E-Valuer

(An Intelligent tool to assist in making smarter property related decisions)

System Requirement Specification

Project ID: 19-010

Sri Lanka Institute of Information Technology

Special Honours Degree of Bachelor of Science in Information Technology

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E-Valuer

AN INTELLIGENT TOOL TO ASSIST IN MAKING SMARTER PROPERTY DECISIONS

System Requirement Specification

(System requirement specification documentation submitted in partial fulfilment of the requirement for the Degree of Bachelor of Science Special (Honors)
In Information Technology)

Bachelor of Science (Honors) in Information Technology
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Department of Information Technology
Sri Lanka Institute of Information Technology

May 2019

DECLARATION

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1 Introduction

1.1 Purpose

The purpose of this document is to give a detailed description of the requirements for the E-Valuer (An Intelligent tool to assist making smarter property). It will illustrate the purpose and complete declaration for the development of system. It formally specifies the proposed system's functional requirements, non-functional requirements, data requirements, quality requirements and constraints. The document describes the issues related to the current system and what actions are to be performed by the development team in order to come up with a better solution. This document will help system developers to understand the overall functionality of the system. By reading this document system users can get a clear idea of systems behavior and how to interact with the system. Also, this document can be used to verify whether the software meets the user's actual needs. The development team uses this document to describe the scope of the project and to plan the system's design and eventual implementation. Our system users are Surveyors, Land sale companies, Brokers, land buyers and sellers. The intended audiences of this System Requirement Specification are the members of the research group, project supervisor – Mrs M.P.A.W.Gamage

1.2 Scope

An Intelligent tool To assist in making smarter property is an automated system. The requirements for An Intelligent tool To assist in making smarter property are included in this System Requirement Specification (SRS).This is an intelligent tool which can help people to get an idea about the land they are hoping to buy, to decide the suitability of their purpose.

To develop a portable application which can provide instant report of a selected land parcel to provide the users with an insight of the land with future value, just by giving the location.

1.2.1Main Objectives

To Provide people with fair and accurate prediction of the value of the land. They are going to buy, on time, to make better decisions.

1.2.2Sub Objectives

Identifying method to predict future value based on last year prices and populations, weather conditions and nearest locations using google api.

1.3 Definitions, Acronyms, and Abbreviations

Definition

Terms	Definitions
SRS	A software requirements specification (SRS) is a description of a software system to be developed. It lays out functional and nonfunctional requirements, and may include a set of use cases that describe user interactions that the software must provide.
Machine Learning	Machine learning is a type of artificial intelligence (AI) that provides computers with the ability to learn without being explicitly programmed. Machine learning focuses on the development of computer programs that can change when exposed to new data .
Google API	Google APIs is a set of application programming interfaces (APIs) developed by Google which allow communication with Google Services and their integration to other services. Examples of these include Search, Gmail, Translate or Google Maps.
GIS	A geographic information system is a system designed to capture, store, manipulate, analyze, manage, and present spatial or geographic data. GIS applications are tools that allow users to create interactive queries, analyze spatial information, edit data in maps, and present the results of all these operations.

Acronyms and Abbreviations

SRS	Software Requirement Specification
AI	Artificial Intelligence
ANN	Artificial Neural Networks
KNN	K Nearest Neighbour
GIS	Geographic Information System
ARIMA	Autoregressive Integrated Moving Average

1.5 Overview

This is an Intelligent tool which can help people to get an idea about the land they are hoping to buy, to decide the suitability of the land for their purpose.

Chapter 1: brief the purpose of preparing the SRS document. Scope consist of a description that clearly mention the tasks that the project team will do and will not do, it also describes the benefits, objectives, and goals of the particular software. Overview section explains how the SRS is organized and describes what the rest of this document contains in a brief manner.

Chapter 2: provides the overall description of the system E-Valuer with product perspective, system interfaces, user interfaces. And also it provides the product functions, user characteristics, constraints which are useful for the system users.

Chapter 3: describes the specific requirements containing of interface and performance requirements, design constraints and software system attributes.

Chapter 4: contains the supportive information containing the table of content, appendices and indexes

With the respect to all these chapters this document will conclude all the necessary information for the development team to understand the final output with certain limitations

2 Overall Descriptions

Real Property are the most valuable possession of most of the common people. Getting the proper valuation for these real properties is very much important. This system is an innovative solution proposed to facilitate land valuation based on past sales, prediction of future price and the effect of proposed development work on the land, so that real-estate customers and owners of real estate companies can be benefitted and make smarter property related decisions.

In practice, this manual process makes a lot of problems. Specially, this is a personal oriented method. The way of analyzing the features and giving them a value may be changed person to person. It will lead to different values for a same land by different valuation officers. Therefore, there should be a proper concept or a mechanism in valuing a land .[1]

Sri Lanka, the valuation officer would consider a lot of external and internal factors.

As external factors, the basic infra structure facilities such as presence of electricity, telephone facility and water would be considered in the process. Also the distances to other facilities such as schools, main and minor roads and financial institutions in the surrounding area play a vital role.[1]

Sri Lanka is lacking a good data platform to gather all these data, considering all these factors can take ages to do proper valuation considering all these factors.

All above mentioned problems can be solved with the implementation of the system which will save time, cost, and with improved fairness of the predictions which will be done.

2.1 Product perspective

There are so many systems like our system in abroad**.** Our intention is to identify the ways to use their underlying methodology in a suitable manner in Sri Lankan context.

we use multiple sources of data to entangle the economic contribution of the neighborhood's characteristics such as walkability and security perception. We also develop and release a framework able to now-cast housing prices from Open data, without the need for historical transactions. Experiments involving 70, 000 houses in 8 Italian cities highlight that the neighborhood's vitality and walkability seem to drive more than 20% of the housing value. Moreover, the use of this information improves the nowcast by 60%.[2]

The initial house prices prediction is challenging and requires the best method to get the best prediction accuracy. In the predicting the sale price of a house that has an uncertainty parameter, fuzzy logic becomes one of the solutions that can be used in solving the problem [3]. Moreover, artificial neural network methods are used to predict house selling prices [3]. In addition to using fuzzy logic and artificial neural networks, predictions can also use the K-Nearest Neighbors algorithm, for estimating residential prices for the residential property market in Hong Kong [3]. Several machine learning methods are compared to get the best prediction of house pricing [3].

Comparison of Existing Systems for the features of Current Value predictor module

	Zillow	Trulia	QV-CoreLogic	HousePrice.ai	Our Product
Current Value Prediction	Yes	Yes	Yes	Yes	Yes
Use of AI/ Machine Learning	Yes	Unknown	No	Yes	Yes
Future Value forecasting	For 12 months	No	Yes, with E-Valuer report	For 3 years	For 5 years
Future Development effects prediction	No	No	Yes	No	Yes
Available for Sri Lanka	No	No	No	No	Yes

Table 2.1: Comparison of existing systems

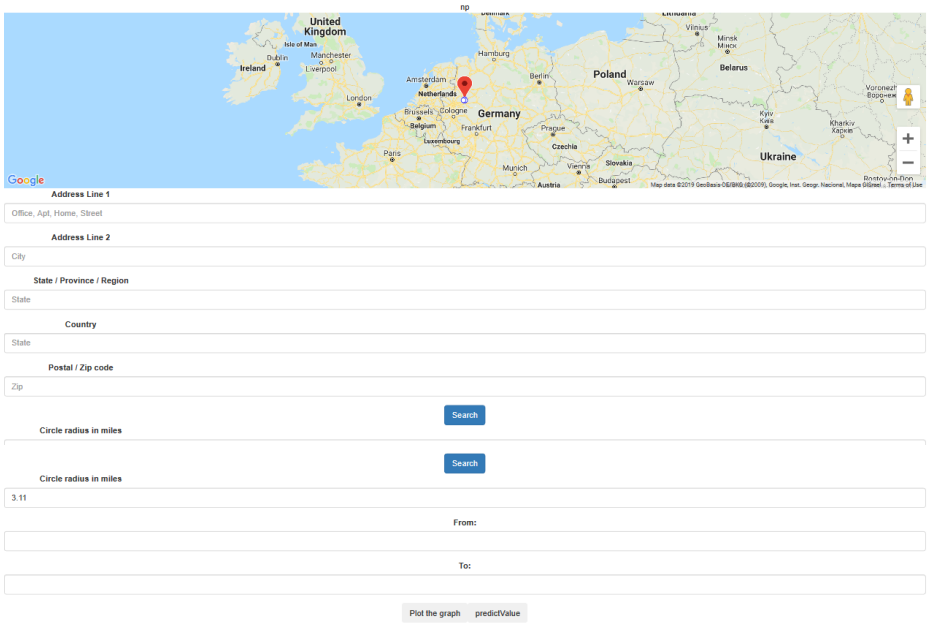
2.1.1System interfaces

The application must be hosted to be accessible by public. Users might access the system via desktop computer or a mobile device. Web application commonly use a combination of server-side script (ASP.net, python) and client-side script (C#, Angular 6) to develop the application. Accessible for a range of devices, Adaptable to increased workload are some benefits of using web application.

1 Data Store historical data relevant to predictions provided by valuers

2 Retrieve data and feed the Artificial intelligence model

2.1.2User interfaces



2.1.3Hardware interfaces

For clients we expect a smart mobile phone / tablet / laptop / desktop computer with minimum RAM of 2GB with web browser

For the developer end, we expect a computer with

- CPU: Quadcore Processor
- RAM: At least 8 GB
- Storage: 20GB

2.1.4Software interfaces

- Application Tool

  We use Android studio for develop our mobile application

- Database

For create our application we use MongoDB.

- Anaconda Navigator

  We use Anaconda Navigator as the application launcher. It allows us to launch applications and easily manage anaconda packages, environments and channels without the need to use command line commands.

- Jupyter

  Jupyter is an IDE we have used to develop our machine learning models and it is powerful interactive development environment for the Python language with advanced editing, interactive testing, debugging and introspection features

2.1.5 Communication interfaces

Internet connectivity is important, other than that this system does not use any communicational interfaces.
To create an internet connection between the client and server the device needs SIM card used for accessing the broad band network works using

- 3G standards like CDMA, HSPA

- 4G, 4G LTE, WCDMA are available with data transmission rate around 144 KB/per second and above.

2.1.6 Memory constraints

The application will not be needed internal or external memory space in device to install application since it is web hosted. But, it will need some memory space for cache data and other data. Hence, it is expected to use no more than 16 MB of Ram and 20 MB of external storage.

2.1.7 Operations

Predict the future price of the selected land

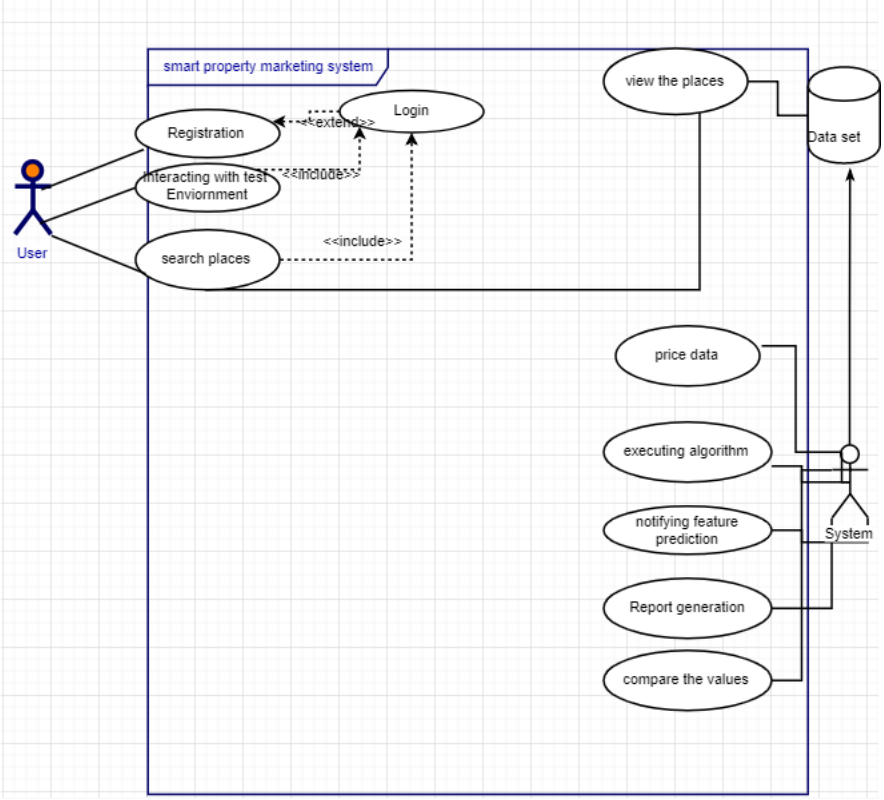
This component is responsible for developing an AI model which predicts future price of the location based on location based on data gathered by analyzing those submited by valuers and other key factors identified as significant to the area, following a time-series based on algorithm. Here the performance of kNN and ARIMA will be evaluated to analyze data and most accurate one will be used to make predictions.

2.1.8 Site adaptation requirements

1.System users are the main users of the system, . It is a necessity to develop the system in a simple and understandable way to make the application more user friendly.

2.Cloud server should be up-to-date.

2.2 Product functions



2.2.2 Use Case Scenario
Use case name Forecasting prices using machine learning model

Actor Customer
Precondition User must be logged in
Exceptions If the user cannot log on to the application, user cannot see the predicted prices.

Use Case	Login
Description	User should be able to login into the system by providing username & password
Pre-condition	Browse the web site
Actors	Surveyors, Land sale companies, Brokers, Land Buyers and Sellers
Main Events	1.Open Application 2. Fill the text box by providing username &password

2.3 User characteristics

Our application is mainly targeted for real-estate customers and owners of real estate companies. But any person can use this application. This intelligent tool can help people to identify the land they are willing to buy.

The forecast of the current value is the first service offered to the customer to decide if this plot of land is suitable for their needs. The terrain, because it is difficult to know manually the reliable average prices of the land that surrounds it, especially if the region is unknown.
Our second customer service provides forecasts of the future value of the land, as well as a report that indicates the effect of the development projects proposed in the area.
This proposed system would be of great help in making better property decisions, which is a huge investment and a very important decision in everyone's life.

2.4 Constraints

In this development process of the criminal identification desktop application, development team had to consider about many types of constraints which were affected to the projected application. Those identified constraints are as follows,

1. **Hardware constrain**

   4 GB ram, i7 processer, VGA minimum NVDIA 920mx with GPU, Windows 10, Windows 8, Windows Embedded Standard 7,32-bit (x86) or 64-bit (x64) processor

2. **Software constraint**

   In this application we have used python in Anaconda framework and Angular JS.

3. **Time constraint**

   The system should be completed by November 2019.

2.5 Assumptions and dependencies

When designing this application there are some assumptions we made. Some are as follows.

1. System user must have at least a slight knowledge to operate computer with system properly.

2.6 Apportioning of requirements

The above requirements we have described in sections 1 and 2 in this SRS document are mentioned as primary specifications. From the details in section 3 it specify the requirements specification. The two levels of requirements are intended to be consistent.

Section 3 describes all the essential requirements that are used in each functions which are going to implement in this system. In section 3.1.1 describes the user interfaces we are used in our system and all our functions will use these user interfaces commonly. In section 3.1.2 describes hardware that the software products deal with. Section 3.1.3 will describe which software the product must interface. From the last section we can have the communication interfaces we have used.

3 Specific requirements[(1)] (for "Object Oriented" products)

3.1 External interface requirements

3.1.1 User interfaces

Previous section presents information oriented to the customer/user while section 3 is oriented to the developer.

It contains both content and format as follows:

- Name of item
- Description of purpose
- Source of input or destination of output
- Valid range, accuracy and/or tolerance
- Units of measure
- Timing
- Relationships to other inputs/outputs
- Screen formats/organization
- Window formats/organization
- Data formats

3.1.2 Hardware interfaces

For the developer end, we expect a computer with

- CPU: Quadcore Processor
- RAM: At least 8 GB
- Storage: 1 TB

3.1.3 Software interfaces

Some software components that we are going to use in our system are as follows.

1.Python(Numpy, Pandas, Matplotlib)

2.Anaconda distribution

3.Angular Js

4.Google API

5.GIS

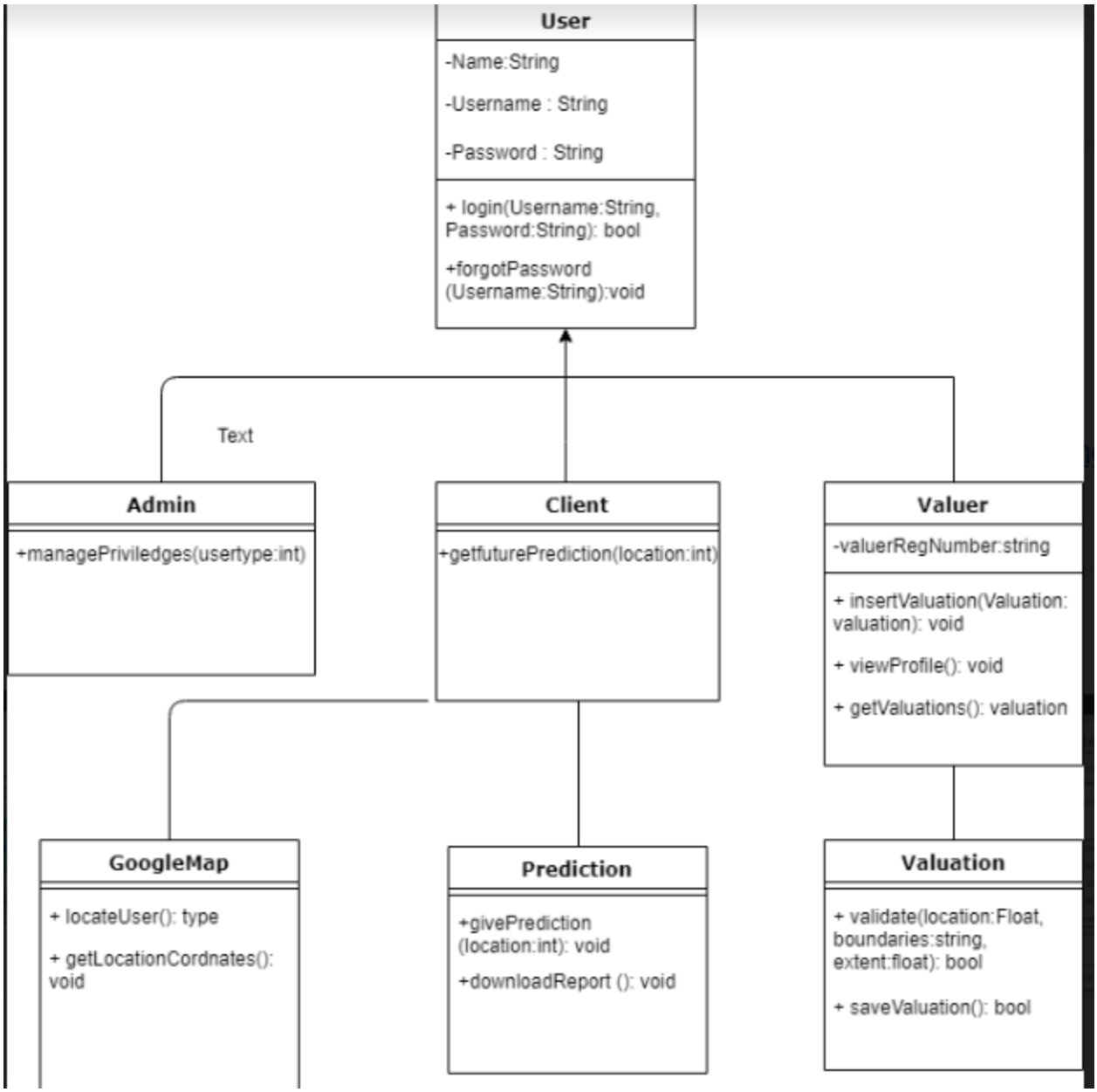
3.1.4 Communication interfaces

Internet connectivity is important, other than that this system does not use any communicational interfaces.

To create an internet connection between the client and server the device needs SIM card used for accessing the broad band network works using

- 3G standards like CDMA, HSPA
- 4G, 4G LTE, WCDMA are available with data transmission rate around 144 KB/per second and above

3.2 Classes/Objects



3.3 Performance requirements

This is used client-server architecture. Therefore, one or more than one person can use this application at the same time. System initially aimed to work with more concurrent users.
Performance requirements define acceptable response times for system functionality.

- It takes no more than two seconds for the user interface screens to load.
- Login information will be verified within five seconds.
- Consultations should return results within five seconds.
- The system consumes very little primary memory.

3.4 Design constraints

The System is network based System, Web app that should be develop to support any web browser to be used, the system, the system design should include a lot of DB and SYSTEM validation. Keep the rules so that you can choose to break them. Prepare the content before the design. knowing your target audience can help you decide.

3.5 Software system attributes

3.5.1 Reliability

The system never crash or hang, other than as the result of an operating system error.

3.5.2 Availability

There are specific availability requirements.

3.5.3 Security

The registered user only can access the website.

3.5.4 Maintainability

All code shall be fully documented. Each function shall be commented with pre- and post-conditions. All program files shall include comments concerning authorship and date of last change.
The code should be modular, to permit future modifications.

3.6 Other requirements

3.6.1 User-friendly

Software interface that is easy to use. It is "friendly" to the user, meaning it is not difficult to learn or understand. Interface is not overly complex, but instead is straightforward, providing quick access to common features or commands.

3.6.2 Simplicity

All the user's interfaces are designed simple manner to use the system without any confusion for visually impaired and other users.

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