Virtual Reality

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ABSTRACT

This project presents a simulation methodology applied to a robotic arm. Its goal is to allow the robotic arm system to perform easy movement in a 2d environment. The robotic arm is represented by using Vrealm, a 3d rendering application, and the movement of the arm was controlled by Matlab. The work includes mathematical modeling of the arms movement by using inverse kinematics. The model allows the user to insert location x and y coordinates, when then moves to that direction to complete a task.

PVLDB Reference Format:
Nahom Negash. Virtual Reality. PVLDB, 14(1): XXX-XXX, 2020.
doi:XX.XX/XXX.XX

PVLDB Artifact Availability:
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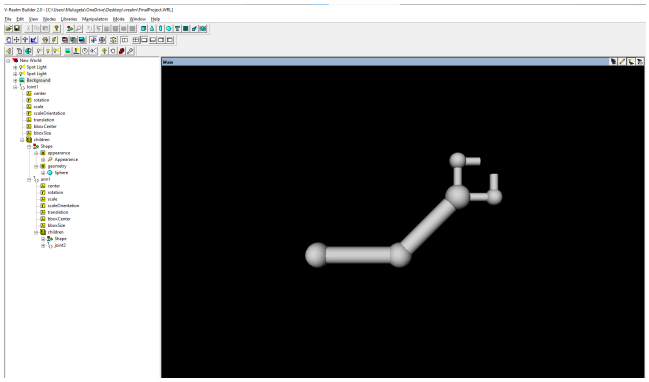

Figure 1: An illustration of Vrealm design of the robotic arm

1 INTRODUCTION

Virtual reality has attracted the interest of many investors and the public, which led the technology to grow vastly. The concept of virtual reality was introduced in 1957 by Morton Heilig (Bridget, Poetker, 2018). Since that time and in accordance with the application area, several definitions have been formulated. For Example, Gigante stated, "The illusion of participation in a synthetic environment rather than external observation of such an environment. VR relies on a 3D, stereoscopic head-tracker displays, hand/body tracking and binaural sound. VR is an immersive, multi-sensory experience".(1993).

Furthermore, a lot of other definitions had come up through time, however, all of them highlighted some common points. These are immersion, perception to be present in an environment and interaction with that environment.

VR can be used as a stimulus to replace real stimuli, recreating experiences that would be impossible in the real world with a high realism. For instance, it can be used to improve the response time of people with phobias. The quality of a VR experience can be measured in three components of VR experience are presence, realism, and reality. The user could then measure these components to evaluate his or her VR experience.

2 METHOD

The goal of the project is to design a simulation of the human arm using Vreal. Some restrictions were included when building the arm, the arm should be controlled in a 2-dimensional and should have claws that enables the user to grab any item from the desired position. The design was accomplished by following hierarchy rules. The first step was building the shoulder joint. Next, building the arm under the child of the first joint. Then, building the next joint under the child of the arm and so on till the last part, which are the claws.

Furthermore, after building the arm a state machine was needed to automate the movement process. The design has 8 states. Start state, this is where all the variables are initiated to starting position zero. CenterState, this is where x and y variables are set to zero. Holdstate1, this is where the state machen waits for the time to reach the desired amount of seconds. This state helps us visualize the arm moving at a slower speed. TargetPosting, at this stage both x and y will be set to move to the target location. Holdstate2, this has the same purpose as the first hold start, it shows the arm moving to the target at a slower speed. Grab State, at this state both x and y have reached the desired location and grab any item. Holdstate3 this has the same purpose as the prevese holdstates. Final state is where the timer is reset to zero and the process will start all over again.

Kinematics model was used to simulate the arm movement and angle. The kinematics description of the robotic arm establishes the transformation relationship between the coordinate axes of each link. After establishing the coordinate system the hook will be placed in a position where it can access the item.

3 DISCUSSION

The robotic arm simulation system is able to provide an average accuracy when it was tested. The arm simulates a human arm by performing simple actions that can be performed on a 2d model. However, the system has a lot of space for improvement on many fronts. For Example, the system can be improved by tracing the trajectory generated in the movement and adding force control.

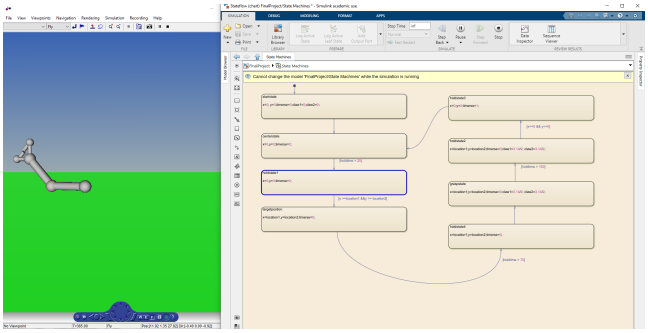

Figure 2: An illustration of arm movement in Matlab

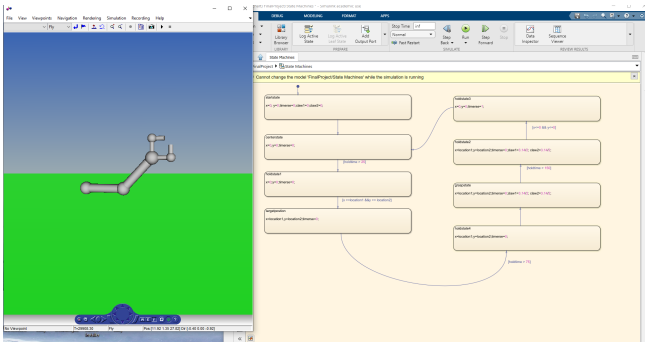

Figure 3: An illustration of arm movement in Matlab

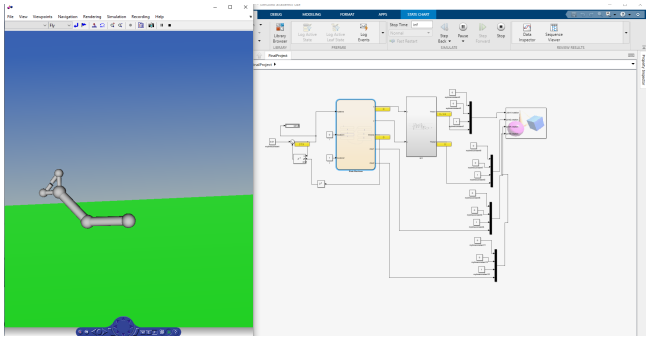

Figure 4: An illustration of arm movement in Matlab

4 CITATIONS

Cipresso, Pietro. (2018). The Past, Present, and Future of Virtual and Augmented Reality Research: A Network and Cluster Analysis of the Literature. Frontiers. [**?**] Bridget, Poetker. (2018). The Very Real History Of Virtual Reality(+A Look Ahead) [**?**]