Poster at AIVR 2020 - Creating Virtual Reality and Augmented Reality development in classroom: Is it a hype?

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Abstract

The fast-growing number of high-performance computer processor and hand-held devices have paved the way for the development of Virtual Reality and Augmented Reality in terms of hardware and software in the education sector. The question of whether students can adopt these new technologies is not fully addressed. Answering this question thus plays an essential role for instructors and course designers. The objectives of this study are:

(1) to investigate the feasibility of the Virtual Reality/Augmented Reality development for undergraduate students, and

(2) to highlight some practical challenges when creating and sharing Virtual Reality and Augmented Reality applications from student's perspective.

Study design for the coursework was given with detail. During a 16-week long, 63 Virtual Reality/Augmented Reality applications were created from a variety of topics and various development tools. 43 survey questions are prepared and administered to students for each phase of the projects to address technical difficulties. The exploration method was used for data analysis.

TABLE I
SHORT PROJECT DESCRIPTION DELIVERED BY EACH GROUP (G) IN PROJECT 1, 2 AND 3

	Short description	Core tool/add-on	VR/AR
P1			
G1-34	'dream' house	A-Frame	WebVR
G35-36	'dream' house	A-Frame, ThreeJS	WebVR
G37	'dream' house	Unity3D	WebVR
P2			
G1	Water management	Unity3D, Oculus Rift	VR
G2	Water contamination	Unity3D	VR
G3	Water reservation	Unity3D	VR
G4	Water management	Unity3D	VR
G5	Flood evacuation	Unity3D, Oculus Rift	VR
G6	Water formation	Unity3D, Oculus Rift	VR
G7	Water elevation	Xcode, ARKit	AR
G8	Water management	Unity3D, Vuforia	AR
G9	Water simulation	Unity3D	VR
G10	Climate change on water	Unity3D	VR
G11	Water management	Unity3D, Vuforia	AR
G12	Underground water	Unity3D	VR
P3			
G1	Electricity generation	Unity3D, Oculus Rift	VR
G2	First-person shooter game	Unity3D, Oculus Rift	VR
G3	Sponge Ball game	Unity3D, GEAR SDK	VR
G4	Space simulator	Unity3D	VR
G5	Meditation application	Unity3D, Google SDK	VR
G6	Social chat	A-Frame	WebVR
G7	Human Anatomy	Unity3D, Vuforia	AR
G8	Water elevation	Unity3D, Oculus Rift	VR
G9	Throwing balls game	Unity3D, Oculus Rift	VR
G10	Rescue game	Unity3D	VR
G11	Objects measurement	Xcode, ARKit SDK	AR
G12	Water management	Unity3D, Vuforia	AR
G13	Flood evacuation	Unity3D, Oculus Rift	VR
G14	Water management	Unity3D, Vuforia	AR

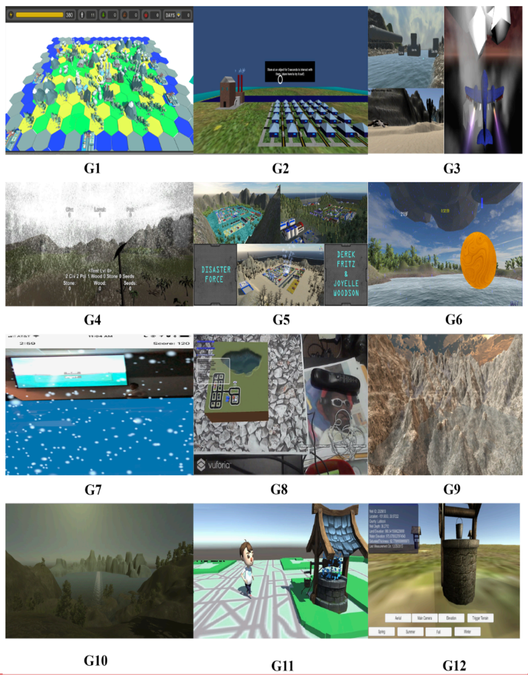
Introduction

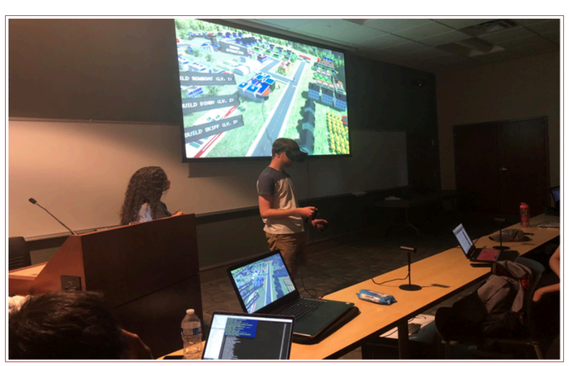
"*We can't really do that...Hype!*" -- this is an inspiring quotation from the book of Biocca and Levy which addressed the Vision of Virtual Reality in the 1900s. The unavailability of hardware and software at that time makes researchers in some areas (e.g., scientific visualization, flight simulation) uncomfortable with what Virtual Reality promised. The release of multiple consumer devices recently from expensive (e.g., Oculus Rift, HoloLens, HTC Vive) to affordable (e.g., Google Cardboard) has brought new promises to the area of Virtual Reality (VR) and Augmented Reality (AR) [1, 2].

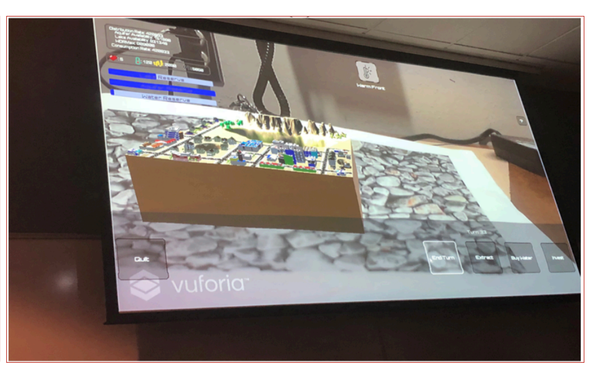
This study focuses on the feasibility of the technology adoption in a classroom. In another word, to what extent can students create a wide range of VR/AR applications within time constraints? What are their choices among abundantly available technologies? What are the challenges in learning new technologies? And ultimately what are the motivating factors to help them accelerate the learning process? and to this end, is it a hype to create VR/AR applications in today's world? Understanding these questions from new learners' perspectives will be a good indicator for instructors to elaborate their lectures in the future. Finally, students are better prepared with broad knowledge and they select more suitable one for their careers in VR/AR development.

Web VR applications:

Water-related VR/AR applications:







Methods

We used *studio-based* approach to maximize student learning and increase the learning curve. Students are heavily involved in three development projects, and each project is designated to answer the research questions: **R1**: To what extent can students adopt a wide range of VR/AR development tools to create their applications? **R2**: What are students' choices among the currently available VR/AR development tools? **R3**: What are the technical challenges from the students' point of view?

There are 38 participants in this study, and they were involved in FIVE activities: learn from instruction, self learning, learning from projects, learning from the Teaching Assistant, and learning from their peers by evaluation and design critiques. The duration is 16 weeklong

Result

R1: To what extent can students adopt a wide range of VR/AR development tools to create their applications?

63 VR/AR applications ware obtained as project outcomes of the course, including 38 WebVR applications, 6 AR applications, and 19 VR applications as shown in Table I

R2: What are students' choices among the currently available VR/AR development tools?

The majority of students (91.67%) chose A-frame as their library to accomplish the first project, 88.5% students chose Unity3D for the second and third projects

R3: What are the technical challenges from the students' point of view?

Collaboration to team up with other members when working on the same project, **API version Incompatibility** due to the different library versions that are unable to work with their devices. **Lack of supporting hardware** to accommodate 38 students at the same time. Learning curve is another challenge when learning new programming language (i.e., JavaScript, C#, Objective C). Models and interactions are difficult to control in 3D environment

Conclusion

This study examined the feasibility of having students to learn a wide range of available VR/AR technologies for WebVR, VR, and emerging AR applications for 16 weeks.

A large number of VR/AR applications were developed with various topics, which indicates that students were able to adopt those necessary tools and create the applications in their own interest. Thus, we would conclude that *VR/AR is not a hype*

Future study will be focused on quantitative analysis based on students' feedback by using the Technology Acceptance Model

References:

[1] Nguyen, Vinh T., Rebecca Hite, and Tommy Dang. "Web-Based Virtual Reality Development in Classroom: From Learner's Perspectives." In 2018 IEEE International Conference on Artificial Intelligence and Virtual Reality (AIVR), pp. 11-18. IEEE, 2018.

[2] Nguyen, Vinh T., Rebecca Hite, and Tommy Dang. "Learners' technological acceptance of vr content development: A sequential 3-part use case study of diverse post-secondary students." International Journal of Semantic Computing 13, no. 03 (2019): 343-366..