Department of Computing
Goldsmiths, University of London

Augmented Reality Navigation System for Commercial Spaces

Report

by

Arif Kharoti, Nicholas Orford-Williams, Hardik Ramesh,
Gabriel Sampaio Da Silva Diogo, Hamza Sheikh, Jonathan Tang
Software Projects – Group 14

Draft: March 31, 2019

Spring 2019

Submitted in partial fulfillment for the degree of
Bachelor of Science in *Computer Science*

Abstract

The use of mobile augmented reality by consumers, and research in the field has become more prominent in the last decade. This has allowed for completely new approaches in solving current problems using this technology as there is a year-on-year increase on smartphone users across the world.

This proposal presents the use of augmented reality in museum navigation on mobile devices. After conducting stakeholder research, there were clear issues presented by current solutions on the market through the form of paper maps. Augmented reality library research was conducted on various platforms to find the appropriate toolkit for the proposed system, and UI/UX prototyping prioritised key design aspects of the system. Following this, the technical architecture and user stories are defined through the model-view controller architectural pattern, along with technologies to be used during implementation. Methods and approaches to implementation are outlined, namely through the agile methodology along with consulting various testing methods.

Contents

List of Figures v

List of Tables vi

Acknowledgements vii

1 Introduction 1

1.1 Motivation . . . 1

1.2 Purpose & Scope . . . 1

1.3 Assumptions . . . 1

1.4 Coverage . . . 1

2 Background and Literature Review 2

2.1 Background . . . 2

2.2 AR Libraries . . . 2

2.3 Software Architecture . . . 2

2.4 Hardware - Arduino and Raspberry Pis . . . 2

3 Project Management Processes 3

3.1 Agile vs Waterfall vs Lean . . . 3

3.2 Software Development Lifecycle . . . 3

3.3 Test-Driven Development . . . 3

3.4 Repository Management . . . 3

4 Requirements 4

4.1 Gathering . . . 4

4.2 Stakeholders . . . 4

4.3 System 4
4.4 Functional 4
4.5 Non-Functional 4

5 Design **5**
5.1 Models 5
5.1.1 Use Case 5
5.1.2 Activity 5
5.1.3 Sequence 5
5.2 User Interface 5
5.3 Accessibility 5
5.4 User consultations 5

6 Implementation **6**
6.1 Backlog 6
6.2 Sprint Outlines 6
6.3 Front-end 6
6.4 Back-end 6
6.5 Hardware 6
6.6 Ethical Audit 6
6.7 Challenges 6

7 Testing & Quality Assurance **7**
7.1 Testing conducted 7
7.1.1 Unit Testing 7
7.1.2 Integration Testing 7
7.1.3 Performance and stress testing 7
7.1.4 Regression testing 7
7.1.5 User Acceptance Testing (UAT) 7
7.1.6 Beta Testing 7
7.2 Deployment 7
7.3 Formative evaluation 7
7.4 Functional requirements review 7

7.5 Non-Functional requirements review 7

8 Project evaluation **8**

8.1 Summative evaluation 8

8.2 Future developments 8

A User & Stakeholder Research **9**

B User Stories **10**

C Documentation Plan **11**

D Testing Plan **12**

E Deployment Plan **13**

F Testing **14**

G User & Stakeholder Feedback **15**

Bibliography **15**

List of Figures

List of Tables

Acknowledgements

Chapter 1

Introduction

1.1 Motivation

1.2 Purpose & Scope

1.3 Assumptions

1.4 Coverage

Chapter 2

Background and Literature Review

2.1 Background

2.2 AR Libraries

2.3 Software Architecture

2.4 Hardware - Arduino and Raspberry Pis

Chapter 3

Project Management Processes

3.1 Agile vs Waterfall vs Lean

3.2 Software Development Lifecycle

3.3 Test-Driven Development

3.4 Repository Management

Chapter 4

Requirements

4.1 Gathering

4.2 Stakeholders

4.3 System

4.4 Functional

4.5 Non-Functional

Chapter 5

Design

5.1 Models

5.1.1 Use Case

5.1.2 Activity

5.1.3 Sequence

5.2 User Interface

5.3 Accessibility

5.4 User consultations

Chapter 6

Implementation

6.1 Backlog

6.2 Sprint Outlines

6.3 Front-end

6.4 Back-end

6.5 Hardware

6.6 Ethical Audit

6.7 Challenges

Chapter 7

Testing & Quality Assurance

7.1 Testing conducted

7.1.1 Unit Testing

7.1.2 Integration Testing

7.1.3 Performance and stress testing

7.1.4 Regression testing

7.1.5 User Acceptance Testing (UAT)

7.1.6 Beta Testing

7.2 Deployment

7.3 Formative evaluation

7.4 Functional requirements review

7.5 Non-Functional requirements review

Chapter 8

Project evaluation

8.1 Summative evaluation

8.2 Future developments

Appendix A

User & Stakeholder Research

Appendix B

User Stories

Appendix C

Documentation Plan

Appendix D

Testing Plan

Appendix E

Deployment Plan

Appendix F

Testing

Appendix G

User & Stakeholder Feedback