

Lab 2 - Product Specification Outline

CS 411W Lab II

Product Specification

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1 Introduction

Of all the crime analysis tools on the web, none adapt to its user or have the simplicity and ease of use that will be featured in Crime HotSpot. Crime HotSpot will give its users the ability to tailor crime analysis to meet their own individual needs.

1.1 Purpose

Crime HotSpot will be a website produced by Team Silver and will be used to aid in the analysis of crime in an area. Those using Crime HotSpot will be able to visualize the safety of an area based on the crimes committed. Crime HotSpot will aid its users in finding a place to live, start a business, travel and have fun with friends. Crime HotSpot will do this by taking crime records in an area and showing those crimes on a map using a heatmap overlay.

1.2 Scope

Crime HotSpot's main goal is to help people find safer areas for living, start businesses, travel and going out with friends. It does this by providing more convenient and intuitive crime analysis tools without cost to the user. Its user interface will be easy to use and give useful and understandable outputs.

1.3 Definitions, Acronyms, and Abbreviations

5.1 Crime Map - A map that has crime statistical data overlaid on it to provide information on the criminal activity of an area.

5.2 Javascript MEAN Stack - MEAN is a free and open-source JavaScript software stack for building dynamic web sites and web applications. The MEAN stack is MongoDB, Express.js, AngularJS (or Angular), and Node.js.

5.3 JavaScript Object Notation (JSON) - a lightweight data-interchange format. It is easy for humans to read and write. It is easy for machines to parse and generate. It is based on a subset of the JavaScript Programming Language

5.4 Application Programming Interface (API) - a set of functions and procedures allowing the creation of applications that access the features or data of an operating system, application, or other service.

5.5 Crime SafetyScore – A heuristic used to approximate the safety of an area based on the crimes committed in an area and their attributes. The lower the Crime SafetyScore the safer the area is assumed to be. The Crime SafetyScore is calculated based on weights assigned by the user and can be changed to suit the user's desire.

5.6 Heatmap - a representation of data in the form of a map or diagram in which data values are represented as colors.

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1.5 Overview

This product specification describes the front and back end, website application and database of Crime HotSpot prototype. The information provided in the remaining sections of this document includes, a detailed description of the front and back end, website application and database of Crime HotSpot prototype: the key features of the prototype; the parameters that will be used to control manage or establish that feature; and the performance characteristics of that feature in terms of outputs, displays, and user interaction.

2 General Description

Crime HotSpot will run as a system of four main parts. Each part will run independently of the others and even on different machines, except for the application which will run from the front end client. Crime HotSpot is designed with compatibility in mind. Users need common web browsers and basic computer skills to use Crime HotSpot.

2.1 Prototype Architecture Description

Crime HotSpot is broken down into four main parts:

1. Front end: initiates communication with the backend and run the website application.
2. Back end: retrieves data from the database, generate a Google Maps object, generate a Heatmap loaded with the data and calculate the Crime SafetyScore. No crime data is ever sent to the front end. This will maintain the security of the data.
3. Database: stores and organizes the crime data and adding new crime data. The database will be managed by MongoDB Atlas.

4. Website application: shows the map and heatmap in an easy to use interface. The application will allow the user to change the weights of each crime type and use filters to remove crimes that do not apply.

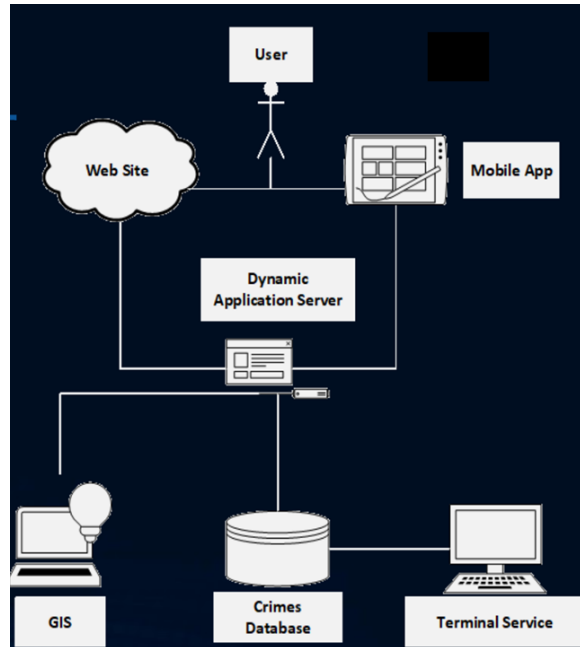


Figure 1. Crime HotSpot Prototype Architecture Diagram.

2.2 Prototype Functional Description

The major functional components of the Crime HotSpot prototype include the following:

1. Weight and filter interface: This function provides the user an interface on sliders, buttons and checkboxes that allow the user to change crime weights and filter crimes based on category and time.
2. Hover function: This function shows takes the position of the mouse pointer on the heatmap and returns the Crime SafetyScore for that point. The Crime SafetyScore is updated whenever the user moves the mouse pointer across the map.
3. Analytics page: This function shows important information about the overall crime of the area shown on the map. This information includes the average SafetyScore of the map and a rate of growth of the crime in that area.

2.3 External Interfaces

The interfaces needed for Crime HotSpot are a web browser, database, and a Linux server. The prototype is being designed to work with Google Chrome and hopefully updated to work with all popular browsers including explorer 11. The Linux server is mainly responsible for data security. All calculations involving crime data are processed by the server and sent to the web browser.

2.3.1 Software Interfaces

To Crime HotSpot will use APIs from two software packages. These APIs come from the MEAN stack and the Google Maps software packages. The APIs are as follows

1. MongoDB: MongoDB is a database API and is part of the MEAN stack. It will be used to manage crime data in the database.
2. Google Maps: Includes the Google Maps, Google Heat Map and Google Geolocator classes.

2.3.2 User Interfaces

The user interface will run from within the application and feature a number of panels, buttons, knobs, and switches to control crime weights, crime filters, navigate the map, and view analytics data. It will also consist of the map and heatmap which are the main parts of the user interface. To use the app, the user will need a color screen with a mouse and keyboard and reliable internet communication.

1. A computer with a color screen, mouse for controlling crime weights and filters and keyboard for data entry.
2. Internet connection for loading the website and client and server communication.

3. Panels, buttons, knobs, and switches from within the app to control crime weights and filters.
4. Map and heatmap shown on the screen to show crime data according to the users specified weights and filters.

2.3.3 Communications Protocols and Interfaces

Appendix