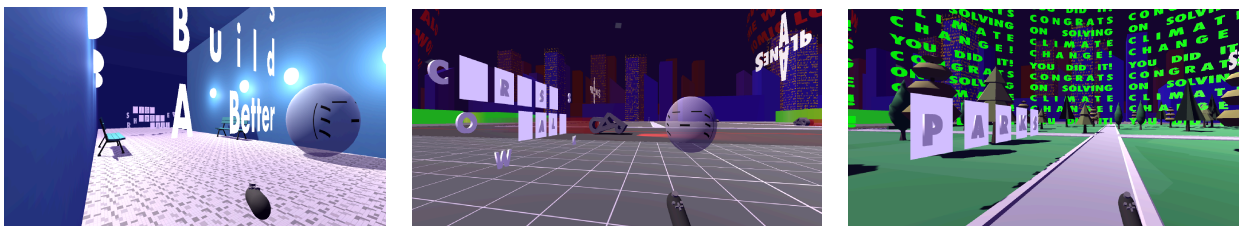


Figure 2: Scenes from *Sustainable Cities* described above

These scenes are set in a cyberpunk cityscape with floating typographic text providing the backdrop for some elements in the city, as well as providing facts about human resource usage over the years. We took inspiration from movies like *Tron* and the “Legible City” art installation (Groeneveld & Shaw, 1989).

4 Interaction and Aesthetic Design

Interaction is driven by simple VR mechanics: players solve word puzzles by placing and arranging letters to form key concepts. This form of interaction encourages critical thinking as participants must come up with an existing solution which works for the dilemmas in urban development today. The visual and

sound design is minimalistic and effective; highlighting the contrast between sustainable and unsustainable urban choices, making the message accessible even without needing prior knowledge of urban planning. The custom voice lines were recorded and edited to engage and entertain the user while criticizing and providing levity to the problems at hand.

4.1 Typography

For our main typography we wanted to use a single sans-serif font, mimicking the corporate and modern design language that is familiar to everyone. We settled on Futura. Aside from the name having futuristic aspirations, it is a font with a lot of history. “Released by The Bauer Type Foundry in 1927... It was marketed as the ‘font of our time,’ and also as the ‘font of the future’”(Storozynsky, 2021). This font is also similar to the font used by CTA, Metra and other American transit systems. Leveraging its timeless look we experimented with it in 3D. By using it as all different types of textures available in Unity; it was wrapped on 2D billboards, inverted meshes, and various 3d models. Unnatural neon colors are used to mirror the unnatural environments caused by industrialization. Many emission textures were also applied to text for legibility in darker lighting conditions.

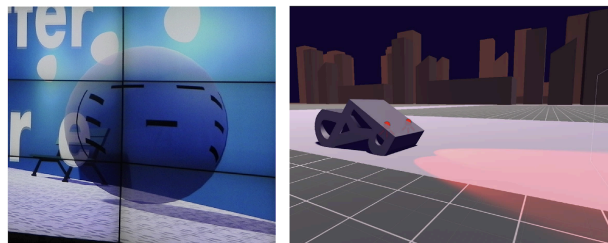


Figure 3: A typographic “civilian” character and 3D car model.

4.2 Copy

The text was selected from the Climate Clock website and NASA web pages about climate change to be displayed as bold headlines and alarming the viewer. Though not being fully readable texts, certain words such as () are able to be seen which give off impressions of larger topics related to climate change. I wanted to explore the limitations of the Unity version while also trying to see type in new ways, stretched, manipulated, and rearranged in 3D space.

5 Conclusion

Debating to about 50 guests in the EVL CAVE 2 environment, we received lots of positive feedback about the immersiveness of the project and the unique environment we created. Though we had difficulties at first with the volume of our experience, in the end sound was a large factor in the immersiveness and contributed to the overall tone of the experience.

The project successfully fulfilled our objective of raising awareness about the UN SDG for Sustainable Cities and Communities. By placing the participants in the middle of each urban challenge: whether it was helping someone reach the city, cross a busy street, or revitalize an empty space, we provided a hands-on understanding of how thoughtful planning and sustainable solutions can directly improve urban life. The word puzzles encourage players to think critically about sustainability rather than simply observe it.

Ultimately, the experience demonstrated that building a better future involves recognizing problems and making small but meaningful changes; whether through transit, walkability, or green space. By combining education and interactivity in a VR setting, we empower users to not just learn about sustainability, but to create it firsthand.

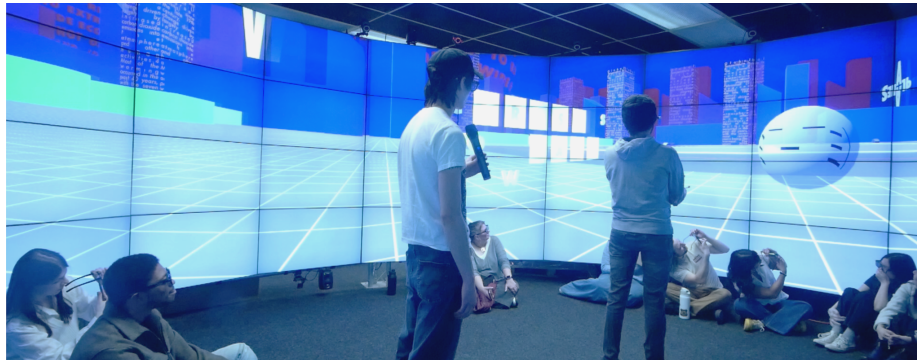


Figure 4: Final Presentation of *Sustainable Cities* in CAVE 2.

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