

GROOVY ASSIGNMENT: THE VR RIDE

A Cross Disciplinary Assignment in Computer Graphics and Interactivity

Nick Jushchyshyn
Digital Media Department
Drexel University
Philadelphia, PA, USA
nickj@drexel.edu

Robert Lloyd
Digital Media Department
Drexel University
Philadelphia, PA, USA
rel63@drexel.edu

Erik Sundquist
Product Design Department
Drexel University
Philadelphia, PA, USA
eps49@drexel.edu



Figure 1: Students and faculty at Drexel University working on the VR Ride assignment.

ABSTRACT

In this Groovy Assignment submission, we present a VR Ride assignment that challenges students to create a fully interactive VR computer graphics experience integrated with a themed ride. For this assignment, a ride is an apparatus that fully supports the users weight, utilizes the user's body motions as a primary input for computer interactivity, and provides haptic feedback relevant to the VR experience.

The assignment is designed to inspire and motivate creative thinking and cross disciplinary collaboration with faculty and students from outside the scope of those traditionally involved in programs focused on computer graphics and interaction.

The assignment can be easily scaled, by utilizing wholly existing, found or purchased platforms (exercise equipment such as a rowing machine or stationary bike) for use with small groups of students if desired. In the example presented, students from Electrical Engineering, Mechanical Engineering, Industrial Design, Game Design, VR & Immersive Media, Animation & VFX and Game Design programs collaborated using primarily found or recycled components to build a bespoke, human powered "VR Cycle" ride, integrated with original VR experiences developed for the ride.

CCS CONCEPTS

• **Applied computing** → **Media arts; Education**; • **Computing methodologies** → *Computer graphics*.

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SIGGRAPH '19 Educator's Forum, July 28 - August 01, 2019, Los Angeles, CA, USA
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ACM ISBN 978-1-4503-6782-0/19/07.
<https://doi.org/10.1145/3326542.3328018>

KEYWORDS

Immersive Media, education, Virtual Reality (VR), Augmented Reality (AR), curricular development, location-based entertainment, themed entertainment, out-of-home entertainment, motion-based attractions

ACM Reference Format:

Nick Jushchyshyn, Robert Lloyd, and Erik Sundquist. 2019. GROOVY ASSIGNMENT: THE VR RIDE: A Cross Disciplinary Assignment in Computer Graphics and Interactivity. In *Proceedings of SIGGRAPH '19 Educator's Forum*. ACM, New York, NY, USA, 2 pages. <https://doi.org/10.1145/3326542.3328018>

1 OVERVIEW

The VR Ride assignment seeks to motivate, inspire and encourage creative thinking, collaborative problem solving and practice of cross disciplinary teamwork by integrating computer graphics and interaction with real world physical, mechanical, electrical and industrial design challenges.

The VR Ride assignment calls for an interactive VR graphics experience to be developed that is fully integrated with a themed ride platform. The ride may be custom designed and built, or could simply be a repurposed piece of existing equipment. The key parameters for the ride are that it should fully support the user's weight, allow the user's body movements to be used as a primary means of interactivity input and offer haptic feedback relevant to the VR experience.

The enabling technology, and bridge between mechanical and digital graphics components of the ride, is the use of standard 6DOF trackers, routinely available as components of consumer VR systems. These trackers are used to digitize mechanical motion, circumventing dependency on use of electromechanical encoders for success. As a result, students focus their efforts primarily on design, graphics and interactivity challenges in completing the assignment.

Table 1: Metadata in tabular format

Summary	Create a VR Ride that combines an immersive interactive graphics experience with a mechanical apparatus that fully supports the user's weight while also accepting the user's intuitive body motions as a primary means of computer interaction.
Learning Outcomes	Students learn and practice creative problem solving, communication and collaboration with others from disciplines outside computer graphics and interaction.
Classification	Interaction, interfaces, animation, modelling, graphics.
Audience	Undergraduate students at all levels.
Dependencies	Varied based on selected project.
Prerequisites	None. Non-sequential assignment.
Strengths	Students collaborate across a broad array of disciplines and are inspired to think outside the boundaries of traditional desk-based computer interactivity.
Weaknesses	Requires extensive collaborative interaction with others, including complete strangers from external learning tracks.
Variants	Unlimited design options
Assessment	Public play-testing and/or exhibition of completed ride experience.

In addition to the system integration challenges of the hardware and software components of the project, the experience or game design component is an opportunity to learn and practice specific design constraints involved in location and motion-based themed entertainment when attractions are meant for use by the public in high-traffic environments. While these elements are not required, they offer an opportunity to engage in industry practices and support a more successful rider/player/guest experience.

2 MATERIALS

For the VR Ride example presented, the instructors challenged students to build an entirely bespoke "bike" style platform, using primarily found or recycled components, with additional constraints of relying on human power and delivering 2-axis (yaw and roll) motion. These constraints fit well with the number of students participating, the mix of their existing skillsets, and the time available to complete the project.

Readily available materials in this case including discarded 8020 aluminum rails and fasteners that were utilized to construct the primary framework for the example ride. Additional materials included recycled motorcycle handles and seat acquired at a junk yard, and inexpensive automotive hatch-back gas springs.

The materials, skills and time frame required for implementation of the assignment can easily be scaled down or up for smaller/larger student groups by adjusting the number and complexity of constraints, or even conceiving a ride to be built upon an existing platform such as a piece of exercise equipment.



Figure 2: The VR Ride as shown in Drexel University exposition booth at SIGGRAPH 2018.

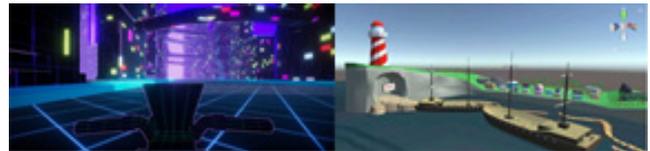


Figure 3: Images from student developed VR Experiences created for the VR Ride assignment.

Access to consumer grade a VR headset system and trackers capable of six degrees of freedom tracking is required as the assignment involves creating a virtual reality computer graphics and interaction component.

3 CONCLUSION

The example VR Ride assignment was completed in three main phases:

- (1) Industrial Design, involving students and faculty from mechanical engineering, electrical engineering and industrial product design working with collaborative input from counterparts in digital media to conceive and construct the motion platform.
- (2) Computer Graphics and Interaction, where classroom groups of digital media students and faculty designed and developed virtual reality experiences interfaced with the motion platform.
- (3) Final Integration, where students and faculty from all groups involved rallied to complete seamless integration between the platform, VR experiences and aesthetic design.

The complete ride has been exhibited both on campus and off, and has been ridden by members of the public representing a broad range of ages, backgrounds and interests.

It is hoped that the excitement this assignment generates and the scalability of its parameters offers a readily adaptable model for future implementations.