Fall 2017

Pre-Occupancy Training with Virtual Reality

Portland State University. School of Architecture

Opsis Architecture

Pre-Occupancy Training with Virtual Reality

Southwest Oregon Community College

Coos Bay, OR

Project Overview

Opsis Architecture has teamed with Portland State University's Research-Based Design Initiative to study occupant behavior and energy consumption.

The relationship between people and building control systems is a critical factor in overall building energy performance. Conventional energy models rely on static, overly simplistic patterns of occupant behavior and are unable to provide energy performance predictions that reflect realistic use. Thoughtfully designed passive systems are ineffective unless operated as intended, resulting in a performance gap between predicted energy consumption and measured energy consumption post-occupancy.

Utilizing virtual reality (VR) simulation with game engine technology, this team is studying the potential of VR to both predict and influence user interaction within specific spaces and environmental conditions. This study will take place over two quarters, Fall 2017 and Winter 2018. During the fall quarter, we are focusing on new ways of training by analyzing VR's gaming capabilities to build upon the users' emotional relationship with a space, improving their ability and desire to better utilize passive and advanced systems such as shades, ceiling fans, lighting controls, and operable windows.

The finished product will transform the way the profession thinks about post-occupancy training, energy modeling, and influencing behavior through design.

Opsis Team

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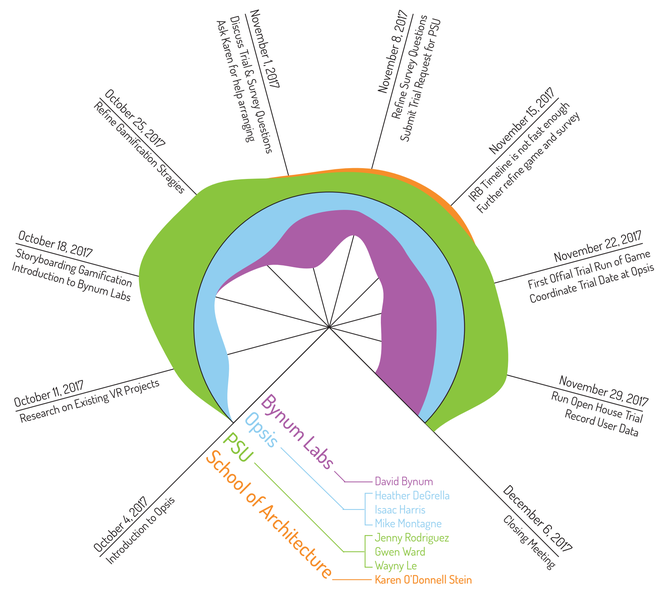
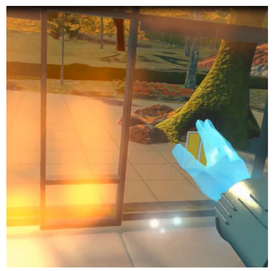
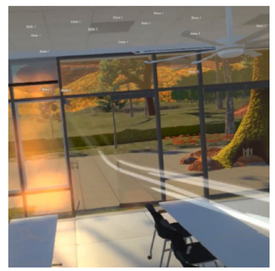


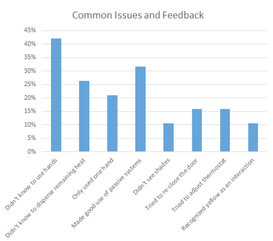
Gameplay Imagery

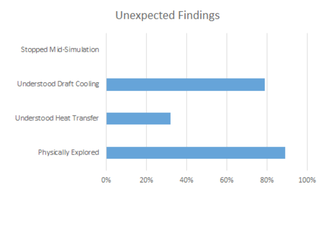


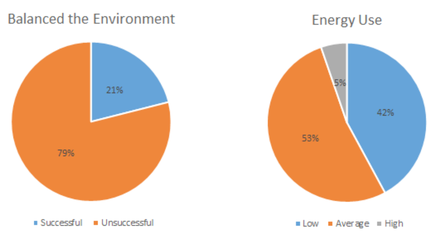


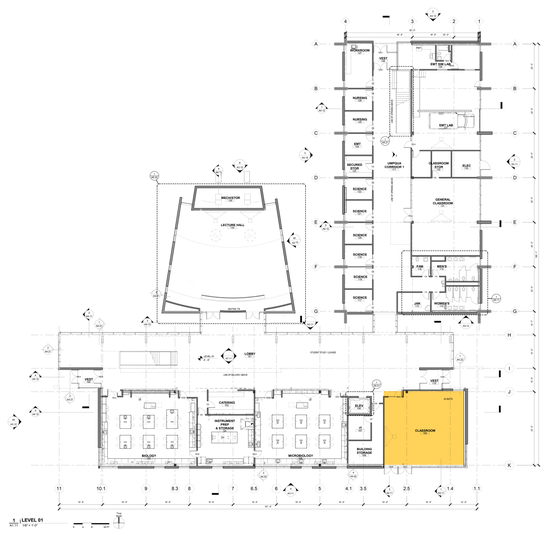
Experiment Findings

We collected anonymous user data from our day of running the simulation and we discovered some trends in terms of both difficulties people had within the game as well as surprising data outcomes. We anticipated that people who had used VR before would have an advantage and would therefore have a higher completion rate, but this was not the case. In fact 0% of people with prior VR experience completed the simulation successfully. We also noticed some subjects did not understand the basic tenants of playing in virtual reality and did not know to physically turn their bodies in order to explore the space, we had been hoping and relying on participants innate curiosity to drive them to explore the room. There was also data to support making certain functionalities more visible and easy to interact with. The window shades were particularly problematic in that many people 53% of users had difficulty operating them and 11% never even noticed them. We were pleasantly surprised to find that no participants became uneasy or motion sick and had to exit the simulation early and 100% were engaged and observed to be enjoying the experience. The enjoyment is a significant factor in that we are trying to utilize fun and gamification as a means of engaged learning. The players were asked to complete a quick informational quiz on the passive and active systems available in the room post-simulation and 93% of all questions were answered correctly. A comparative control group will need to be utilized in order to give value to the VR as a more or less effective training tool than standard methods, however time was a limiting factor. The total number of successful completions of the game, 21%, was lower than expected and hoped for, with most participants getting close but not having a full enough understanding of heat dissipation methods in the game to effectively maintain a lowered temperature, even with all of the passive systems being utilized.









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