CPS 595/596-RESEARCH PROJECT SPRING 21

VR BASED JENGA GAME USING OCULUS HEADSET

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INTRODUCTION

Recently, virtual reality technology has advanced to the point that it has applications in entertainment, healthcare, education, civil engineering. This Project introduces game development by using an Egocentric View (First-person vision). In particular, we develop the Jenga game using VR technology in an innovative concept of creating a game in 3d Virtual Space and provide an immersive experience with human interaction. To this end, we are using the Unity3D engine and deploying the game onto the Oculus VR headset. The original Jenga game consists of a collection of rectangular blocks piled on top of each other. A player is responsible for removing one block at a time while ensuring the tower does not become too unstable that blocks fall from it. In the original game, the blocks removed from the tower had to be placed on its top at any angle, leaving it vulnerable to later addition of blocks. When a block hits the floor, the game ends. The game allows gameplay via VR headsets.

APPROACH

We are simulating a real world JENGA game in virtual reality using oculus VR and Unity3d.

JENGA is a board Game which uses same dimension blocks builds into a tower.

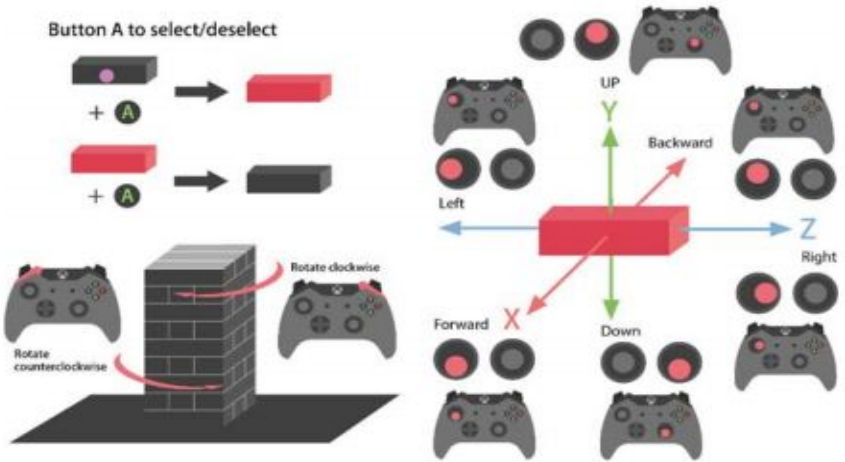
Each block removed is then placed on top of the tower, creating a progressively more unstable structure.

We are developing this game in first person view using Hand tracking technology using controllers.

Creating a JENGA game in virtual world which will give an immersive experience of virtual reality.

PREVIOUS RESEARCH WORK PAPER I

BlockTower: A Multiplayer Cross-Platform Competitive Social Game



Pros:

The ray casting technique implemented in the Oculus and similar VR HMD
Gestural set used for controlling the cubes
VR version allowed players change perspectives easily by walking around and/or moving their heads to get a closer look at the tower

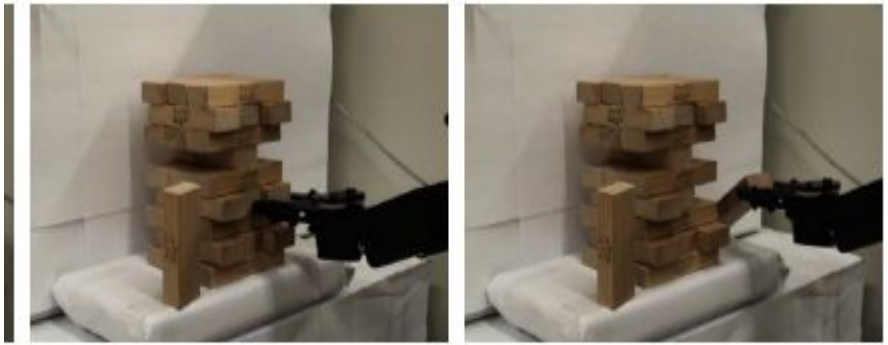
Cons:

Moving the Blocks using the Game Controller where hands are not displayed

Large display like tablet using hand gestures to control the cubes

PAPER II

Robot Jenga: Autonomous and Strategic Block Extraction



d (b) A new block is selected by the Block Removal Planner. (c) The block is successfully extracted from the tower.

Pros:

Used robot arm for the extraction of blocks from the tower.
Developed an autonomous Jenga robot using low cost and inexpensive components.

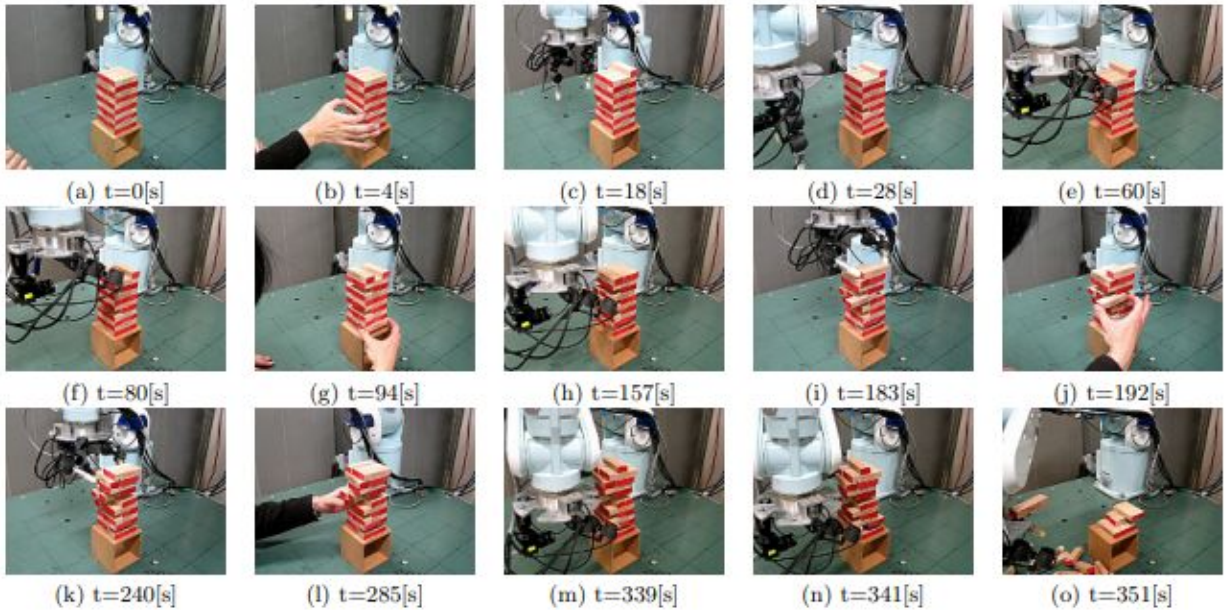
Cons:

After a block is removed, instead of placing it on top of the tower, the block is simply dropped to the side to simplify the manipulation task.

If the tower is disturbed during the block extraction process, the out of place blocks are not corrected.

PAPER III

Development of a Jenga Game Manipulator Having Multi-articulated Fingers



Pros:

Multiplayer game with human and robot manipulator.
Used camera to determine the block position.
Used robotic hand instead of gripper for most precise block removal.

Cons:

Performance of robotic system is low.
Variety of ideas could be used to improve the system.
Manually clicking a key of a PC controller of the robot to determine the robot turn to play.

PAPER IV

A Physics-Based Augmented Reality Jenga Stacking Game

Pros:

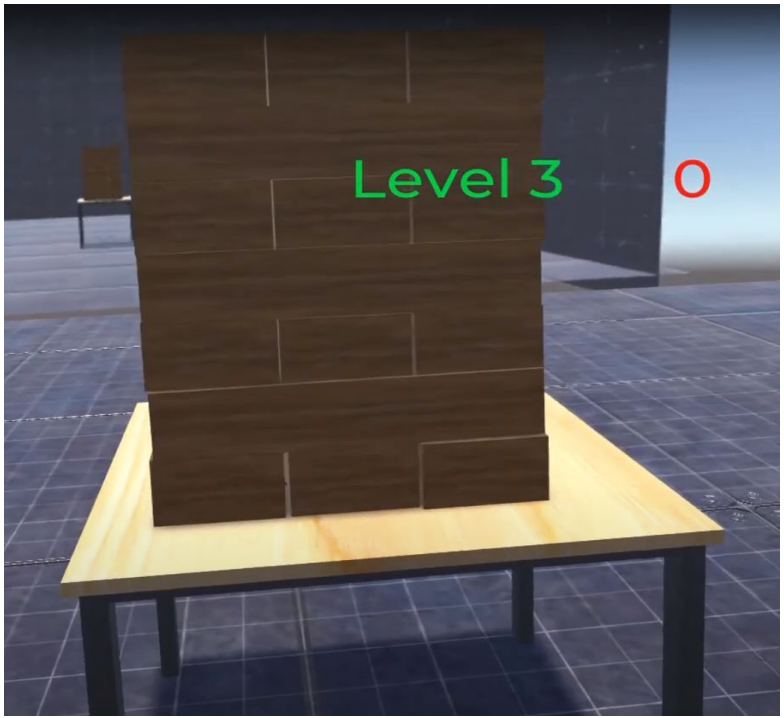
a cross-platform environment in which handheld and desktop-computer users can collaborate with each other in a shared scene to accomplish physically realistic experiences.
used mobile phones as input object to provide an interaction interface
Used Computer vision tracking libraries ARtoolkit, ARTag, ARtoolkit plus.
Used ARtoolkit plus to calculate camera position and orientation
Skin color segmentation method that can efficiently distinguish hand region through a skin-color classifier

Cons:

Quite expensive to use it in everyday life.
socially using Augmented Reality may be inappropriate in some situation.
Lack the experience of Virtual environment/ world.
Performance is a concern as it depends of hardware how powerful it is.

Framework and Results

Framework and Results



Future Work

1. Develop a Player Assist (Set of instruction to understand the player about how to play the game)
2. Use of Artificial Intelligence to Predict the next move.
3. Make Multiplayer mode to make game more fun and interactive.
4. Use of Artificial Intelligence in Multiplayer mode.