

MODERN TRIP ASSISTANT

Project ID 19-136

Final Report

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**Bachelor of Science Special Honor's Degree in
Information Technology**

Department of Information Technology

Sri Lanka Institute of Information Technology

Sri Lanka

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(Final Report submitted in partial fulfillment of the requirement for the Degree of Bachelor of Science Special Honor's in Information Technology)

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DECLARATION

We declare that this is my own work and this Final Report does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Abstract

Modern Trip Assistant System is advanced tour planning guide for tourists who wish to travel historical and popular tourist places in Sri Lanka. The system is designed to help tourists to plan day-based trip with all the facilities. More specifically, the flow of proposed system is when a user opens this application for the first time, a login / signup interface will be displayed. After that user has to specify the no of days or total duration of trip. Then in the next screen user can choose all the tourist places and our system will plan the trip according to the tourist places. Our system will notify tourist according to the trip plan in order to prevent time lack. Duration for each tourist place will be determined with the help of the data provided by the tourist guides when registering to our system. At the end of the trip system will charge for the entire trip with all the expenses as a single payment. All the payment related information can be accessed using web interface of Modern Trip Assistant System.

Acknowledgement

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Definitions, Acronyms and Abbreviations

AR	Augmented Reality
GPS	Global Positioning System
API	Application program interface
HTTPS	Secure Hyper Text Transfer Protocol
Android	Android is an Operating System based on Linux Kernel and designed primarily for Touchscreen mobile device.
Cloud Computing	The practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer

Table 1: Definitions, Acronyms and Abbreviation

1. Introduction

1.1 Problem to be addressed

The purpose of this document is to give a detailed description of the requirements for all the function which is used in travel guide application. This document will illustrate the purpose and complete declaration of development of the system to give an in-depth insight of “Modern Trip Assistant”. It will also explain product’s target audience, system constraints, interfaces and interactions with other external applications, features of the system, functional requirements, nonfunctional requirements, data requirements, quality requirements, hardware requirements and software requirements. Issues related to the current system and actions to be performed by the development team are described in order to come up with a better solution. This document can be used to verify whether the software meets the user’s actual needs and requirements. In Development team’s perspective SRS is valuable as it describes scope of the project, plan system’s design and eventual implementation

1.2 Background

During late years tourism has turned out to be one of the world's most intense ventures in terms of revenue creation. This Industry becoming more and stronger considering global economy which expanded with the increment of tourist arrival. From recent times Sri Lanka able to expand the tourist sector and able to attract foreign investors and local people who are interested in contributing. By being a tropic country, it helps to attract lot of European people who loves to enjoy the climate here in Sri Lanka. Also, the location and beauty of the country further help in attracting process of tourists which also encouraged by the ending of 30 years of war.

Sri Lankan Economy is mostly depending on the Service Sector which is around 60% of entire the Production. So, government also very much interested in providing facilities and uplift the tourism sector to earn more and more profits. With the enlargement of tourist industry, it brings some common problems which require the attention of all of us. So, we come up with a solution to one such problem through this Research project. With the development of the technology it is easier for any tourist to access any location and get details of what they want [1].

Nowadays' wireless networks like mobile phones, internet and numerous other new technologies together gives different functionalities which are significantly making impact on our day to day activities. In this manner mobile tourism spread rapidly among tourists which becomes a self-navigation to them. It not helps to tourist other than hotel owners and trip advisor [2].

The System covers project areas like Hotel room booking prediction, Virtual guide, and tourist place identifies and entertainment sector. Prediction help to hotel owner make sure to ready for each month. This given to option found suitable accommodation for tourist budget. Virtual guide done through the image process technology. it is most important feature because normally tourist not comfortable with unknown tourist guide with them so virtual guide will provide most comfortable and secure travelling to tourist. Place identify done through the image process technology. it will be providing identify unknown tourist place. Partly system cover entertainment perspective as well. System will provide image capture and share using argumentative reality [3].

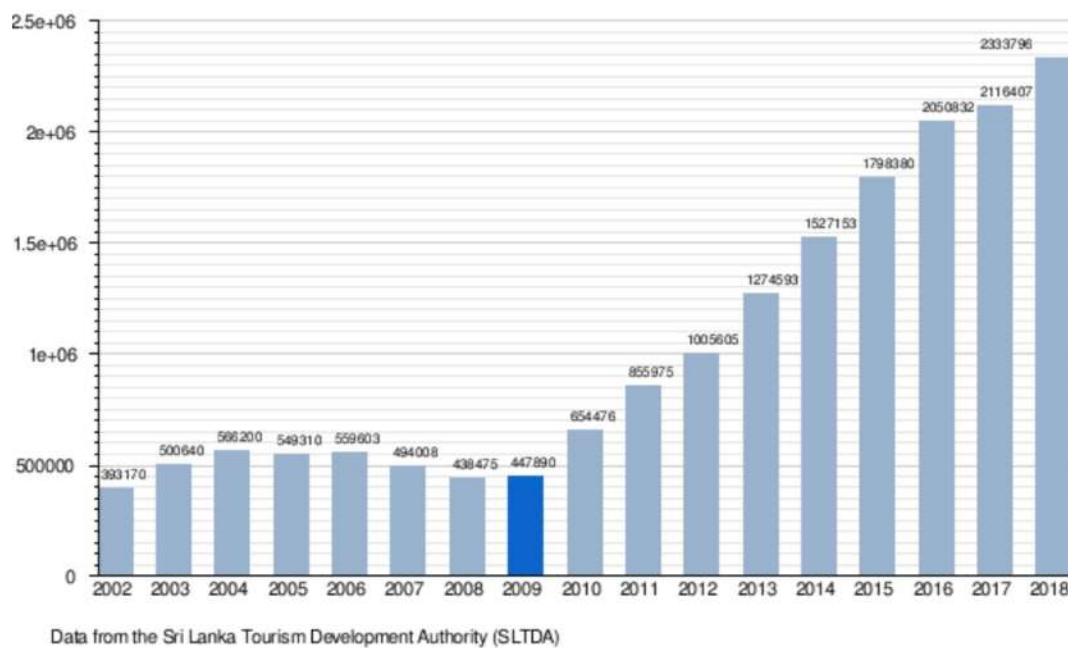


Figure 3.1.1 Data from Sri Lanka Tourism Development Authority (SLTDA)

1.3 Literature survey

There are several researches have been done related tourism, but there did not provide enough specific functionality to the tourist to satisfy their journey. A machine learning based smart tourist guidance system has been used Google maps API and point out places which they preferred. When start the tourist start the journey, it helps to find most suitable routes to direct trip [4]. Here, only ML algorithms used to predict the exact route by using Google maps API.

Different types of researches carried out through the domain of sharing tourist experience via albums and videos, it helps for those who passionate to visit tourist places. Here, they didn't ensure the tourist's privacy when sharing experiences [5]. Only focusing to promote tourist places. In tourism domain some researches have been done for collect photos, videos, posts and calculate estimations about attractions attended by the tourist [13].

Very few researches have been done and build mobile application to know information about tourism and cultures in different province of a country [6]. Here, objects and videos displayed virtually, and user interact with application when select the province.

The popular recommender system which has been seen respective collaborative filtering methods based on tourists' historical behaviors. Predict the customer's historical information [7]. Collaborative travel app in the tourism domain have been designed, built and tested for smart phone technology helps to identify current and anticipate future patterns [8] and virtual reality (VR) technology used to explore any destination or location in real-time but it was in internet based virtual system [9] main disadvantage of this system cannot use offline.

Android based mobile application which provides geographic services and tourism in Istanbul city. It has internal database and represents the possibilities of searching places of interest using Variable-neighborhood algorithm [10]. There are very few numbers of application which is on windows phone 7 application that provides the photos to the users around user's location [11], photos are automatically downloaded from Flickr and Panoramio and shows to the user.

Hence, innovative museum guidance system, where determine user's position information by using ZigBee protocol [12]. Tourist use tablets to interact with elements in the environment and receive personalized information. This system gets a location precision of less than one meter. There is another mobile application for tourist that makes context aware recommendation respective to tourist's interest and context [14] which is built on WSAP platform and it represents generic supporting services combined with the semantic web technology.

Classification of mobile applications accessible under tourism domain there are four different categories “Online Booking”, “Information Resources”, “Location based service” and “Trip Journals” which are combined together in one single application [14], but there are no any Machine Learning algorithms used predict the data easily. Only using individual database to keep the record and identify the tourist request.

Tour planning support system provides a way to combined tour planning in a tour and it guides tourist respective their specific profile which is interest, wishes, personal values, disabilities and constraints also transportation schedules based on tour planning [15]. Interact the system through the web or mobile according the tourist preference.

1.4 Research gap

Most of the research applications regarding tourism have focused on the service which could be provided to tourist. There are plenty of tourist apps that are available for booking hotels, find the restaurant and find the travel agency.

The previous research project also contain some facility for tourist such as calculate tour budget, planning trip dynamically and find the tourist places in shortest route. But we have focused on some unique features like, time management which automatically calculates the trip time to all the tourist places according to the data provided by the tourist guides to each and every tourist places, automated image analysis which automatically find the details about the image which is taken in the tourist place, search prediction which automatically predicts the appropriate tourist place according the data collected by learning the user searches, photo capturing and sharing feature which allows users to pin a more realistic image in the tourist place and share them with other users hotel room prediction and virtual guide

The following are some applications which are relevant to this research area.

- Tour Buddy
- TourPal
- TripAdvisor
- Tripomatic
- Minube

The below table clearly defined the functionalities of our application

Functions	Our Application – Trip Assistant	Tour Buddy (SLIIT – Research Application)	TourPal	TripAdvisor	Tripomatic	Minube
Booking Facilities	✓	✓	✓		✓	✓
Location & Navigation	✓	✓	✓	✓	✓	✓
Weather Service	✓	✓				
Automated transaction management	✓					
Time management	✓					
Calculating Budgets	✓	✓			✓	
Automated tour plan	✓	✓				

Automated Image Analysis	✓					
Demand prediction	✓					
Photo capturing and sharing.	✓					
Virtual trip assistant	✓					

Table 2: Research gap

1.5 Research problem

Nowadays tourism has become one of the major sources of Sri Lanka. There are many attractive tourist places cover the tourist but still they struggle to find the tourist places and tour guides. There are some drawbacks impacting the tourism industry. When tourist search some places, they don't get any proper way to reach the destination and also they don't get better information regarding the places what they searched. At the time they might skip those places.

1.6 Research objectives

1.6.1 Main objectives

- Provide a user friendly application for the user.
- Provide all the facilities for tourist.

1.6.2 Specific objectives

- Collect the exact set of requirements in order to proceed the project plan
- Gather the exact set of parameters needed to find the real time weather Condition.
- Gather the information of the important places and hidden places which
- Will be needed to display via application.
- Implement user interfaces and system logics according to the system specifications.
- Create a database and store the tourist places description.
- Save the images with the extract location.
- Test and validate the application implemented and define that the application has been built according to the requirements gathered
- To initiate a business plan and introduce the solution to the market.

2. Methodology

2.1 Methodology

2.1.1 System overview

Augmented reality based application

This project is about creating photo capturing and sharing application using augmented reality.

The project will use cloud storage to have a database of the users. It will use Application program interface (API) in order to get the users locations to the exact point.

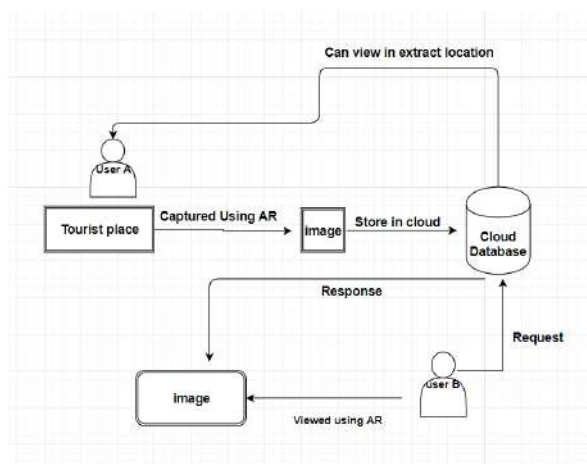


Figure 2: Workflow diagram

For the purpose of this application, we must consider about below function.

- recognize humans from other backgrounds on the photo using algorithms

Human body Detection

Given an input image frame, find out all present human body and output their bounding box (i.e. the rectangle coordinates in the form: X, Y, and Width & Height).

For this purpose we should create very effective algorithms. Through the algorithm we can filter human from the other background.

- Create 3D models and store in a database.

After that detect the human the system connect with a unity and use of the image processing apply features onto human body (3D Model). And store real images and 3D converted images based on the location.

- Create own API

When the user in the same location the system will show the past memories. In this case we find the exact location. So we create the API and find the exact location.

Below images explain some features of the augmented reality application.

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

/// <summary>
/// Holds settings that are used to configure the Unity ARKit Plugin.
/// </summary>
[CreateAssetMenu(fileName = "ARKitSettings", menuName = "UnityARKitPlugin/Settings", order = 1)]
public class UnityARKitPluginSettings : ScriptableObject {

    /// <summary>
    /// Toggles whether Facetracking for iPhone X (and later) is used. If enabled, provide a Privacy Policy for submission to AppStore.
    /// </summary>
    [Tooltip("Toggles whether Facetracking for iPhone X (and later) is used. If enabled, provide a Privacy Policy for submission to AppStore.")]
    public bool m_ARKitUsesFacetracking = false;

    /// <summary>
    /// Toggles whether ARKit is required for this app; will make app only downloadable by devices with ARKit support if enabled.
    /// </summary>
    [Tooltip("Toggles whether ARKit is required for this app; will make app only downloadable by devices with ARKit support if enabled.")]
    public bool AppRequiresARKit = false;
}
```

Figure 3: Unity AR kit plugin

```

using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using MiniJSON;
using Mapbox.Unity.Map;
using TMAP;
using Mapbox.Unity.Utilities;
using Mapbox.Unity.Location;

public class InstagramGetter : MonoBehaviour
{
    List<GameObject> pictures = new List<GameObject>();

    public AbstractMap _map;
    public string access_token;

    private IEnumerator coroutine;

    ILocationProvider _locationProvider;
    // Use this for initialization

    void LocationUpdated(Location location)
    {
        _locationProvider.OnLocationUpdated -= LocationUpdated;
        coroutine = GetInstaPictures(location);
        StartCoroutine(coroutine);
    }
}

```

```

IEnumerator GetInstaPictures(Location location)
{
    string url = "https://api.instagram.com/v1/media/search?lat="+location.LatitudeLongitude.x+"&lng="+location.LatitudeLongitude.y+"&distance=2000&access_token="+access_token;
    //string url2 = "https://api.instagram.com/v1/media/search?lat=29.891215&lng=-82.789295&distance=500&access_token=2192846875.4268208.7089226527ec01feac69049918924788";
    WWW www = new WWW(url);
    yield return www;
    string api_response = www.text;
    Debug.Log(api_response);

    Dictionary apiParse = (Dictionary)Json.Deserialize(api_response);
    List<InstagramPicture> list = (List)apiParse["data"];

    foreach (InstagramPicture picture in list)
    {
        //main picture info
        Dictionary images = (Dictionary)picture["images"];
        Dictionary standardResolution = (Dictionary)images["standard_resolution"];
        string mainPic_url = (string)standardResolution["url"];
        Debug.Log(mainPic_url);

        WWW mainPic = new WWW(mainPic_url);
        yield return mainPic;

        //location info
        Dictionary location = (Dictionary)picture["location"];
        double lat = (double)location["latitude"];
        double lon = (double)location["longitude"];
        string placeName = (string)location["name"];
    }
}

```

Figure 4: API creation

```
using UnityEngine;

namespace Scripts.Utilities
{
    public class Billboard : MonoBehaviour
    {
        [SerializeField]
        Camera _camera;

        [SerializeField]
        bool _lockX;

        Transform _transform;

        Quaternion _originalRotation;

        public Camera BillboardCamera
        {
            set
            {
                _camera = value;
            }
        }

        void Awake()
        {
            _transform = transform;
            _originalRotation = _transform.rotation;
            if (_camera == null)
            {
                _camera = Camera.main;
            }
        }

        void Update()
        {
            if (_camera == null)
            {
                return;
            }

            var lookPos = _transform.position - _camera.transform.position;

            if (_lockX)
            {
                lookPos.y = 0f;
            }

            var rotation = Quaternion.LookRotation(lookPos);
            transform.rotation = _originalRotation * (rotation);
        }
    }
}
```

Figure 5: Camera setting

Tourist place detection-based application

Modern Trip Assistant System will be consolidated mobile development with DL Techniques. The challenging part of TPD component is to identification of tourist places and differentiate two similar tourist places. in order to overcome this problem, we are going to collect tourist places and going to train using TensorFlow after that we will be get XML file with tourist place data then convert to CSV. The description of text and audio would be stored in DB after identified tourist places description for corresponding tourist place will be extracted and will be shown to end user.

The biggest part of the system development is collecting data of tourist places, verification and labeling of collected data, processing and generating text as well as audio descriptions of identified tourist places. Above mentioned areas are clearly discussed in the below section.

System overview

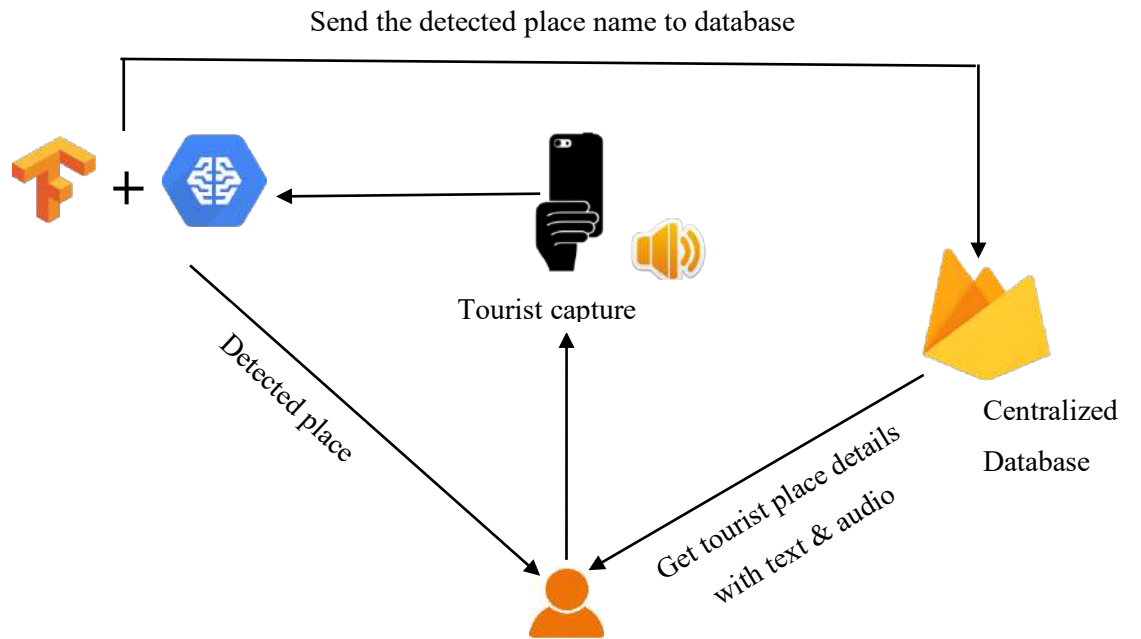


Fig. II. System Overview

A. Collecting data of tourist places

One of the essential groundwork information acknowledged in this report is collecting pictures of tourist places, Basically, the appearance of tourist places not change if any

maintenance activities occur in the tourist places the appearance of tourist places may vary. To collect the pictures of tourist places at the starting stage the pictures of most important tourist places in Colombo is gathered. The essential sense of selecting Colombo tourist places are the huge number of tourists are spending their time in Colombo and they are struggling to identify tourist places which are inside the Colombo.

The process starts with getting hundreds of pictures of tourist places in different angles due to get higher accuracy and every tourist place must be included the picture frame. Pictures are captured using smartphone because it's very powerful and easy to carry. While taking the pictures the consideration of camera frame is very important because it's should not miss important feature of tourist places.

B. Verification and labeling of collected data

In this phase corrupted, blurred and unwanted pictures of tourist places are ignored after that every picture are opened using "LabelImg" tool then draw a box around each tourist place object in every image. Repeated this process for all the images which gathered in the previous step.

C. Processing and generating text as well as audio description

In this step by using collected pictures the TensorFlow model is created and by using that the tourist places which taken by tourists identified, after that text as well as audio description generated according to identified tourist place to achieve this text description and audio description related to particular tourist place is stored in the database it will be retrieve when user taken picture in front of tourist place.

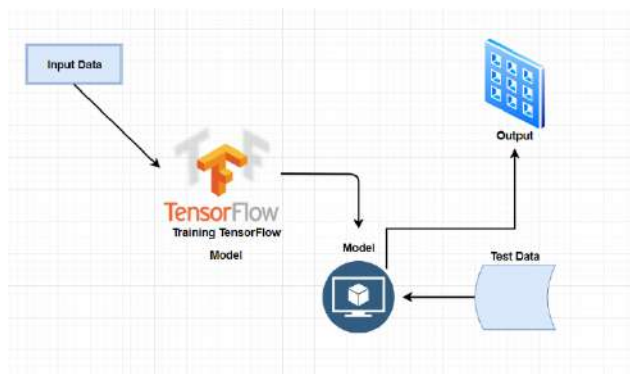
Virtual guide

This is a Real-time process and it is identify the elements of the tourist places offered by the application and it is provide real-time information and voice activated information. Image processing and Machine learning plays key aspects in this. Considering the application size, the data needed for this virtual guide will be obtained time to time from the cloud database. User can get information in any vies or angles so that will provide a comfortable user experience. There are some issues in this virtual

guide function. Any changes in the surrounding or any changes in the actual state of the element and lighting conditions might cause trouble in identifying it properly. This function is highly depend on both the processing speed and networks speed.

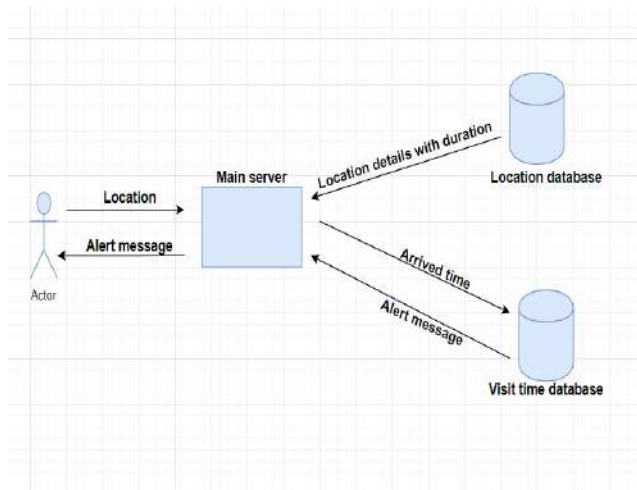
The specific goals of the virtual guide functionality are given below.

- I. Recognizing important element in real-time while the user is moving around with the virtual guide feature turned on, in service offered tourist locations in any position or angles.
- II. Providing real-time information about recognized tourist elements both as text and voice activated outputs to the user.
- III. Providing timely alerts for the user for avoiding the tourist run out of time by spending more time in a place than allocated.



Alert time overlap

System popup the reminder system notification based on the user tourist location allocated time. First system capture entering time base in entering time system will compare the escalation level timeline to backend. If spending time meet escalation level time then system will popup the alert notification



Booking Prediction

Information gathering methodology

To implement hotel booking prediction part, we had to collect booking counts from some

	A	B	C
1	Hotel A	Hotel B	Hotel C
2	38	11	36
3	26	16	5
4	38	44	16
5	7	9	15
6	13	1	30
7	26	7	11
8	18	19	25
9	17	17	42
10	14	4	17
11	11	7	25
12	22	38	30
13	32	40	13
14	15	24	23
15	47	24	22
16	28	3	2
17	36	2	30
18	45	15	10
19	39	7	2
20	12	17	21
21	17	18	19
22	1	11	7
23	16	38	20
24	36	10	45
25	5	20	39
26	12	28	30
27	3	3	8
28	34	11	43
29	1	27	4
30	10	0	28
31	2	10	34
32	2	12	7
33	19	27	38
34	24	39	31
35	3	9	37
36	28	30	11

hotels. We gathered some processed booking dataset from 3 hotels and arranged accordingly. We requested and collected dataset for more than 5 years which will help us to train our model and get a precise results.

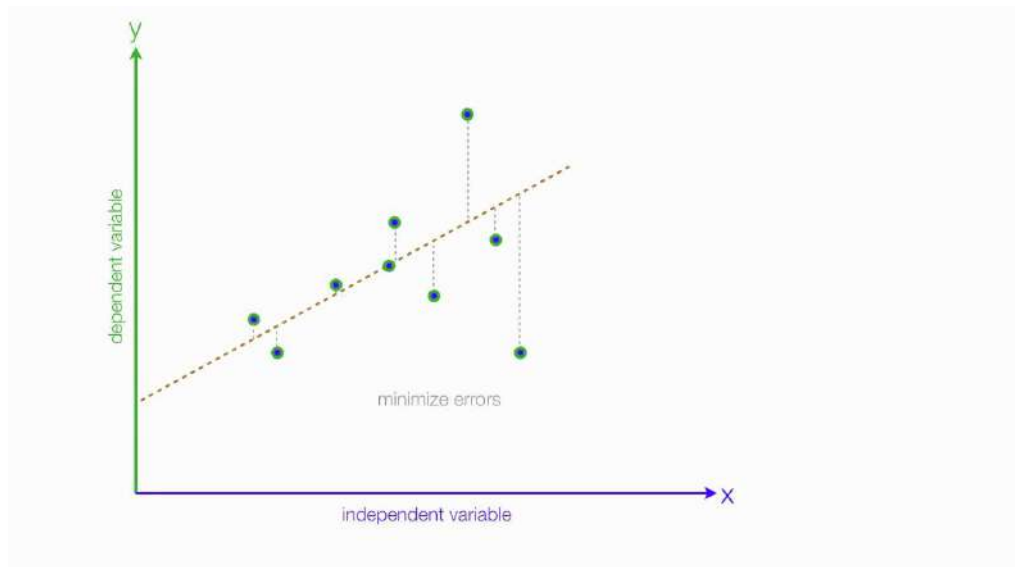
Predicting Booking Count

The above data in the datasets are straight forward and the values are not having complexity. So, there is no need to use any reducing techniques. The following observations are considered on those datasets.

Linear regression is supervised learning-based machine learning algorithm which performs regression task. Linear regression predicts the value of variable y based on the value of variable x.

In simple linear regression, a single variable is used to predict the value and in multiple linear regression, multiple variables are used to predict the value.

$$y = \Theta_1 + \Theta_2 * x$$



In the above graph, x axis represents independent variables and the y axis represents dependent variables. We make connection between those 2 variables and draw a straight line. If independent variable and dependent variable also increases, we call it positive relationship and if independent variable increases and dependent variable decreases, we call it negative relationship. To produce regression line, we have to get the observations as plots in graph and we have to draw a straight line throughout those plots. The regression line is based upon the least squares method.

Model Evaluation

Evaluating the model

```
In [9]: R = np.sqrt(model.score(x_val, y_val))  
print(R)  
0.9678232049926498
```

2.1.2 Hardware interfaces

For Software Implementation

Minimum requirements

- 1.5GHz
- 4GM RAM
- 100GB hard disk space

Sever

Minimum requirements

- 2GHz
- 2GM RAM
- 250GB hard disk space

Android Device

Minimum requirements

- 1GHz
- 1GM RAM
- 2GB Internal Storage
- Android OS 4.4 or Higher

2.1.3 Software interfaces

Software Needed in Design and Implementation

- Android Studio
- Firebase
- IBM VMware to create cloud.

- Windows 8 or more

2.1.4 Communication interfaces

- Developer needs mobile Data to access Internet when necessary.
- System Developer on Internet will be using HTTP/HTTPS protocol
- Mobile internet will be used as Communication for Android Application and cloud.

2.2 Testing and Implementation

After the implementation procedure the testing of the component is compulsory. Testing eliminate most of the errors in the developed component. The developed system is tested for the selected news domain.

There are 3 types in testing.

- **Unit Testing**

Unit testing is performed regarding to each and every individual component. Unit testing is performed under white –box testing approach. Unit testing helps developers decide that the individual units of the program are working as per requirement and are error free, thus making the overall system error free.

- **Integration Testing**

Integration testing is to test errors in the integrated modules. Even if the units of the software are working fine individually, there is a need to find out if the units integrated together would also work without errors. In here the testing will be done in the Black – Box testing approach.

- **System Testing**

System testing will be done finally. The software product is compiled as product and then it tested as a whole. This can be accomplished by using one or more of the following tests.

– Functionality Testing: Testing of all the functionalities of the software against the requirement.

- Performance Testing: To estimate how efficient the product is performance testing can be used. The system will be pushed to higher and lower limits and the defects will be identified. It measures the effectiveness and average time taken by the software to do desired tasks.
- Security and Portability Testing: This test is done when the software is meant to work on various platforms and accessed by number of persons.

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