CMSC 447

Software Requirements Specification (SRS)

Revision 3

1 Scope

1.1 Identification

This Software Requirements Specification (SRS) establishes the concrete software requirements to be fulfilled by version 1.0.0. of the CSCI, called the ROBBR system. No other releases of this system have been made, and no new releases are foreseen as of latest document revision.

1.2 System overview

The purpose of the ROBBR system is to allow a user to determine the best location for a new headquarters for some particular jewel thief syndicate. The system collects publicly available statistics about locations within the United States, and the user provides criteria for filtering and ranking houses within a user-selected state. The system then generates a list of houses, weighed by their adherence to the user specified criteria, and displays it to the user. The ROBBR system is being developed for the customer who will be the sole sponsor, acquirer, and user. The ROBBR system will run on a bootable which may be carried by the customer. The I am Root Software Engineering Team shall be the sole developers of the software, and any reference to the developer will refer to the I am Root Software Engineering Team. For privacy and security reasons, the customer is not identified.

1.3 Document overview

This SRS for the ROBBR system details program requirements and the resulting program modes. All requirements include names and sources for traceability, the constraints that are imposed on how the requirement is to be fulfilled, the conditions to be met to consider the requirement satisfied, and other relevant information.

2 Referenced documents

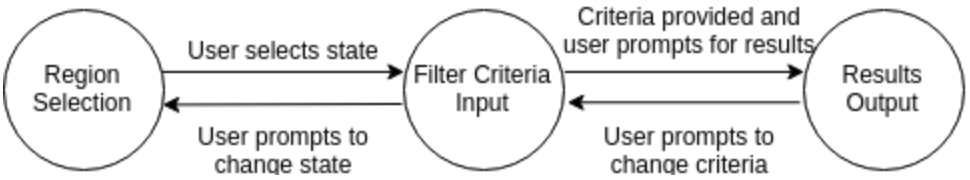
Number	Title	Revision	Date
1	Software Development Plan	2	4/19/2018

3 Requirements

3.1 Required states and modes

The ROBBR CSCI operates under three modes: Region selection, Criteria Filter Input, and Results. These operate as follows:

- ❏ Region Selection allows the user to select one of the fifty United States. This will be the region in which the search is performed. Once a region is selected, the system enters the Filter Criteria Input mode.
- ❏ Filter Criteria Input allows the user to input filter parameters. These parameters determine how houses in the region are ranked and selected for the Results Output mode. When the user is satisfied with the input parameters, they can prompt the system to transition into the Results Output mode. If the user wishes to select another region for searching, they can prompt the system to transition back into the Region Selection mode.
- ❏ Results Output displays a sorted list of zip codes, with a list of best matching houses for sale within that zip code. The list is sorted by rank, determined by user specified criteria. The user shall be able to prompt the system to transition back into the Filter Criteria Input mode.



3.2 CSCI capability requirements

The ROBBR CSCI itself has three notable capabilities specified by user requirements. The system states (as mentioned in section 3.1 of this document) are derived from these capabilities, and the names of these states correspond to the requirements named below. The user defined capabilities are as follows:

1. Allow user to select a single state out of the fifty United States in which to conduct a search.
2. Allow user to select zip code search criteria. These criteria are:
   - 2.1. Minimum average household income
   - 2.2. Maximum average household income
   - 2.3. Minimum average distance from the center of mass of jewelry stores in region
   - 2.4. Maximum average distance from the center of mass of jewelry stores in region
   - 2.5. Average amount of crime
   - 2.6. Amount of houses available
3. Display list of zip codes in the state that best match the search criteria. Each zip code has a list of houses available for sale.

3.2.1 Region Selection

Number	Capability Name	Prerequisites	Source	Requirement	Satisfaction Qualification Method

1	Select Region	A state has been selected by the user.	User defined functionality, high importance.	The system shall provide a list of the fifty United States, and shall allow the user to select one state.	Demonstration of selected state visibly in the interface; Demonstration of resulting zip codes in selected state.
2	Switch to Filter Criteria Input Mode	None	Developer defined user interface requirement.	The system shall switch to the Filter Criteria Input mode when prompted to by the user.	Demonstration of switch to Filter Criteria Input system mode.

3.2.2 Filter Criteria Input

Number	Capability Name	Prerequisites	Source	Requirement	Satisfaction Qualification Method
1	Switch to Select Region Mode	The user has selected a state in the Select Region mode, and has switched to the Filter Criteria Input mode.	Developer defined user interface requirement.	The system shall switch to the Select Region mode when prompted to by the user.	Demonstration of switch to Select Region system mode.
2	Input Criteria Selection Sliders	See prerequisites in 1.	User defined functionality requirement.	The system shall provide sliders for each criteria used to filter zip codes. Each slider shall select a quintile of the range of values it represents. The sliders default to selecting the	Demonstration of slider ranges and quintile ranges for filter criteria; Test of resulting zip codes; Analysis by comparison of zip code results

				middle quintile.	information against criteria.
2.1	Minimum Household Income Slider	See prerequisites in 1.	Medium importance, see 2.	The system shall provide a slider for selection of minimum household income.	See qualification method in 2.
2.2	Maximum Household Income Slider	See prerequisites in 1.	Medium importance, see 2.	The system shall provide a slider for selection of maximum household income.	See qualification method in 2.
2.3	Minimum Distance Slider	See prerequisites in 1.	Medium importance, see 2.	The system shall provide a slider for selection of minimum average distance between zip code and the center of mass of all jewelry stores in the selected region. The smallest value in this range is to be no less than 25 miles.	See qualification method in 2.
2.4	Maximum Distance Slider	See prerequisites in 1.	Medium importance, see 2.	The system shall provide a slider for selection of maximum average distance between zip code and the center of mass of all jewelry stores in the selected region. The largest value in this range	See qualification method in 2.

				is to be no great	
2.5	Average Crime Slider	See prerequisites in 1.	Low importance, see 2.	The system shall provide a slider for selection of average amount of crime reports.	See qualification method in 2.
2.6	House Quantity Slider	See prerequisites in 1.	Low importance, see 2.	The system shall provide a slider for selection of number of houses for sale in zip code.	See qualification method in 2.
3.0	Criteria Weighting Fields	See prerequisites in 1.	Low importance, see 2.	The system shall provide fields for each slider representing criteria. Each field shall accept a floating point multiplier. The multiplier shall determine how each result's adherence to the criterion influences it's weight. The default value shall be 1.0.	Demonstration of field values and their effect on weighting; Test of resulting zip codes; Analysis by comparison of zip code results information against field values.
4.0	Switch to Results Output Mode	See prerequisites in 1.	Developer defined user interface requirement.	The system shall switch to the Results Output mode when prompted to by the user.	Demonstration of switch to Results Output system mode.

3.2.3 Results Output

Number	Capability Name	Prerequisites	Source	Requirement	Satisfaction Qualification Method
1	Switch to Filter Criteria Input Mode	The user has switched to the Results Output mode.	Developer defined user interface requirement.	The system shall switch to the Filter Criteria Input mode when prompted to by the user.	Demonstration of switch to Filter Criteria Input system mode.
2	Generate Results	See prerequisites in 1.	User defined functionality requirement, high Importance.	The system shall apply an algorithm to the data for each zip code of the selected region to generate a set of zip codes. This algorithm shall fulfill filtering criteria provided in the Filter Criteria Input state.	Demonstration of results appearing. This is satisfied through satisfaction of requirements detailed below.
2.1	Generate Results Quickly	See prerequisites in 1.	User defined performance requirement, medium importance.	The results are displayed within 30 seconds of system switch to Results Output system state.	Demonstration or Test of results appearing within the time imposed by the requirement.
3	Display Results	See prerequisites in 1. Criteria has been provided by the user.	User defined functionality requirement, medium importance.	The results are displayed to the user, as defined by sub-requirements.	Satisfaction of sub-requirements.

3.1	Display Zip Codes as List	See prerequisites in 3.	See source in 3.	The system shall display a zip codes. These shall be ranked in order of best adherence to criteria provided by user.	Demonstration of zip codes as list; Test/Analysis by comparison of zip codes' statistics against criteria influenced ranking algorithm.
3.2	Display Houses as List	See prerequisites in 3.	See source in 3.	The system shall display a list of houses in a selected zip code.	Demonstration of a list of houses available in a selected zip code; Test/Analysis of houses within corresponding files.
3.3	Display a Map	See prerequisites in 3.	See source in 3, low importance.	The system shall display a map of the region that includes results.	Demonstration of map data with corresponding elements; Test/Analysis of house/store CoM location within corresponding files.
3.3.1	Display Houses on Map	See prerequisites in 3.	See source in 3.3.	The system shall display the location of the center of mass of all jewelry stores in the state.	See qualification method in 3.3.

3.3.2	Display Region on Map	See prerequisites in 3.	See source in 3.3.	The system shall display the subregion representing the zip code.	See qualification method in 3.3.
3.3.3	Display Center of Mass on Map	See prerequisites in 3.	See source in 3.3.	The system shall display the houses within each zip code subregion.	See qualification method in 3.3.

3.3 CSCI interface requirements

3.3.1 Interface identification and diagrams

Two interfaces exists. An external interface exists between the CSCI system and the file system on the USB 3.0 flash drive. The system shall perform file reading operations in order to retrieve information for every zip code of every state within the fifty United States. The relevant file system structure has been determined by the developer, and is elaborated upon in the SDD. The other interface is an internal user GUI. This requirement coexists with functionality and system mode change requirements in section 3.2 of this document. No specific diagrams are included.

3.3.2 External - File System

Number	Capability Name	Prerequisites	Source	Requirement	Satisfaction Qualification Method
1	Results Generation Algorithm Zip Code Statistics	The user has switched to the Results Output mode. A region is available. Zip code filter criteria is available.	Developer defined functional requirement. Derived from Generate Results, in section 3.2.3 of this document.	The system shall provide statistics regarding zip codes to the algorithm that ranks/selects zip codes. The statistics pertain to all non house-specific criteria.	Satisfaction of Generate Results requirement, in section 3.2.3 of this document.
2	Results Generation Algorithm Zip Code	The user has switched to the Results Output	Developer defined functional requirement.	The system shall provide house information regarding zip	Satisfaction of Generate Results requirement,

	House Information	mode. A region is available. Zip code filter criteria is available.	Derived from Generate Results, in section 3.2.3 of this document.	codes, including pricing and addressing.	in section 3.2.3 of this document.

3.3.3 Internal - User Interface

Includes mode change requirements in section 3.2 of this document.

Number	Capability Name	Prerequisites	Source	Requirement	Satisfaction Qualification Method
1	Provide Graphical User Interface	None	User specified interface requirement. High importance. Derived from functionality requirements.	The system shall provide a graphical user interface with which to interface with the program.	Demonstration of system functionality as a program with a graphical user interface.

3.4 CSCI internal data requirements

All data is stored as a series of files. Data pertaining to zip codes exists in one folder-sorted system of files, while house information exists in another. This is all described by the requirements in section 3.3.2. This file information is formatted as a requirement below.

Number	Capability Name	Prerequisites	Source	Requirement	Satisfaction Qualification Method
1	Statistics Format Within File Structure	None	Developer defined interface requirement. Derived from requirements in section 3.3.2 of this document.	The system shall provide zip code statistics regarding each zip code in a Comma Separated Value (CSV) type file. These statistics include distance from center of mass of jewelry stores in	Analysis of file contents within defined file structure.

				region, minimum/maximum household income, and crime report amount. These statistics will reside within files in the file structure with the name structure “[Name of region][File Number].csv”. The CSV file type specifies how this data is layed out within the file.	
2	House Format Within File Structure	None	See source at 1.	The system shall provide zip code statistics regarding house information in a Comma Separated Value (CSV) type file. These statistics include the price and the address of each house available for sale within the zip code. These statistics will reside within files in the file structure with the name structure “[Zip code]Houses.csv”.. The CSV file type specifies how this data is layed out within the file.	See qualification method at 1.

3.5 Security and privacy requirements

Number	Capability Name	Prerequisites	Source	Requirement	Satisfaction Qualification Method

1	Flash Drive System	None	User specified privacy requirement, medium importance.	ROBBR shall only function from a Linux installation on a bootable USB 3.0 flash drive. This will be the only one of its kind available.	Observation of system working from USB 3.0 flash drive.
2	No Logging	None	Developer specified privacy requirement. Derived from Flash Drive System at requirement 1.	The system shall not save any logging information, or any information revealing system use.	Analysis of file system of USB 3.0 flash drive, as well as host computer.

3.6 Computer CSCI environment requirements

The environment is dictated partially by the requirements listed in section 3.5 of this document.

Number	Capability Name	Prerequisites	Source	Requirement	Satisfaction Qualification Method
1	Computer Guest Operating System Boot Capability	None	Developer specified functionality requirement. Derived from Flash Drive System at section 3.5 of this document.	The system shall only function from a Linux installation on a bootable USB 3.0 flash drive. This will be the only one of its kind available.	Demonstration of Linux operating system booting from the USB 3.0 flash drive on the user computer.
2	Computer USB 3.0 Port Availability	None	Developer specified performance requirement.	The system shall be operated on a computer with a USB 3.0	Demonstration of sufficient operating system and

	for Guest OS Flash Drive		Derived from Flash Drive System at section 3.5 of this document, and from Generate Results Quickly at section 3.2.3 of this document.	port that has the Linux guest operating system USB 3.0 flash drive plugged into it.	CSCI speed; Analysis/Test of USB 3.0 flash drive memory access speeds.
3	Computer Internet Connection	None	Developer specified functionality requirement.	The system shall be operated on a computer that is connected to the Internet.	Demonstration of Internet connection; Test of ping command.

3.7 Software quality factors

Requirements, from Computer USB 3.0 Port Availability for Guest OS Flash Drive at section 3.6 of this document, and from Generate Results Quickly at section 3.2.3 of this document, pertain to this document.

3.8 Design and implementation constraints

There are no external design or implementation standards used for the project, other than that we must use APIs to request and interpret data. This is fulfilled through the Google Maps API, used to display results in the Display a Map component (section 3.2.3 of this document). Further design decisions are left to the developer as long as the user specified functionality and performance requirements are met.

3.9 Training-related and personnel-related requirements

The customer is to be the single user of this system. The user is expected to know how to boot the Linux operating system from the USB Flash Drive on which the program is installed. They should know when the operating system has finished initializing and how to start the program after operating system initialization. Finally, they should know how to operate the program itself. This will be aided by prompting text in the GUI. A user manual will be available at the end of the development life cycle that facilitates this training. However, no requirements have been specified regarding any training.

3.10 Packaging requirements

This is reflected in Flash Drive System, in section 3.5 of this document. The system is to be delivered on a bootable USB flash drive to run in a Linux distro. Additionally, all files necessary to execution must be installed on the bootable USB drive.

3.11 Precedence and criticality of requirements

Precedence and criticality of user defined requirements is listed where applicable, under the source information for requirement. This information is summarized below, with three categories of importance as defined by user, and the requirements that comprise each category:

1. High importance; defined as "it needs to do this or else"
    a. Select Region (section 3.2.1)
    b. Generate Results (section 3.2.3)
    c. Display Results (sections 3.2 and 3.12)
    d. Provide Graphical User Interface (section 3.3.3)
2. Medium importance; defined as "it should do this to be considered a good use of my time"
    a. Input Criteria Selection Sliders (section 3.2.2)
    b. Display Zip Codes as List (section 3.2.3)
    c. Flash Drive System (section 3.5)
3. Low importance; defined as "nice to have at this point"
    a. Input Criteria Selection Sliders (section 3.2.2)
    b. Display a Map (section 3.2.3)

4 Qualification provisions

All qualification satisfiability is classified and elaborated upon under “satisfied by” information for each requirement. This information is better detailed at the description of each requirement. For the sake of brevity, these are not included here.

5 Requirements traceability

Sections 3.2, 3.3 and 3.5 include each requirement, as well as the item to which it may be traced. See above for all traceability information.