Team 1 - VR Texting & Driving

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Project Overview & Background

- Project sponsored by Erie Insurance
- Android App
  - Google Cardboard VR
- Used by agents with young drivers
  - Purpose is to connect with young drivers
  - Will help young drivers recall the conversation about distracted driving they had with their agent

Google Cardboard

Project Needs & Our Objective

- Business sponsors looking for an engaging experience to:
  - Complement Erie Insurance SHIFT program
  - Use as a tool to help young drivers remember discussion with agent
- We have created an interactive, virtual reality experience featuring:
  - A short tutorial
  - Three levels (Jungle, Lava, Space)
    - Each level has multiple scenarios
    - Each level has many point orbs to collect
  - Scoreboards after each level and an overall score at the end

Source:
https://www.jointheshift.org/themes/base/images/logo-shift.svg

Requirement Review

Project Name: Virtual Reality---Texting While Driving			
User Requirements		**System Requirements**	
Req ID	**Description**	**Req ID**	**Description**
UF-A	The application should present various scenarios that display a distracted driver, and give the user the ability to overcome the potential negative outcome.	SF-A-01	The system should provide two possible solutions for every decision presented.
		SF-A-02	When the car passes a trigger, a scenario should be presented.
UF-B	The user should control a passenger in a vehicle driven by a person engaging in dangerous activities.	SF-B-01	The user should have a first person perspective during the experience, and can use motion inputs to position the camera.
		SF-B-02	The user will use the button on the cardboard headset to interact with objects in the environment, and select choices during scenarios
		SF-B-03	Double clicking the input button will re-center the camera to the front of the car
UF-C	The system should feature multiple outcomes that can occur due to the driver being distracted.	SF-C-01	The system should include various types of outcomes that can occur within the environment, including avoiding falling objects, avoiding collisions with other objects, and dealing with going off the path.
UF-E	There should be orbs around each level that the user can collect to gain additional points.	SF-E-01	There should be white, glowing orbs featuring the Erie Insurance logo placed around each level which the user can collect by focusing on them to gain an additional amount of points.
UF-F	The driver should be controlled by an AI and should engage in various tasks.	SF-F-01	The driver AI should text while driving, and should stop texting when the user looks in the direction of the driver.
UO-01	The application should be developed for modern Android devices.	SO-01-01	The system should be targeted for Android 5.1.1 "Lollipop" for phones with hardware specifications of the Samsung S5 and up
UO-02	The application should be developed for cardboard VR use.	SO-02-01	The system will utilize the Google VR SDK to display two images through the cardboard.
UO-03	The application must feature ERIE Insurance branded paraphernalia advertising the company throughout.	SO-03-01	Erie Insurance logos will be placed on objects within the environment.
UP-01	The system should run at an acceptable frame rate suitable for virtual reality use.	SP-01-01	The application should run at a minimum of 30 frames per second.

Implementation Status - Complete

Feature	Implementation Status
Backend scenario system	🟢
AI driver drives the car and animates	🟢
Driving path is complete in each scene	🟢
Audio	🟢
Backend point system	🟢
Point orb collection	🟢
User control	🟢
Scenarios	🟢
Level transitions	🟢

Feature	Implementation Status
VR rendering on Android	🟢
Levels are complete in design	🟢
Score sheet / conclusion	🟢

- 🟢 Implemented
- 🟡 Partially Implemented
- 🔴 Not Implemented

Test Results

Project Name:	Virtual Reality---Texting While Driving	
Test Suite	TS-002: Environment Interaction	
Test Case ID	TC-001 (Unit Test)	
What To Test	Camera Recentering	
Test Data Input	Google Cardboard Input Button 2x	
Expected Result	Camera resets to the default view looking out of the windshield of the vehicle upon two rapid clicks of the input button.	
Traceability	Relevant User Req.(s)	UF-B
	Relevant System Req.(s)	SF-B-03
	Relevant Use Case(s)	UC-002

Project Name:	Virtual Reality---Texting While Driving				
Test Case ID:	TC-001				
Testing Tools Used:	Android, Google Cardboard, Unity Remote 5				
Testing Type:	Function coverage				
Execution Steps:	1	Begin the experience			
	2	Turn the camera in some direction away from the default view			
	3	Quickly double tap the Cardboard input button			

Test Execution Records:

#	Tester	Test Date	Actual Result	Status	Defect	Correction
1	Nick Kapty	11/9/2016	Double tapping does nothing	Fail	Not yet implemented	10/10/2016 by Jake Wheeler
2	Nick Kapty	11/15/2016	Double tapping recenters the camera	Pass		

Execution Summary:	Upon implementation, the feature works as intended.

Project Name:	Virtual Reality---Texting While Driving	
Test Suite	TS-001: Scenario Interaction	
Test Case ID	TC-002 (System Test)	
What To Test	Scenario Triggers	
Test Data Input	Google Cardboard	
Expected Result	A scenario is presented to the user upon reaching a trigger in the environment.	
Traceability	Relevant User Req.(s)	UF-A
	Relevant System Req.(s)	SF-A-02
	Relevant Use Case(s)	UC-002,UC-003

Project Name:	Virtual Reality---Texting While Driving				
Test Case ID:	TC-002				
Testing Tools Used:	Unity Test Tools				
Testing Type:	Agile (automated) testing				
Execution Steps:	1	Begin the experience			
	2	Allow the car to proceed to a predefined trigger point			

Test Execution Records:

#	Tester	Test Date	Actual Result	Status	Defect	Correction
1	Nick Kapty	11/9/2016	No scenario presented	Fail	Not yet implemented	1/14/2017 by Jake Wheeler
2	Nate Christiansen	2/8/2017	A scenario is presented passing the trigger	Pass		

Execution Summary:	

Test Results

Project Name:	Virtual Reality---Texting While Driving	
Test Suite	TS-001: Scenario Interaction	
Test Case ID	TC-004 (Unit Test)	
What To Test	Camera Rotation	
Test Data Input	Moving Google Cardboard	
Expected Result	Rotating the phone moves the camera in the experience.	
Traceability	Relevant User Req.(s)	UF-B
	Relevant System Req.(s)	SF-B-01
	Relevant Use Case(s)	UC-002

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Project Name:	Virtual Reality---Texting While Driving		
Test Case ID	TC-004		
Testing Tools Used:	Unity Test Tools		
Testing Type:	Function coverage		
Execution Steps:	1	Begin the experience	
	2	Rotate Cardboard in any direction	

Test Execution Records:

#	Tester	Test Date	Actual Result	Status	Defect	Correction
1	Nick Kapty	11/9/2016	Camera moves around	Pass		

Execution Summary:	The feature works as intended

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Project Name:	Virtual Reality---Texting While Driving	
Test Suite	TS-002: Environment Interaction	
Test Case ID	TC-005 (Integration Test)	
What To Test	Environment Interaction	
Test Data Input	Google Cardboard Input	
Expected Result	Looking at orbs in the environment will collect them.	
Traceability	Relevant User Req.(s)	UF-B
	Relevant System Req.(s)	SF-B-02
	Relevant Use Case(s)	UC-002, UC-003

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Project Name:	Virtual Reality---Texting While Driving		
Test Case ID	TC-005		
Testing Tools Used:	Unity Test Tools		
Testing Type:	Agile (automated) testing		
Execution Steps:	1	Begin the experience	
	2	Look at an interactive environment object	
	3	Click on object if reticle expands	

Test Execution Records:

#	Tester	Test Date	Actual Result	Status	Defect	Correction
1	Nick Kapty	11/9/2016	Object does not move	Fail	Not yet implemented	
2	Nate Christiansen	2/8/2017	Window rolls down, driver looks up	Pass		
3	Nate Christiansen	4/15/2017	Points can be collected	Pass		

Execution Summary:	

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Test Results

Project Name: Virtual Reality---Texting While Driving

Test Suite	TS-001: Scenario Interaction
Test Case ID	TC-006 (System Test)
What To Test	Bad Scenario Outcomes
Test Data Input	
Expected Result	Failing to prevent the driver from texting during a scenario will lead to the failure of that scenario.
Traceability	Relevant User Req.(s) — UF-C
	Relevant System Req.(s) — SF-C-01
	Relevant Use Case(s) — UC-003

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Project Name: Virtual Reality---Texting While Driving

Test Case ID:	TC-006
Testing Tools Used:	Unity Test Tools
Testing Type:	Agile (automated) testing
Execution Steps:	1 Begin the experience
	2 Wait for the vehicle to move to the first scenario
	3 Do not nudge driver in time

Test Execution Records:

#	Tester	Test Date	Actual Result	Status	Defect	Correction
1	Nick Kapty	11/9/2016	No outcomes occur	Fail	Not yet implemented	
2	Nick Kapty	4/8/2017	Car does not stop or branch and proceeds to hazard	Pass		

Execution Summary:

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Project Name: Virtual Reality---Texting While Driving

Test Suite	TS-002: Environment Interaction
Test Case ID	TC-009 (Acceptance Test)
What To Test	AI Driver Actions
Test Data Input	Google Cardboard
Expected Result	The AI driver drives and gets distracted when scenarios are triggered through texting/not paying attention to the road.
Traceability	Relevant User Req.(s) — UF-F
	Relevant System Req.(s) — SF-F-01
	Relevant Use Case(s) — UC-002

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Project Name: Virtual Reality---Texting While Driving

Test Case ID:	TC-009
Testing Tools Used:	Unity Test Tools
Testing Type:	Functional testing
Execution Steps:	1 Begin the experience
	2 Look at driver to trigger animations

Test Execution Records:

#	Tester	Test Date	Actual Result	Status	Defect	Correction
1	Nick Kapty	11/9/2016	Driver does not animate or interact with the user in any way	Fail	Not Implemented	
2	Nick Kapty	4/8/2017	Driver looks up when nudged	Pass		

Execution Summary:

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Test Results

Project Name:	Virtual Reality---Texting While Driving	
Test Suite	TS-003: System Performance	
Test Case ID	TC-010 (Acceptance Test)	
What To Test	Hardware Validation	
Test Data Input		
Expected Result	The system runs smoothly on hardware specifications of the Samsung S5 and up.	
Traceability	Relevant User Req.(s)	UO-01
	Relevant System Req.(s)	SO-01-01
	Relevant Use Case(s)	

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Project Name:	Virtual Reality---Texting While Driving					
Test Case ID:	TC-010					
Testing Tools Used:						
Testing Type:	Function coverage					
Execution Steps:	1	Build the application in Unity				
	2	Export to and attempt to launch the app on an Android phone				
	3	Begin the experience				
Test Execution Records:						
#	Tester	Test Date	Actual Result	Status	Defect	Correction
1	Nick Kapty	11/9/2016	App launches successfully	Pass		
Execution Summary:	The app was able to launch on a phone of comparable hardware to the Samsung S5 successfully.					

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Project Name:	Virtual Reality---Texting While Driving	
Test Suite	TS-003: System Performance	
Test Case ID	TC-011 (Acceptance Test)	
What To Test	Double Image VR Display	
Test Data Input	Test Data Input	
Expected Result	Two images should be displayed for use with the Google Cardboard.	
Traceability	Relevant User Req.(s)	UO-02
	Relevant System Req.(s)	SO-02-01
	Relevant Use Case(s)	

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Project Name:	Virtual Reality---Texting While Driving					
Test Case ID:	TC-011					
Testing Tools Used:						
Testing Type:	Function coverage					
Execution Steps:	1	Export built app to an Android phone				
	2	Launch app				
Test Execution Records:						
#	Tester	Test Date	Actual Result	Status	Defect	Correction
1	Nick Kapty	11/9/2016	The app displayed with a binocular view	Pass		
Execution Summary:	The app ran correctly with a binocular view using the Google VR SDK.					

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Test Results

Project Name:	Virtual Reality---Texting While Driving	
Test Suite	TS-003: System Performance	
Test Case ID	TC-012 (Acceptance Test)	
What To Test	System Frame Rate	
Test Data Input	The app	
Expected Result	The system runs at or above 30 frames per second when viewed through on a mobile device through a Google Cardboard.	
Traceability	Relevant User Req.(s)	UP-01
	Relevant System Req.(s)	SP-01-01
	Relevant Use Case(s)	

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Project Name:	Virtual Reality---Texting While Driving					
Test Case ID:	TC-012					
Testing Tools Used:						
Testing Type:	Functional testing					
Execution Steps:	1	Export the built app to an Android phone				
	2	Launch the app				
	3	Begin the experience				
	4	Monitor the FPS throughout the experience				

Test Execution Records:

#	Tester	Test Date	Actual Result	Status	Defect	Correction
1	Nick Kapty	11/9/2016	FPS unknown	Fail	Not yet implemented	
2	Nick Kapty	4/8/2017	FPS is able to be tracked	Pass		

Execution Summary:

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Full Video Playthrough of VR - Texting & Driving

Learned Skills During Project Development

- Unity
  - Little to no experience when project started
  - Scripting, working with 3D objects, interaction between components
  - Utilizing Git with Unity
- Teamwork
  - Coordination between group members
    - Trello
  - Receiving and evaluating criticism
    - Improving the project from feedback
  - Effective meetings with industry mentor and faculty adviser
- Delivering a project
  - Working with ERIE to fulfill a need

Source: https://unity3d.com/files/images/ogimg.jpg

Source: https://pbs.twimg.com/profile_images/
552177275911671808/JiszgZdZ.png

Lessons Learned

- Teamwork is not always easy
  - Different class schedules
  - Conflicting designs, ideas, or implementations
  - Allows for a better product in the end
- Stick to the schedule
  - Allows more time to add features, test, etc.
  - Decreases stress
- Be creative
  - Better product
  - Unique experience
  - Prepares us for the future

Source: capstone.bd.psu.edu

Source: http://www.jwolfeinsurance.com/Logos/Erie_Web.png

Project Impacts

- Help minimize distracted driving
    - young drivers will remember the dangers of distracted driving
- less accidents, less injuries, and less deaths
- runs on the Android operating system
    - used by millions of people every day
    - can reach a large number of drivers and passengers

Questions?