DV20447 – Virtual-Reality Procedural Experiences with 3ds Max’s Max Creation Graph and Stingray

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Class summary

- Approach creation challenges **procedurally**
- Create and **iterate** around a roller coasters ride
- Create virtual reality (VR) **experiences**
- Use **3ds Max’s MCG** for models and animations
- Use **Stingray** game engine to build the VR experience.
- Study some **tricks** to **enhance** the experience
Key learning objectives

At the end of this class, you will be able to:

- Create **procedural** content with 3ds Max's **MCG**
- Author real-time **VR** in **Stingray**
  - Enhance VR experiences by **triggering events** for the viewer
  - Setup fast **updates** and **alternatives** for rides review
  - **Decorate** real-time environments using **animated assets**
How did this idea begin?
Tech Demo: Race Track ToolKit
Procedural Content
What is Procedural Content?

- Meaningful **Systems**
- Objects with a **Parameterized** Definition
- **Combination** of:
  - Mesh Creation
  - Cloning
  - Transformations
  - Relationships
  - Conditions
  - Functions
  - Mathematics
- **Simple** Tools With Large Scale **Influence**
The Max Creation Graph

- **Node-Based** editor to build **Graphs**
  - Graphs that build **Procedural** Tools
  - Not Wiring Parameters
  - Packages
- **Inputs**
  - Nodes
  - Parameters
- **Outputs**
  - Primitives
  - Modifiers
  - Controllers
- **MCG Nodes & Compounds**
  - Multitude of Functions
Tech Demo: Intro to Working in MCG
Starting a Project: Best Practices

- Start **small**
  - Grow in complexity
- Clearly identify **components** to build
  - Avoid rebuilding the same things twice
  - Think **generic** rather than specific
  - Build **Reusable** Nodes
- Use **Compounds** *ad nauseam*
- **Layout** Intelligibly
  - Group, color and comment
Start Small: Creating A Mesh

vertices
1: (0,5,0)
2: (5,5,0)
3: (0,0,0)
4: (5,0,0)

indices
1: (3,2,1)
2: (3,4,2)

Smoothing Groups
1

Mat ID’S
1
1
1

UV Map
1: (0,1,0)
2: (1,1,0)
3: (0,0,0)
4: (1,0,0)
Start Small : Creating A Mesh in MCG
Start Small: Bolt Use Case

36 vertices
50 faces
Start Small: Simplify Mesh Creation Tools

vertices

Indices

Mat ID's

UV Map

Smoothing Groups
Tech Demo: Using LM_StringToTriMesh
Systems of Components
Transformations

- In Object Space
  - 0,0,0 is at mouse click location
  - Mesh Creation Happens at 0,0,0
- Pivot of ALL Transformations at 0,0,0
  - No parenting
  - Only Mesh Combining
  - No Arbitrary Pivot Point
- Plan from Origin to Final Transformation
  - Order is key:
    1. Scale
    2. Rotation
    3. Translation
Useful Mathematics

- Scaling
  - Rule of 3

\[
\begin{array}{c}
16 \\
25 \\
\end{array}
\]

- Rotation
  - Degrees and Radians
  - Vector Algebra
  - Translation
  - Trigonometry
Tech Demo: *Building A System*
Working With Splines

- Translate Spline Data to Useable Transforms
  - From Origin to Position/Rotation/Scale

Clone Along
Loft Along
Working With Splines

- Data From One Spline
  - Position at percent
  - Position forward
  - No Up!
- Second Spline
  - Up Direction
  - Right Vector
- Important to Match Splines
  - Clone
  - Reference
Working With Splines

- Clone At Multiple Percent Values
  - Create and Transform
    - Layout at origin
    - Scale
    - Rotate
    - Translate

- Loft Along Spline
  - Create Vertices Along Spline
  - Create faces from vertices
Tech Demo: Working With Splines
Finishing The Tool

- Max Script
  - Arrange and group parameters
  - Add functions
- Animation Controller
  - Train
  - Camera
Tech Demo: Roller Coaster ToolKit
Real Time VR
#1 Rule of VR

- Don’t Move the Point of View
- Don’t Move the Camera

- If You Move the Point of View, Give it a Platform to Stand On
Stingray (V1.5) Templates

In place
Seating or Standing

Room Scale
Bringing Content In Stingray

- Each *Export* or *Send* Created a Single Entity
  - Break in Workable Pieces
- Static Assets
  - Environment
  - Props
  - Roller Coaster Structures
  - Use *Send To Stingray* Commands
- Animated Assets
  - Train
  - Cameras
  - Animated Props
  - Use FBX Export
    - Bake Animation
Connecting the HMD to the Ride (in Flow)
Tech Demo: VR Roller Coaster In Stingray
Alternatives

- Choose Track
  - Input
- Hide Unused Tracks
- Show Chosen Track
  - Set Its Point Of View
  - Play Its Animation
Tech Demo : *Alternatives*
Animated Environment Assets
Types of Animations

- Transformations
  - Position Rotation Scale
  - Skinned
  - Loop (Seamless)
  - Default Animation Controller

- Shader
  - Panner
  - Vegetation

- Particles

- Import / Export Assets
  - “Smart Assets”
Tech Demo: *Animated Assets*
Class Files

- Link in Handout:
  - [https://www.dropbox.com/sh/dd6racpwykzo10p/AACTibWfVl11ZlL_zWs0lXFNa?dl=0](https://www.dropbox.com/sh/dd6racpwykzo10p/AACTibWfVl11ZlL_zWs0lXFNa?dl=0)
  - Password: IWasThere

- Distribution Files used in the Class
- The 3ds Max Project
- All Video Tutorials
- Final Ride Builds for HTC Vive and Oculus
- PPT Presentation and Handout for the class
How did I do?

- Your class feedback is critical. Fill out a class survey now.
- Use the AU mobile app or fill out a class survey online.
- Give feedback after each session.
- AU speakers will get feedback in real-time.
- Your feedback results in better classes and a better AU experience.