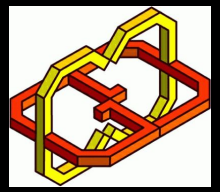

3D Paint

By

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Supervisors

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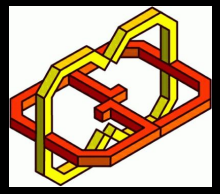
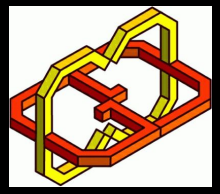
Introduction



- We have created a Virtual Reality 3D Paint using Unity engine with C# scripting.

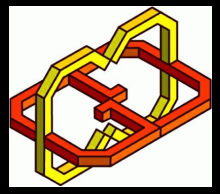
- The equipment we used includes Manus-VR gloves and HTC Vive headset and trackers.

Introduction



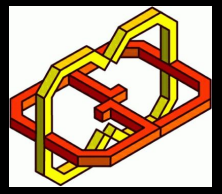
- Since the Manus VR gloves is a new product we wanted to explore its capabilities and create an easy to use 3D-paint platform.

Technologies



- Unity, C# scripting
- HTC Vive - Headset and trackers
- Manus VR gloves

Project Objectives

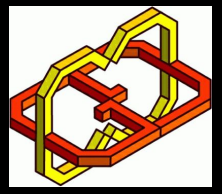


We had 3 main goals:

1. Smooth and interactive painting with both gloves
2. Grabbable paintings
3. Intuitive usage of the product

Solution Procedure

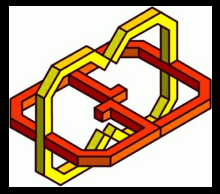
Interaction with the gloves



- Since the gloves are a pretty new product, its documentation and open source Q&A can’t be easily found.

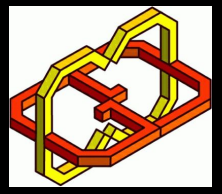
- However, Manus-VR provides us with its SDK implementation written in C#, thus we dived into the given code and explored some specific features.

Interaction with the gloves



- The important instructions for using the gloves are described in our project report, including:
  - fingers joints open/close values
    - an array with [0,1] values
  - hands state (e.g. open, close)
    - useful enum

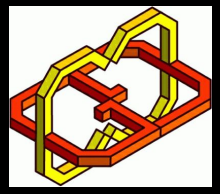
Painting Implementation



Unity provides us with several ways for implementing the painting feature.

- Line Renderer
  - a component that takes an array of 3D points and draws a straight line between each one.

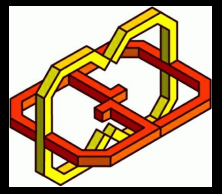
Painting Implementation



Line Renderer

- Pros
  - easy to implement and use
- Cons
  - a game object is not created which affects the ability to edit its transform.

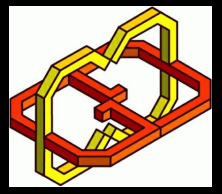
Painting Implementation



Creating a game object in the gloves' position for each frame.

- Cons:
  - each painting is composed of thousands of game objects which results in a poor performance.
  - the complex design makes it barely impossible to move the painting smoothly and effectively.

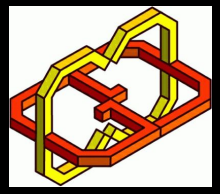
Painting Implementation



Building a mesh for each painting

- Mesh consists of triangles arranged in 3D space to make the impression of a solid object.
- Pros
  - only one game object is generated per painting, thus it can be moved easily by changing its transform.

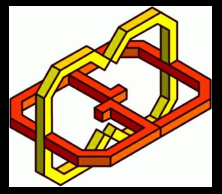
Painting Implementation



Building the mesh

- Given the previous (s) and current (e) points of the user's finger
  - n = s * e
  - l = n * (s - e)
  - the two new edges of the mesh are:
    - s
    - s + l * w, where w is the custom width.

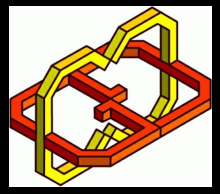
Painting Implementation



Building the mesh

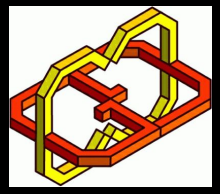
- Each frame we
  - add the previous calculation to the mesh
  - update the value of the last point
- This technique computes the previous vector due to the next position of the finger
  - it makes the rotation of the painting smoother

Future Work



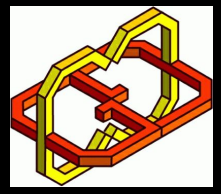
- Communication online – paint with friends
- Printing and saving the paintings
- Choosing colors

Demo



- Pictures
- Video

Demo



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