Using Location Data to Aid Recovery of Stolen Property

CS310 Computer Science Project

Project Specification

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Contents

1 Introduction

The purpose of this document is to provide an overview of the project. This will allow the reader to gain an understanding of the project, its motivation, challenges, and the problem it aims to solve. Additionally, the document will outline the project management and design approach being undertaken as well justifying these decisions.

1.1 Problem

Millions of items are stolen every year, in the UK alone[7]. There are several processes in place to help victims of theft recover their belongings, and prevent these stolen items being sold on to other people. Despite all these efforts, only in a small number of cases the items are recovered by the police. In majority of the cases, these items are sold on to local shops or other people and are never returned the original owner.

The project aims to build a system where users can record all their valuables upon purchase, along with any meta-data, such as serial numbers, that uniquely identifies these valuables. This will then allow potential buyers to check the cross check any items, before purchase, for any history and hence prevent stolen items from being sold. Once a buyer has identified a stolen item they can then communicate with the owner through a built in messaging system to help them recover the item. An additional feature of the system will aid victims of theft with insurance claim by allowing them to print a proof of purchase/ownership document for each item they have recorded and reported as stolen.

1.2 Motivation

In the year August 2014 to August 2015, 21,987 cases of robbery and, 71,888 cases of burglary were reported in London alone[7]. Based on these statistics, despite best efforts, hundreds of people are robbed and thousand of items are burgled on a daily basis. People often lose or misplace small hand-held devices, in addition to the theft, which raises the quoted figures significantly. As a response to this, most portable devices such as phones and laptops can be tracked, through built-in or third-party software, as long as they are connected to the internet. Unfortunately, this alone is not enough as the items end up being sold on for quick cash before they're connected to Wi-Fi.

These lost or stolen items are purchased by innocent buyers who do not know about the origin of the item and its history. Once these items have been sold on, it is unlikely that they will ever be recovered and returned to the original owner. In the rare cases that the item is recovered and returned to it's original owner, the buyer is not reimbursed for purchasing the item so either way a loss is incurred by a victim of the theft. This project focuses on preventing both parties, potential buyers and the original owner, from incurring a loss. When a user is buying an item, whether it is in a shop or online, they will be able to check it's history and message the original owner of the item to let them know its whereabouts. This will allow the original owner to recover the item, from an online or a local shop, by reporting it to the police.

2 Related Technologies

It is believed that one in four devices have a significant use history[2]. It is also estimated that only one in four people report missing/stolen possessions[3]. This can be due to several reasons, such as long forms which take up more time to fill than necessary or excessive fees for recovery processes.

There are several other systems available which allow users to register their property into a national database. This database can then be crosschecked when purchasing items. These system do come with a price so they often note used by individuals but rather organizations such as the police.

2.1 Immobilise

Immobilise helps combat the sale of stolen gadgets and valuable goods[10]. Users can sign-up to the site and then add items to their profile. These items are stored in a database which is available to the police. This helps the police identify owners of recovered stolen property. The downfall of this system is that the police only checks items against this database once they have been recovered. This means that unless the police has raided a location containing stolen items, the item won't be checked against the database.

2.2 CheckMEND

CheckMEND is the world's largest source of used mobile phone and device history, including data from police, insurers, retailers and networks[2]. The offer services which allow individuals to check the history of a mobile phone or device but, this comes with a price which users are often not willing to pay as, results are not guaranteed. The result of the check is provided as a PDF which can take a long time. Another downfall of this system is that it only supports mobile phones and other electronic devices.

2.3 Summary

From the above examples it is clear that most of the existing systems available are intended for use on a large scale, to check thousands of items. For this reason customers carrying out individual checks pay a much larger fee. In conclusion, the developed system needs to be tailored towards individuals rather than corporations. This means that the user should be able to perform an instant search and get immediate results rather than filing a check which takes time to be processed.

3 Project Requirements

In order for the system to be successful and provide a good service to the users, it must meet the following requirements.

3.1 Functional Requirements

1. Users must be able to register and create a profile on the system.

    (a) Each user will have a personal valuables list. This will be the default store location for new items that are added.

    (b) Each user will also have a public list. This will contain all the items that have been marked as lost or stolen.

2. Registered users must be able add items to their personal valuables list.

    (a) An item will be private and invisible to the public search until it is reported lost or stolen.

    (b) If the item being added has already been reported as lost or stolen then the user should be notified and given the option to contact the original owner.

    (c) All items are geotagged with the users address or current location upon being added.

    (d) Optionally the user may attach a receipt or proof of purchase document.

    (e) The user can upload photos and add extra meta-data which may help to uniquely identify the item.

3. Users may delete an item from either their private or public list.

    (a) Once an item is deleted, it will be moved to a deleted list.

4. Items in the deleted list will automatically be deleted after a set period of time.

    (a) The user can force a permanent deletion of the item before the automatic deletion date.

5. Registered users can report/mark valuables in their private list as lost or stolen.

    (a) This will move the item into the public list so that other users can search for it.

6. Registered users can mark, previously reported as stolen, items on their profile as reclaimed.

    (a) This will move the item back into the private list and remove it from search listings.

7. Users can search for items reported as stolen by other users.

    (a) The search must support various attributes including but not limited to:
        i. Name
        ii. Serial Number
        iii. Meta-Data/Description

    (b) The search result will be loaded asynchronously without reloading the page.

    (c) The user may change the sorting of the results by various attributes.

8. Users can explore items reported as stolen in their local area or a specific region.

(a) The results will be sorted by distance, closest first.

9. Registered users can message the owner of an item on the public search through an inbuilt messaging system.

    (a) All messages are stored and displayed in a conversation format so that previous messages are visible on the same page.

    (b) The recipient may reply to a message in a conversation.

    (c) A user can only send a specified amount of messages. After this limit the user must wait for a reply before sending any more messages.

10. A registered user may block another registered user.

    (a) This will prevent the blocked user from sending any messages to the user who has blocked them.

11. Users will be able to delete their profile if they no longer wish to use the system.

    (a) Once the user has deleted their profile, any items and lists associated with the user will also be removed.

4 Potential Issues

4.1 Legal Issues

Users will be required to register on the system before they are able to add items. As part of this registration process the user will be required to provide personal details, including but not limited to name, email, and address, which much be used in accordance with the data protection act. In accordance with the data protection principles[14], stating that the data may not be kept for longer than necessary, users will be allowed to delete their account when they no longer require the service which will result in corresponding data being deleted.

5 Project Management

5.1 Design Approach

There are two key aspects to the system, the back-end for managing all the data and the the user interface for collecting and displaying the data in a user friendly way. The backend will be developed first along with the database layout. This will then allow a user interface to be created which abstracts the complexities and provides the user with a simple view[11].
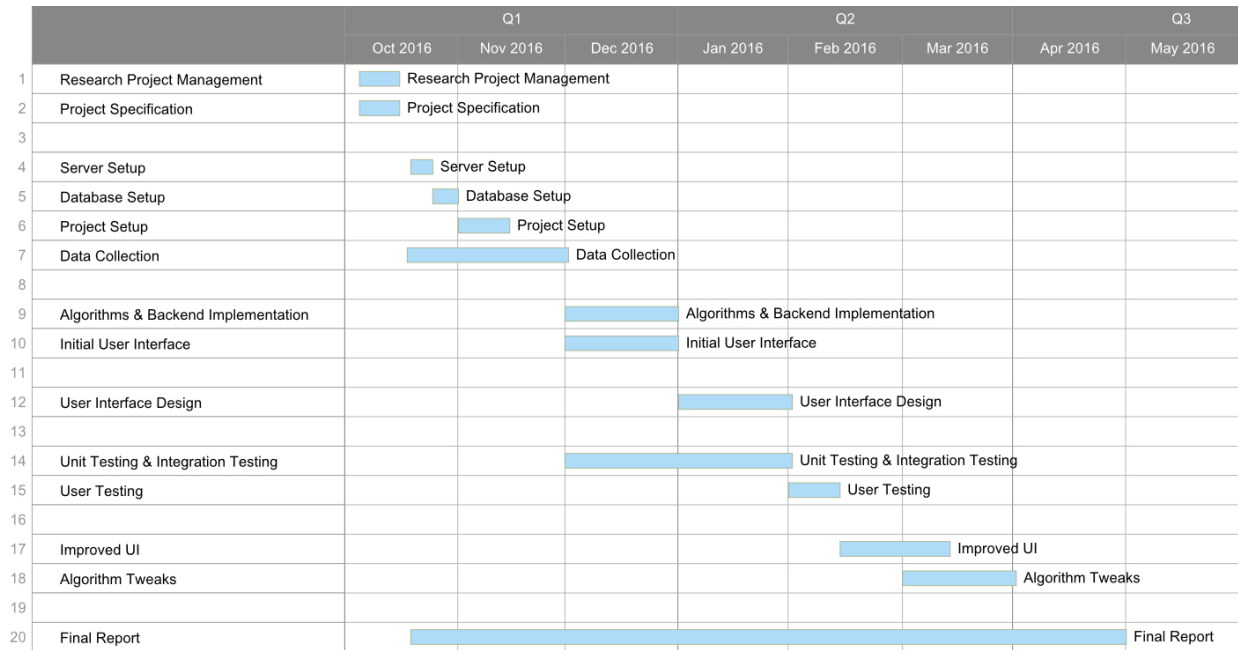
5.2   Software Development Methodology

The project will be developed using an agile approach. The project specification, at the current time, is not complete and as the project progresses it is likely that more and more features will be implemented. Also as the the project is developed, issues will arise which may not have been accounted for previously in a plan driven approach. An agile approach is a good way of tackling these issues. Throughout the development of this project, there will be constant communication with the project supervisor. This constant stream of communication also tends to lead towards an agile approach as new features may be suggested and implemented.

It is important to note that agile methodologies do not focus on documentation as much as a plan driven approach. As documentation is a key part of this project, a modified version of the agile approach will be used to focus on documentation.

5.3   Project Timeline

The gantt chart below outlines the project timeline. This will be used as a rough guide for deadlines but may be subject to change over time due to the agile approach as more features are added to the project.

		Q1			Q2			Q3	
		Oct 2016	Nov 2016	Dec 2016	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016
1	Research Project Management	Research Project Management							
2	Project Specification	Project Specification							
3									
4	Server Setup	Server Setup							
5	Database Setup		Database Setup						
6	Project Setup		Project Setup						
7	Data Collection		Data Collection						
8									
9	Algorithms & Backend Implementation			Algorithms & Backend Implementation					
10	Initial User Interface			Initial User Interface					
11									
12	User Interface Design				User Interface Design				
13									
14	Unit Testing & Integration Testing			Unit Testing & Integration Testing					
15	User Testing				User Testing				
16									
17	Improved UI					Improved UI			
18	Algorithm Tweaks						Algorithm Tweaks		
19									
20	Final Report		Final Report						Final Report

6   Resources and Technologies

Several technologies and third-party tools will be utilized during the development and documentation of this project in order to improve efficiency and quality of work.

6.1   Technologies

- **HTML5** is a markup language used for structuring and presenting content on the World Wide Web. I will be using HTML 5 for the structure of the application[4].

- **CSS3** is the latest evolution of the Cascading Style Sheets language. CSS3 will be used to style the user interface so it is user friendly and simple to use[12].

- **PHP** is a server-side scripting language designed for web development but also used as a general-purpose programming language. PHP will be used for interacting with the database and majority of the data processing[9].

- **JavaScript** is a high level, dynamic, untyped, and interpreted programming language. JavaScript will be used for some data processing but mainly for an improved user experience by updating the page without reloading[5].

- **MySQL** is an open source database management system and will be used as the main database server for this project[13].

- **Bootstrap** is the most popular HTML, CSS, and JS framework for developing responsive, mobile first projects on the web. It contains predefined CSS selectors to ease design and development. The main purpose of using Bootstrap is that it will allow for a mobile responsive web app to be developed[1].

6.2   Resources

Version control and backup will be carried out using Git. A private repository will be created on GitHub which will contain all the revisions. Additionally, rough documentation will be achieved through the use of GitHub by adding comments on each commit.

A Trello board along with an excel sheet and a gantt chart is being used for the timeline of the project. This can be referred to in order to keep track of progress and plan the tasks for upcoming weeks.

WunderList is a todo list tool which will be used to keep track of tasks on a weekly basis. It will be synchronised with the gantt chart and the project timeline. Once the tasks are completed they can be marked as completed. If there any incomplete tasks from the previous week, they will be carried on to the next week.

DigitalOcean will be used to create a virtual private server with a distribution of Linux installed on it[6]. This VPS will be used as a web server with an XAMPP installation containing Apache[8] and MySQL. This can be accessed through the DigitalOcean control panel using a browser.

7 Testing and Evaluation

7.1 Testing

Unit testing will be employed throughout the development of the system to ensure that each component works correctly and meets the requirements listed in the specification. Each module will be tested as it is completed. This will allow changes to be made based on the test results in order to improve the correctness, reliability and stability of each module. if a module takes data as input then suitable and realistic data will be used in the testing process to provide accurate results.

The system will also go through incremental integration testing. Although components are being subjected to unit testing and only being integrated into the system if they pass the test, it is important that they are also tested when they are pieced together. This will prevent any errors from occurring later on due to incompatibility of components or incorrect interfacing between two components.

Finally, the system will go through rigorous user testing to ensure that the system functions correctly under realistic use. A group of users will test the various functionality of the system and provide feedback on the usability and functionality of the system. This feedback will then be used to make some final tweaks to the user interface and the data processor.

7.2 Evaluation

Once the system has been completed and thoroughly tested its functionality will be documented and compared against the initial requirement in the project specification. This will be used to measure the success of the system. Any requirements that are not met will be documented and justified.

8 Conclusion

The finished system will provide a solution to a real world problem faced by millions of people across the world. The web application can be made available in all regions due to its geotagging feature which will allow users to use it as if it were designed for their local area. The system will not only implement the features offered by existing systems mentioned in the related work section but extend these to provide a simple user experience for individuals and large organisations.

References

[1] Bootstrap. Bootstrap. `http://getbootstrap.com`, oct 2015.

[2] CheckMEND. Checkmend. `http://www.CheckMEND.com/uk/`, oct 2015.

[3] Wikipedia contributors. Crime in london. `http://en.wikipedia.org/wiki/Crime_in_London`, sep 2015.

[4] Wikipedia Contributors. Html 5. `https://en.wikipedia.org/wiki/HTML5`, oct 2015.

[5] Refsnes Data. Javascript. `http://www.w3schools.com/js/`, oct 2015.

[6] DigitalOcean. Digitalocean. `https://www.digitalocean.com`, oct 2015.

[7] Mayor's Office for Policing and Crime. Metropolitan police services - crime figures. `http://www.met.police.uk/crimefigures/`, aug 2015.

[8] Apache Friends. Xampp. `https://www.apachefriends.org/index.html`, oct 2015.

[9] The PHP Group. Php. `http://php.net`, oct 2015.

[10] Immobilise. Immobilise. `http://www.Immobilise.com/`, oct 2015.

[11] Steve Krug. *Don't Make Me Think! A Common Sense Approach to Web Usability*. New Riders Press, 2000.

[12] Mozilla Developer Network. Css3 - css — mdn. `https://developer.mozilla.org/en/docs/Web/CSS/CSS3`, sep 2015.

[13] Oracle. Mysql. `https://www.mysql.com`, oct 2015.

[14] Government Digital Service. Data protection. `https://www.gov.uk/data-protection/the-data-protection-act`, sep 2015.