PENNSTATE
1855

Virtual Reality---Texting While Driving

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Contents

1. Abstract

Erie Insurance currently works with its agents to help them display the dangers of distracted driving to their policy holders. This can often be very difficult for agents to do since the user is not able to experience the consequences of distracted driving for themselves in a safe way. In order to help solve this problem for the agents, we are creating a virtual reality experience to demonstrate how distracted driving can affect the policy holder. This virtual reality experience will utilize the Unity 3D engine and the Google Cardboard SDK to give the policy holder different scenarios in which they will have to make decisions influencing their outcome. This virtual reality experience will allow the policy holder to better understand how they can influence dangerous driving activities as well as to help stop them.

2. Report Revision History

3. Problem Statement

3.1 Business Background

Erie Insurance is a Fortune 500 insurance company employing thousands of people. Erie Insurance has been a figure in the insurance world for 90 years, and currently serves over 4 million customers in 13 states. They utilize and manage smaller agencies to deal directly with customers, selling them auto, home, life, and business insurance.

With the rise of technology, distracted driving has become more of a risk than ever before. As Erie Insurance is invested in protecting people, they are taking the initiative in informing families about the dangers of driving while distracted.

3.2 Needs

Currently, it is very difficult to display the dangers of distracted driving to a younger generation in a way that engages them. Erie Insurance is seeking an innovative solution in order to solve this problem.

3.3 Objectives

This project aims to utilize virtual reality technology to create an immersive experience that engages users of all ages. The application will be easily distributed to agents around Erie's footprint and will effectively capture the younger audience.

4. Requirements

4.1 User Requirements

4.1.1 Glossary of Relevant Domain Terminology

<u>Virtual Reality (VR)</u> – A simulation of a three dimensional environment

<u>Cardboard</u> – Google's SDK created for smartphone devices

<u>Headset</u> – A head mounted device that displays virtual reality devices

4.1.2 User Groups

<u>User</u> – Any person engaging in our experience

4.1.3 Functional Requirements

4.1.3.1 Project Scope (Use Case Diagram)

Figure 4.1 displays the system's use case diagram. This gives a layout of the main user interactions that can occur as they use the system.
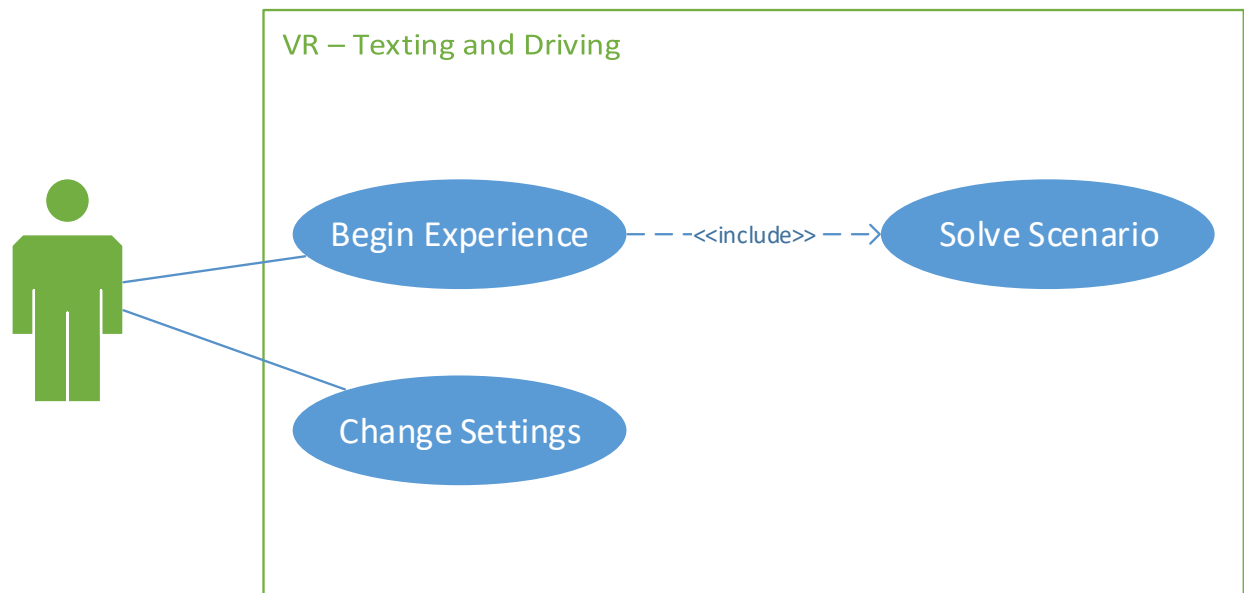
Figure 4.1 - Use Case Diagram

4.1.3.2 User Scenarios

Figure 4.2 lists the details of the use cases that occur within the system. The use cases give an overview of the sequence of the interactions that occur with the user and the system.

Project Name: Virtual Reality--Texting While Driving

Use Case ID	Use Case Name	Level	Author	Version
UC-001	Change Settings	Primary task	Nathan Christiansen	0.4
UC-002	Begin Experience	Primary task	Nathan Christiansen	0.5
UC-003	Solve Scenario	Subfunction	Nathan Christiansen	0.3

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Figure 4.2 - Use Case List

Project Name:	Virtual Reality--Texting While Driving		
Use Case ID:	UC-001		
Use Case Name:	Change Settings		
User Goal:	Change Experience Settings		
Scope:	VR - Texting While Driving		
Level:	Primary task		
Relevant User Reqs:	UF-E		
Relevant System Reqs:	SF-E-01		
Primary Actor:	User		
Precondition:	The application is running and on the main menu		
Minimal Guarantee:	Setting changes do not persist		
Success Guarantee:	Settings are changed to user specifications		
Trigger:	User selects settings option on main menu		
Success Scenario:	Step	Actions	
	1	The user selects settings in the main menu	
	2	The system brings up the settings menu	
	3	The user changes their desired settings	
	4	The user saves changes	
	5	The system applies changes	
Extensions:	Branching Scenarios		
4A	Condition: The user does not save changes		
	Step	Actions	
	1	The user declines to make changes	
	2	The system returns to the main menu	
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Figure 4.3 - Change Settings

Project Name:	Virtual Reality--Texting While Driving		
Use Case ID:	UC-002		
Use Case Name:	Begin Experience		
User Goal:	Experience the experience		
Scope:	VR - Texting while Driving		
Level:	Primary task		
Relevant User Reqs:	UF-B,UF-C,UF-D		
Relevant System Reqs:	SF-B-01,SF-B-02,SF-C-01,SF-D-01		
Primary Actor:	User		
Precondition:	The application is running and on the main menu		
Minimal Guarantee:	The user enters the experience		
Success Guarantee:	The user finishes the experience		
Trigger:	User selects start experience on the main menu		
Success Scenario:	Step	Actions	
	1	The user selects start experience on the main menu	
	2	The system begins the experience	
	3	The user gains control of the passenger	
	4	The user SOLVES SCENARIO	
	5	The system continues until the next threshold	
	6	The system repeats step 4-5 until the user completes the experience	
	7	The system displays a results screen to the user	
Extensions:	Branching Scenarios		
5A	Condition: The user fails a scenario		
	Step	Actions	
	1	The system ends the experience	
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Figure 4.4 - Begin Experience

Project Name:	Virtual Reality--Texting While Driving	
Use Case ID:	UC-003	
Use Case Name:	Solve Scenario	
User Goal:	The user makes choices to solve a scenario	
Scope:	VR - Texting While Driving	
Level:	Subfunction	
Relevant User Reqs:	UF-A	
Relevant System Reqs:	SF-A-01	
Primary Actor:	User	
Precondition:	The user is in the experience and has not failed	
Minimal Guarantee:	The default solution is chosen	
Success Guarantee:	The user's solution is chosen	
Trigger:	The user reaches a scenario threshold	
Success Scenario:	**Step** **Actions**	
	1	The user reaches a scenario threshold
	2	The system presents a scenario involving a dangerous situation
	3	The user selects a solution presented by the scenario
	4	The system enters a success state for the scenario
Extensions:	**Branching Scenarios**	
3A	Condition: The user selects an incorrect solution or does not enter within the alloted time	
	Step **Actions**	
	1	The system enters a fail state for the scenario
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Figure 4.5 - Solve Scenario

4.1.3.3 List of User Functional Requirements

User functional requirements describe functionality that the system should provide.

Project Name:	Virtual Reality--Texting While Driving						
Requirement ID:	UF-A				Type	Functional	Non-Functional
Creation:	Sep 16 2016 12:51 PM				User	☒	☐
Modification:	Sep 30 2016 03:07 PM				System	☐	☐
Description:	The application should present various scenarios that display a distracted driver, and give the user the ability to overcome the potential negative outcome.						
Priority:	✓ Highest	High	Medium	Low			Lowest
This Req. is Refined Into:		SF-A-01					
Justify why UF-A can be completely covered by SF-A-01		SF-A-01 describes how many choices the user will be able to choose from to affect their outcome.					
Traceability:	Use cases cf.	UC-003					
	Test cases cf.	Yet to be completed in test case worksheet!					
Acknowledgment	*Generated from the CapStone Process Management System ©2015*						

Figure 4.6 - Requirement UF-A

Project Name:	Virtual Reality--Texting While Driving						
Requirement ID:	UF-B				**Type**	**Functional**	**Non-Functional**
Creation:	Sep 16 2016 01:05 PM				**User**	☒	☐
Modification:	Sep 30 2016 03:06 PM				**System**	☐	☐
Description:	The user should control a passenger in a vehicle driven by a person engaging in dangerous activities.						
Priority:	✓ Highest	High	Medium	Low			Lowest
This Req. is Refined Into:	SF-B-01, SF-B-02						
Justify why UF-B can be completely covered by SF-B-01, SF-B-02	SF-B-01 specifies how the user will be able to control a passenger. SF-B-02 specifies how the user will be able to input commands.						
Traceability:	Use cases cf.	UC-002					
	Test cases cf.	Yet to be completed in test case worksheet!					
Acknowledgment	*Generated from the CapStone Process Management System ©2015*						

Figure 4.7 - Requirement UF-B

Project Name:	Virtual Reality--Texting While Driving						
Requirement ID:	UF-C				**Type**	**Functional**	**Non-Functional**
Creation:	Sep 21 2016 02:59 PM				**User**	☒	☐
Modification:	Sep 30 2016 03:06 PM				**System**	☐	☐
Description:	The system should feature multiple scenarios depicting distracted driving.						
Priority:	✓ Highest	High	Medium	Low			Lowest
This Req. is Refined Into:	SF-C-01						
Justify why UF-C can be completely covered by SF-C-01	SF-C-01 specifies how many scenarios the system will provide and gives detail about each.						
Traceability:	Use cases cf.	UC-002					
	Test cases cf.	Yet to be completed in test case worksheet!					
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Figure 4.8 - Requirement UF-C

Project Name:	Virtual Reality--Texting While Driving					
Requirement ID:	UF-D			**Type**	**Functional**	**Non-Functional**
Creation:	Sep 21 2016 03:00 PM			**User**	☒	☐
Modification:	Sep 30 2016 03:01 PM			**System**	☐	☐
Description:	The user should be able to interact with their environment between scenarios presented to them					
Priority:	✓ Highest	High	Medium	Low		Lowest
This Req. is Refined Into:	SF-D-01					
Justify why UF-D can be completely covered by SF-D-01	SF-D-01 specifies the objects that the user will be able to interact with.					
Traceability:	Use cases cf.	UC-002				
	Test cases cf.	Yet to be completed in test case worksheet!				
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Figure 4.9 - Requirement UF-D

Project Name:	Virtual Reality--Texting While Driving					
Requirement ID:	UF-E			**Type**	**Functional**	**Non-Functional**
Creation:	Sep 26 2016 03:11 PM			**User**	☒	☐
Modification:	Sep 30 2016 03:01 PM			**System**	☐	☐
Description:	User should be able to modify experience settings					
Priority:	Highest	High	✓ Medium	Low		Lowest
This Req. is Refined Into:	SF-E-01					
Justify why UF-E can be completely covered by SF-E-01	SF-E-01 provides some settings that the user can modify to alter the experience.					
Traceability:	Use cases cf.	UC-001				
	Test cases cf.	Yet to be completed in test case worksheet!				
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Figure 4.10 - Requirement UF-E

4.1.4 Non-functional Requirements

Non-functional requirements describe the constraints and quality of the functionalities, providing testable features and specifying restrictions.

4.1.4.1 Product: Usability Requirements

Usability requirements describe how easily a user interacts with the system.

4.1.4.2 Product: Performance Requirements

Performance requirements describe how well a system performs in terms of time and resource usage.

Project Name:	Virtual Reality--Texting While Driving					
Requirement ID:	UP-01			Type	Functional	Non-Functional
Creation:	Sep 26 2016 03:06 PM			User	☐	☒
Modification:	Sep 30 2016 03:02 PM			System	☐	☐
Description:	The system should run at an acceptable frame rate suitable for virtual reality use.			Product (sub-type below)		
				Performance Requirements		
Priority:	Highest	High	✓ Medium	Low		Lowest
This Req. is Refined Into:		SP-01-01				
Justify why UP-01 can be completely covered by SP-01-01		Specifies what the acceptable frame rate the system should run at.				
Traceability:	Use cases cf.	N/A				
	Test cases cf.	Yet to be completed in test case worksheet!				
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Figure 4.11 - Requirement UP-01

4.1.4.3 Product: Dependability/Security Requirements

Dependability/Security requirements describe the reliability and security concerns of the project.

4.1.4.4 Organizational: Development Requirements

Development requirements describe how a system should be developed.

Project Name:	Virtual Reality--Texting While Driving					
Requirement ID:	UO-01			Type	Functional	Non-Functional
Creation:	Sep 16 2016 12:56 PM			User	☐	☒
Modification:	Sep 30 2016 03:03 PM			System	☐	☐
Description:	The application should be developed for modern Android devices.			Organizational (sub-type below)		
				Development Requirements		
Priority:	✓ Highest	High	Medium	Low		Lowest
This Req. is Refined Into:		SO-01-01				
Justify why UO-01 can be completely covered by SO-01-01		SO-01-01 specifies a modern Android operating system and device for eventual app deployment.				
Traceability:	Use cases cf.	N/A				
	Test cases cf.	Yet to be completed in test case worksheet!				
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Figure 4.12 - Requirement UO-01

Project Name:	Virtual Reality--Texting While Driving						
Requirement ID:	UO-02				Type	Functional	Non-Functional
Creation:	Sep 16 2016 12:58 PM				User	☐	☒
Modification:	Sep 30 2016 03:01 PM				System	☐	☐
Description:	The application should be developed for cardboard VR use.				Organizational (sub-type below)		
					Development Requirements		
Priority:	✔ Highest	High	Medium	Low		Lowest	
This Req. is Refined Into:		SO-02-01					
Justify why UO-02 can be completely covered by SO-02-01		Specifies the SDK and method of displaying virtual reality applications.					
Traceability:	Use cases cf.	N/A					
	Test cases cf.	Yet to be completed in test case worksheet!					
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Figure 4.13 - Requirement UO-02

Project Name:	Virtual Reality--Texting While Driving						
Requirement ID:	UO-03				Type	Functional	Non-Functional
Creation:	Sep 16 2016 01:04 PM				User	☐	☒
Modification:	Sep 30 2016 03:01 PM				System	☐	☐
Description:	The application must feature ERIE Insurance branded paraphernalia advertising the company throughout.				Organizational (sub-type below)		
					Development Requirements		
Priority:	Highest	✔ High	Medium	Low		Lowest	
This Req. is Refined Into:		SO-03-01					
Justify why UO-03 can be completely covered by SO-03-01		Specifies objects to be textured with ERIE Insurance textures.					
Traceability:	Use cases cf.	N/A					
	Test cases cf.	Yet to be completed in test case worksheet!					
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Figure 4.14 - Requirement UO-03

4.1.4.5 Organizational: Operational Requirements

Operational requirements describe conditions that a system must support.

4.1.4.6 Organizational: Environmental Requirements

Environmental requirements describe the look and feel of the system's interface.

4.1.4.7 External: Safety/Security Requirements

Safety/Security requirements detail how the system will interact with other systems, and the security concerns of these interactions.

4.1.4.8 External: Cultural and Social Requirements

Cultural and social requirements describe how the system conforms to cultural and social expectations.

4.1.4.9 External: Political Requirements

Political requirements detail how the system will impact different sections of the company.

4.2 System Requirements

System requirements are derived from user requirements. They engineer and refine the user requirements into many detailed requirements that are much more descriptive and implementable.

4.2.1 Functional Requirements

4.2.1.1 List of System Functional Requirements

Project Name:	Virtual Reality--Texting While Driving				
Requirement ID:	SF-A-01		Type	Functional	Non-Functional
Creation:	Sep 23 2016 01:00 PM		User	☐	☐
Modification:	Sep 23 2016 01:02 PM		System	☒	☐
Description:	The system should provide three possible solutions for every decision presented.				
Priority:	Highest	High	Medium	Low	Lowest
This Req. is Engineered From:	UF-A				
Justify why meeting SF-A-01 can contribute to the fulfilment of UF-A	Specifies how the user can overcome each situation.				
Traceability:	Use cases cf.	UC-003			
	Test cases cf.	Yet to be completed in test case worksheet!			
Acknowledgment	Generated from the CapStone Process Management System ©2015				

Figure 4.15 - Requirement SF-A-01

Project Name:	Virtual Reality--Texting While Driving					
Requirement ID:	SF-B-01			**Type**	**Functional**	**Non-Functional**
Creation:	Sep 23 2016 12:54 PM			**User**	☐	☐
Modification:	Sep 27 2016 10:55 AM			**System**	☒	☐
Description:	The user should have a first person perspective during the experience, and can use motion inputs to position the camera.					
Priority:	✓ Highest	High	Medium	Low		Lowest
This Req. is Engineered From:	UF-B					
Justify why meeting SF-B-01 can contribute to the fulfilment of UF-B	Specifies the inputs the user can use to control the passenger.					
Traceability:	Use cases cf.	UC-002				
	Test cases cf.	Yet to be completed in test case worksheet!				
Acknowledgment	*Generated from the CapStone Process Management System ©2015*					

Figure 4.16 - Requirement SF-B-01

Project Name:	Virtual Reality--Texting While Driving					
Requirement ID:	SF-B-02			**Type**	**Functional**	**Non-Functional**
Creation:	Sep 27 2016 10:55 AM			**User**	☐	☐
Modification:	Sep 27 2016 10:56 AM			**System**	☒	☐
Description:	The user will use the button on the cardboard headset to interact with objects in the environment, and select choices during scenarios					
Priority:	✓ Highest	High	Medium	Low		Lowest
This Req. is Engineered From:	UF-B					
Justify why meeting SF-B-02 can contribute to the fulfilment of UF-B	Specifies input the user has during control					
Traceability:	Use cases cf.	UC-002				
	Test cases cf.	Yet to be completed in test case worksheet!				
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Figure 4.17 - Requirement SF-B-02

Project Name:	Virtual Reality--Texting While Driving					
Requirement ID:	SF-C-01			Type	Functional	Non-Functional
Creation:	Sep 23 2016 12:59 PM			User	☐	☐
Modification:	Sep 30 2016 02:58 PM			System	☒	☐
Description:	The system should have four types of scenarios that can occur within the environment, including hitting an object, running off the road/lanes, speeding/slowing down, and missing traffic lights.					
Priority:	Highest	✓ High	Medium	Low		Lowest
This Req. is Engineered From:	UF-C					
Justify why meeting SF-C-01 can contribute to the fulfilment of UF-C	Specifies the different situations and outcomes that the user is presented with.					
Traceability:	Use cases cf.	UC-002				
	Test cases cf.	Yet to be completed in test case worksheet!				
Acknowledgment	Generated from the CapStone Process Management System ©2015					

Figure 4.18 - Requirement SF-C-01

Project Name:	Virtual Reality--Texting While Driving					
Requirement ID:	SF-D-01			Type	Functional	Non-Functional
Creation:	Sep 23 2016 01:02 PM			User	☐	☐
Modification:	Sep 26 2016 02:56 PM			System	☒	☐
Description:	The user should be able to open/close glove box, interact with objects in the glove box, drink a drink in the cup holder, open/close the window, and adjust the radio.					
Priority:	Highest	✓ High	Medium	Low		Lowest
This Req. is Engineered From:	UF-D					
Justify why meeting SF-D-01 can contribute to the fulfilment of UF-D	It specifies the objects that the user can interact with					
Traceability:	Use cases cf.	UC-002				
	Test cases cf.	Yet to be completed in test case worksheet!				
Acknowledgment	Generated from the CapStone Process Management System ©2015					

Figure 4.19 - Requirement SF-D-01

Project Name:	Virtual Reality--Texting While Driving					
Requirement ID:	SF-E-01			Type	Functional	Non-Functional
Creation:	Sep 30 2016 01:07 PM			User	☐	☐
Modification:	Sep 30 2016 01:08 PM			System	☒	☐
Description:	The system will provide options to the user including changing weather effects and time of day.					
Priority:	Highest	✓ High	Medium	Low		Lowest
This Req. is Engineered From:	UF-E					
Justify why meeting SF-E-01 can contribute to the fulfilment of UF-E	The user will be given some control of the environment that they participate in.					
Traceability:	Use cases cf.	UC-001				
	Test cases cf.	Yet to be completed in test case worksheet!				
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Figure 4.20 - Requirement SF-E-01

4.2.1.2   System Behavior

Figures 4.21 and 4.22 detail the sequence of flow between user and system, much like use cases. However, they give a more detailed look into the system, providing interaction between components in the system as well.
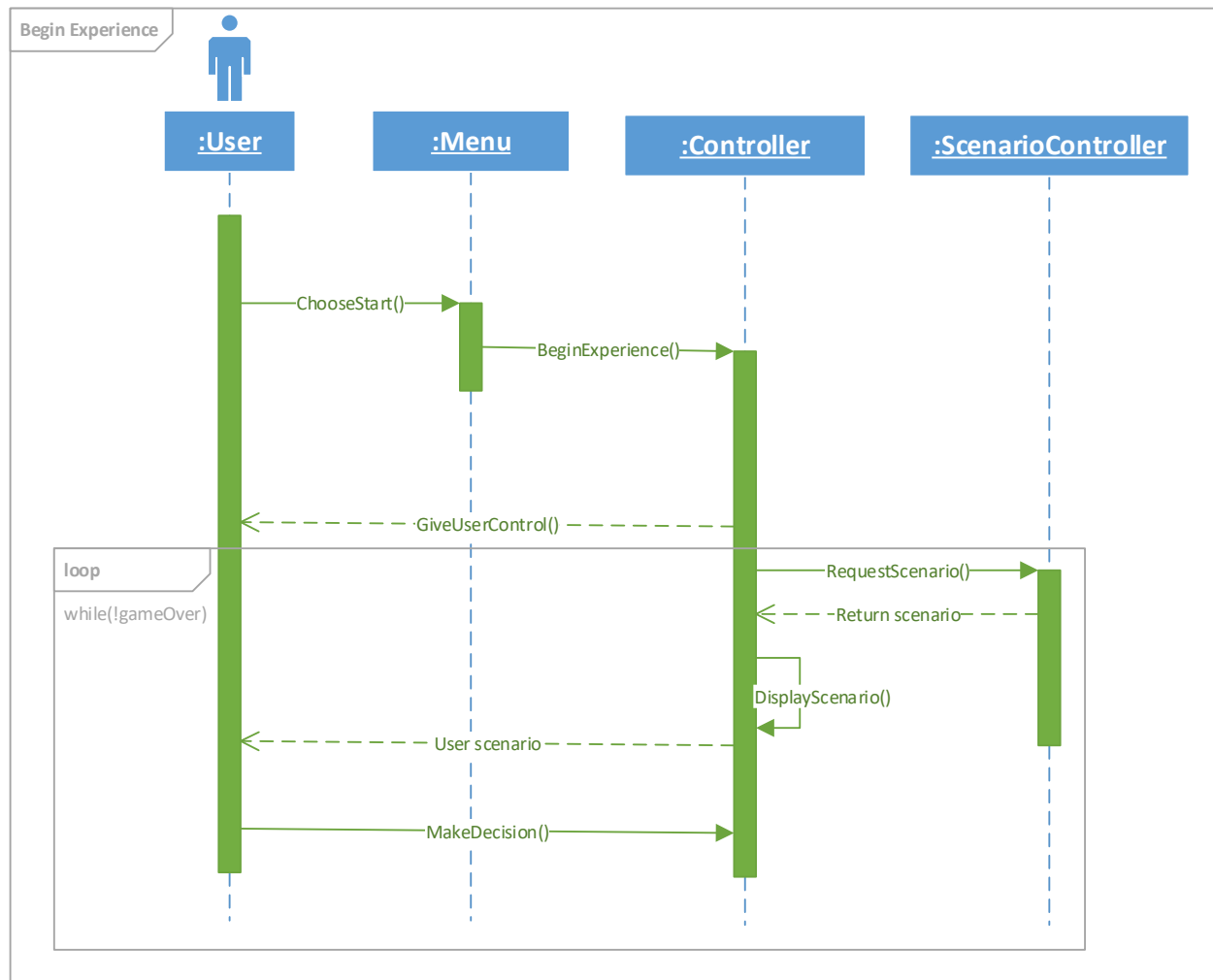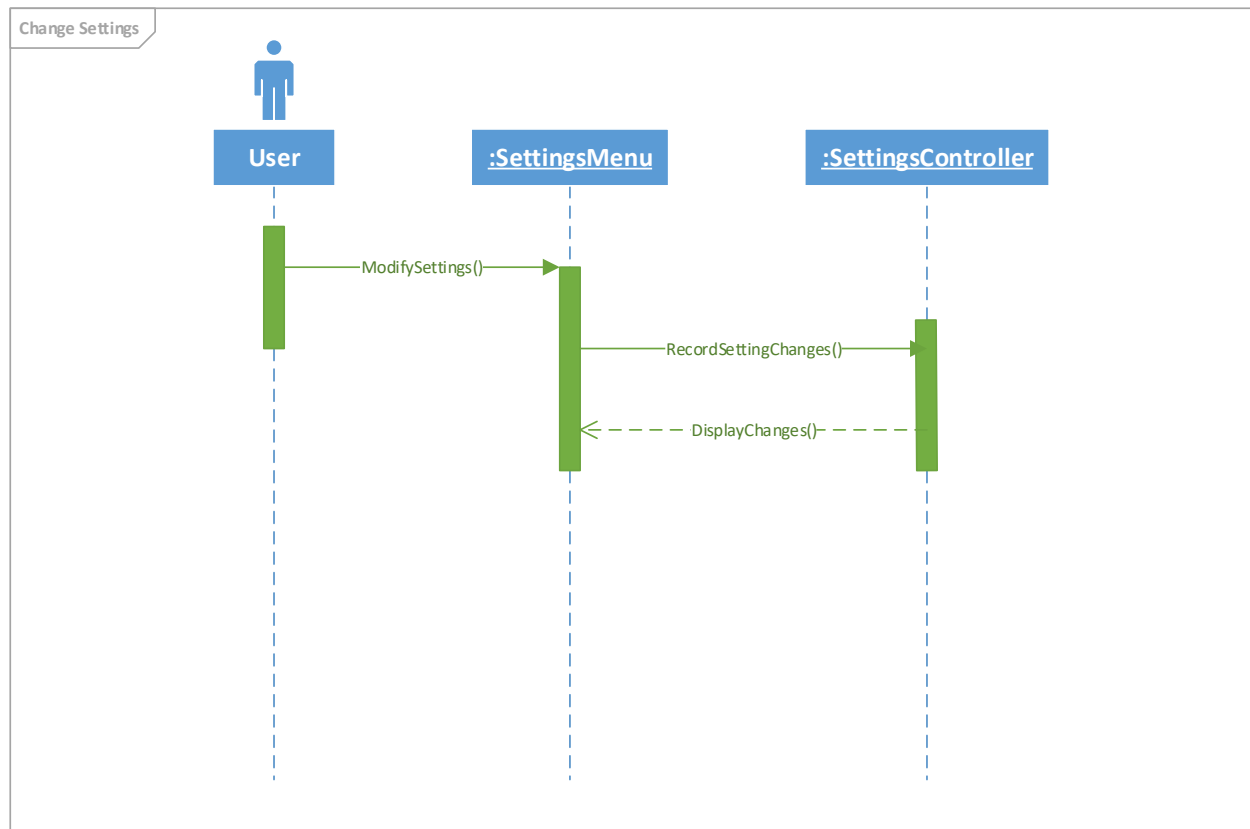
Figure 4.21 - Begin Experience Sequence

Figure 4.22 - Change Settings Sequence

4.2.1.3 Data Requirements

4.2.2 Non-functional Requirements

4.2.2.1 Product: Usability Requirements

4.2.2.2 Product: Performance Requirements

Project Name:	Virtual Reality--Texting While Driving					
Requirement ID:	SP-01-01				Type	Functional	Non-Functional
Creation:	Sep 30 2016 02:54 PM				User	☐	☐
Modification:	Sep 30 2016 02:55 PM				System	☐	☒
Description:	The application should run at a minimum of 30 frames per second.				Product (sub-type below)		
					Performance Requirements		
Priority:	Highest	✓ High	Medium	Low		Lowest	
This Req. is Engineered From:		UP-01					
Justify why meeting SP-01-01 can contribute to the fulfilment of UP-01		Specifies the minimum fps that the experience should perform at.					
Traceability:	Use cases cf.	N/A					
	Test cases cf.	Yet to be completed in test case worksheet!					
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Figure 4.23 - Requirement SP-01-01

4.2.2.3 Product: Dependability/Security Requirements

4.2.2.4 Organizational: Development Requirements

Project Name:	Virtual Reality--Texting While Driving					
Requirement ID:	SO-01-01				Type	Functional	Non-Functional
Creation:	Sep 26 2016 02:59 PM				User	☐	☐
Modification:	Sep 26 2016 03:02 PM				System	☐	☒
Description:	The system should be targeted for Android 5.1.1 "Lollipop" for phones with hardware specifications of the Samsung S5 and up				Organizational (sub-type below)		
					Development Requirements		
Priority:	Highest	✓ High	Medium	Low		Lowest	
This Req. is Engineered From:		UO-01					
Justify why meeting SO-01-01 can contribute to the fulfilment of UO-01		Specifies the OS version and hardware requirements					
Traceability:	Use cases cf.	N/A					
	Test cases cf.	Yet to be completed in test case worksheet!					
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Figure 4.24 - Requirement SO-01-01

Project Name:	Virtual Reality--Texting While Driving					
Requirement ID:	SO-02-01			Type	Functional	Non-Functional
Creation:	Sep 30 2016 01:03 PM			User	☐	☐
Modification:	Sep 30 2016 01:05 PM			System	☐	☒
Description:	The system will utilize the Google VR SDK to display two images through the cardboard.			Organizational (sub-type below)		
				Development Requirements		
Priority:	✓ Highest	High	Medium	Low		Lowest
This Req. is Engineered From:	UO-02					
Justify why meeting SO-02-01 can contribute to the fulfilment of UO-02	The system will provide a VR experience that is designed around the cardboard.					
Traceability:	Use cases cf.	N/A				
	Test cases cf.	Yet to be completed in test case worksheet!				
Acknowledgment	Generated from the CapStone Process Management System ©2015					

Figure 4.25 - Requirement SO-02-01

Project Name:	Virtual Reality--Texting While Driving					
Requirement ID:	SO-03-01			Type	Functional	Non-Functional
Creation:	Sep 30 2016 01:00 PM			User	☐	☐
Modification:	Sep 30 2016 01:02 PM			System	☐	☒
Description:	Erie Insurance logos will be placed on buildings, billboards, bumper stickers, and air fresheners.			Organizational (sub-type below)		
				Development Requirements		
Priority:	Highest	High	✓ Medium	Low		Lowest
This Req. is Engineered From:	UO-03					
Justify why meeting SO-03-01 can contribute to the fulfilment of UO-03	Erie Insurance will be represented within the experience.					
Traceability:	Use cases cf.	N/A				
	Test cases cf.	Yet to be completed in test case worksheet!				
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Figure 4.26 - Requirement SO-03-01

4.2.2.5   Organizational: Operational Requirements

4.2.2.6   Organizational: Environmental Requirements

4.2.2.7   External: Safety/Security Requirements

4.2.2.8   External: Cultural and Social Requirements

4.2.2.9   External: Political Requirements

4.3   Requirements Trace Table

Figure 4.27 gives a breakdown of the system requirements that have been engineered from the user requirements.

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 three possible solutions for every decision 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
UF-C	The system should feature multiple scenarios depicting distracted driving.	SF-C-01	The system should have four types of scenarios that can occur within the environment, including hitting an object, running off the road/lanes, speeding/slowing down, and missing traffic lights.
UF-D	The user should be able to interact with their environment between scenarios presented to them	SF-D-01	The user should be able to open/close glove box, interact with objects in the glove box, drink a drink in the cup holder, open/close the window, and adjust the radio.
UF-E	User should be able to modify experience settings	SF-E-01	The system will provide options to the user including changing weather effects and time of day.
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 buildings, billboards, bumper stickers, and air fresheners.
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.

Figure 4.27 - Requirement Trace Table

5. Exploratory Studies

5.1   Relevant Techniques

We will be taking advantage of the prototype software development model.

5.2   Relevant Packages/Products

We will be utilizing various free and store-bought assets found in the Unity asset store.

5.3   Broader Impacts

This virtual reality experience has the potential to help minimize distracted driving. Minimizing distracted driving means that there will be less accidents, less injuries, and less deaths because of distracted driving. Since the application runs on the Android operating system, which is used by millions of people every day, this application has the potential to reach a large number of drivers and passengers.

6. System Design

6.1 Architectural Design

The system will be using the MVC architectural pattern, but will explore other options as we progress.

6.2 Structural Design

6.3 User Interface Design

6.4 Behavioral Design

6.5 Design Alternatives & Design Rationale

7. System Implementation

7.1 Programming Languages & Tools

We are implementing our project using Unity, which takes advantage of C# for creating scripts.

7.2 Coding Conventions

We will be using Microsoft C# coding conventions.

7.3 Code Version Control

We are utilizing Git and Github to keep track of all changes.

7.4 Implementation Alternatives & Decision Rationale

7.5 Analysis of Key Algorithms

8. System Testing

8.1   Test Automation Framework

8.1.1   Steps for Installing Test Framework

8.1.2   Steps for Running Test Cases

8.2   Test Case Design

8.2.1   Acceptance Test Cases

8.2.2   System Test Cases

8.2.3   Integration Test Cases

8.2.4   Unit Test Cases

8.3   Test Case Execution Report

8.3.1   Unit Testing Report

8.3.2   Integration Testing Report

8.3.3   System Testing Report

8.3.4   Acceptance Testing Report

9. Challenges & Open Issues

9.1 Challenges Faced in Requirements Engineering

We had trouble dealing with somewhat vague requirements provided by the industry sponsor, and were faced with the task of continuous meetings in order to get a clear understanding of the sponsor's needs in regard to the system.

9.2 Challenges Faced in System Development

9.3 Open Issues & Ideas for Solutions

10. System Manuals

10.1 Instructions for System Development

N/A

10.1.1 How to Set Up Development Environment

In order to develop the application, the developer must have Unity installed as well as Git in order to pull from the repository. Once pulled, opening the project in Unity will allow for additional development.

10.1.2 Notes on System Further Extensions

10.2 Instructions for System Deployment

10.2.1 Platform Requirements

10.2.2 System Installation

10.3 Instructions for System End Users

11. Conclusion

11.1 Achievement

11.2 Lessons Learned

11.3 Acknowledgment

12. References