Location based route analysis for urbanized Travelers

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Abstract

This proposal is prepared for Sri Lanka Institute of Information Technology (SLIIT), Faculty of Computing (FOC) that will describe the Location based crisis analysis and day planning with artificial intelligence and IOT for smart city and how it affects the current society.

Traditionally, these matters are solved by making calls, asking other people and getting knowledge from various resources. But this information is not enough to make a decision or come to a solution. So, these uncertain circumstances have motivated us to develop an automated system that works according to the user inputs. Everyday a disaster, a crisis or something unexpected things can happen. But the information about those might not spread among people which causes people to face unprepared problems.

The concept of a Smart City highlights the need to enhance quality, interconnection and performance of various urban services with the use of information and communication technologies (ICT). Smart City technologies promote Internet of Things (IoT) based services in which real-world user interfaces use smart phones, sensors and RFIDs. IoT is presently one of the most important ICT models that are shaping the next generation of computing. This concept has major impact on how we build and deploy smart applications/solutions for smart cities.

The aim in this research is to keep people prepared for those uncertain unprepared events by setting up this application. A smart city is a high-performance urban context, where citizens are more aware of, and more integrated into the city life. In this proposal the authors design, implement and deploy a smart application that retrieves the user relevant information on the user's surroundings. This case study application let us discuss the challenges involved in creating a location-aware mobile service based on live information coming from the city IT infrastructure.

1 Introduction

A large number of people moving towards urban cities, by 2030 more than 60% of the population will live in urban environment. With this accelerated rise of the urban population, cities throughout the world are facing many risks and concerns. This situation has created an urgency for finding smarter ways to manage the challenges.

Introducing application is a great step towards a better and faster smarter city. Because with this application people will be able to travel here and there without any trouble because they will be able to plan ahead. It will cause people to be more efficient and time saving in the busy world.

1.1 Background

Nowadays people are so busy with their day-to-day work. They have a very limited time gap to complete all the responsibilities. People will use anything that they can to maximize their efficiency and save their time to do daily tasks. In the present people tend to use technology to get things done than manually. Even the older technology is getting thrown away with the newer ones.

Here people can use the app to update disasters, crimes and crisis just by uploading a picture under the correct department that we have listed in the app. Also, people can plan ahead by using day planning with the weather and traffic analysis. Knowing these things in the busy world this will be much more helpful.

The proposed system is basically based on using Internet of Things (IOT) and so that it leads to use technology on fulfilling analysis effectively and efficiently.

1.2 Problem Statement

1.There is no way (or at least no reasonably easy and convenient way) to get the raw traffic data from Google Maps Javascript API v3. ... It's not clear from the documentation how much traffic data that exposes as it's only data about "incidents".

2.Weather analysis might not be 100% correct because it's just a prediction. And it's hard to give out the weather analysis of every area.

3.It's hard to predict the relevant problem related to the route just by uploading a picture.

1.3. **Research objectives**

The primarily objective of our research is to develop a user friendly and timesaving automated smart city application.
•Preparing people for upcoming climatic problems

•People can quickly take action against disasters and crimes

•Avoiding traffic and picking best route for reaching destinations

1.4. **Importance and Benefits of Research**

Smart city application provides lots of benefits for the people in urban areas making their tasks easier,

1)Save time

This is the most worth benefit of this research. Because people in urbanized areas struggle with the time management. This app will help them with that.

2)Accurate and secure information

People give false information about crimes and crisis. But when using our app, they will have to provide a photo attachment with the report that will make sure it's no false information.

3)Instant updates and notifications

Whenever we get a report it immediately updates and send notifications so not only the departments also the other users can get to know about them.

4)Newsfeed

Users can check the newsfeed for latest updates that will help them

5)Ability to minimize damage

Just calling and reporting a crime or crisis will take a lot of time to process. But with the app report will directly go to the closest department.

6)Anyone can use when logged in

Everyone with a smart phone will be able to sign in and use the app

7)User friendly

App is built so anyone can use, it can be used without any confusion. While being easy to operate technology

2 Literature Review

2.1 Background

This chapter describes the approaches and technologies, which were used by many researches to overcome the problem with Smart City applications and the outcomes of those projects. Also summarized description about the factors affecting the research problem and existing limitations and challenges will be described as follows.

Urbanization process is related to economic development,

social development and environmental protection.

Consequently, the urban population percentage is increasingly

important. This last took the speed character to overcome the

rural one since 2007 [1]. Consequently, cities all over the

world is at the height of seeking for optimal solutions to

face new challenges that grow variably over space and time

[1]. The quick transition to a highly urbanized population

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A. GSM/GPS Assisted Road and Traffic Congestion Detection System

With this system user can know the traffic condition on the road using GPS and GSM. So users can use alternative routes as well. So the speed sensor of vehicle a controller can get the current speed of the vehicle. When that speed falls below a present threshold the controller is informed the vehicle location. When such a vehicle speed decreasing happens in few vehicles white's location is contiguous each other the controller identifies there is a traffic grid lock in that location. So then controller informs other users about the grid lock. Then they can use alternative routes to save their times.

B. Traffic congestion detection based on GPS floating car data

They said congestion has been a major challenge to the urban traffic system. They used GPS floating car data(FCD) method to detect traffic congestion information is studied. They used data for experimentation. This data extract from traffic congestion information of a big city in China. They extract that thing through GPS data processing, map matching travel speed estimation and after that they show all those details inside the map. They said the GPS floating car technology to collect traffic information becomes more cost effective to collect traffic information in a large scale. They said compared with the traditional fixed detection devices such as (inductive loops, video cameras and radar based sensors) floating car data technique can collect traffic information more accurate and more wide in real time. They said that they consider using GPS floating car data to detect traffic congestion information.

C. Automatic vehicle accident detection and messaging system using GSM and GPS modem

In this research paper they have described the way in which a traffic accident is diagnosed and how people are informed about the crash. They use the accelerometer as a car alarm application. Using that application System can detect danger drivers. And also they use as a rollover or a crash detector of a vehicle after an accident. The server identifies an accident using accelerometer signals. If vehicle met with an accident vibration sensor detect the signal and Micro electro mechanical system [MEM] will detect that vehicle rolls over or not. Then send a signal to ARM Controller. Using GSM Modem Microcontroller sends alerts about location to police, and rescue team. Once the message is received, a police vehicle can reach that location if there is a minor accident, the driver informs all relevant sections that the driver will not be in danger. So they can avoid wasting time. Their main technical components are Vibration sensors, Micro Electro Mechanical System (MEMS) accelerometer. In the future, they will use a WIFI webcam based on the need to improve this system.

D. Detection of traffic congestion and incidents from GPS trace analysis.

This research paper contains detecting traffic congestions and incident from GPS data. They get those GPS data using GPS trackers or drivers' smartphones. They manipulate the GPS and place in the road map. They assign this system to each road segment of the map and a traffic state based on the speeds of the vehicle, it send to the users traffic alert based on the classified segments. Their traffic alert contains the affected area, a traffic state. They give example for traffic state. e.g.: Incident, slowed traffic, blocked traffic and they give estimated velocity of vehicles in the area for user's alerts. They said this proposed system is give valuable support in traffic management for municipalities and citizens. They said their very important for urban and non-urban areas. Their experimental analysis was performed using a combination of simulated GPS data and real GPS data from city. Their result of the incident detection rate 91.6% and an average detection time lower them 7 minutes.

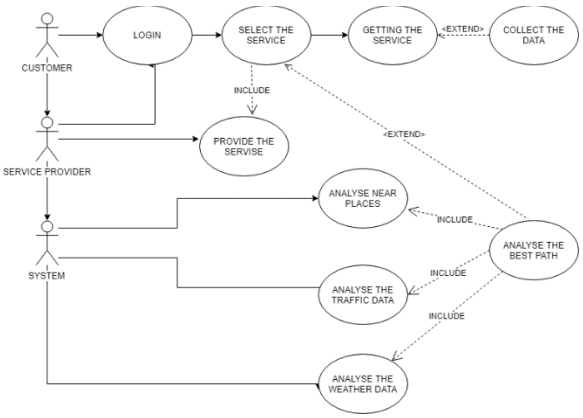
Research gap

Although accidents, crimes and disasters are a common occurrence in roads and urban areas, a quick report submission, identification and notification capabilities are lacking in most of the existing road-based solutions as elaborated in the literature. The proposed Smart City Application is a solution which enhance the user experience.

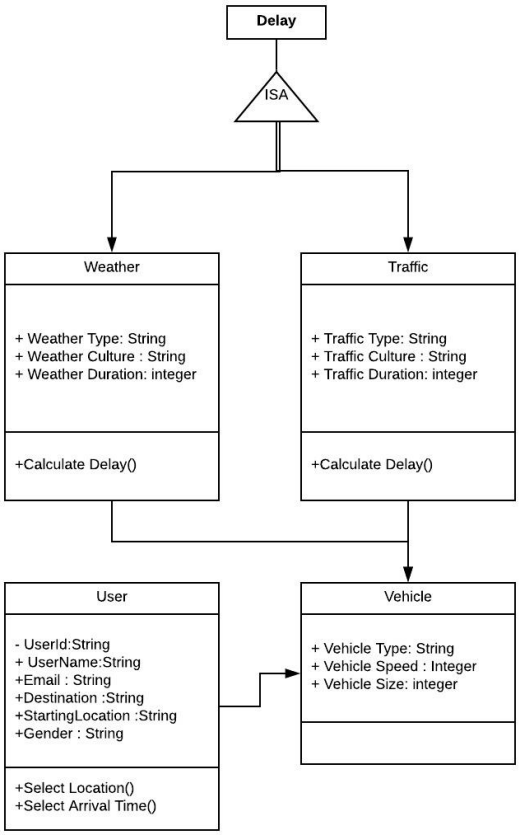
Even though there are existing proposed applications available, they do not address most of the problems that the proposed system is going to address. Proposed mobile application consists of many features as a solution for the main issues people faced in day to day life due to traffic problems.

Features	Google map	Culture and new digital technologies Transforming world cities	Proposed app	Pick me
Analyze the time taken for reach the destination	✓	✓	✓	✓
When we submit the time to reach the destination show the start time	✗	✗	✓	✗
When we start travelling show us the weather report on the passing areas	✗	✗	✓	✗
Identifying the closest department relevant to the report	✗	✗	✓	✗
Shows the closes route according to the weather and traffic data	✗	✗	✓	✗

Use Case Diagram



Class Diagram

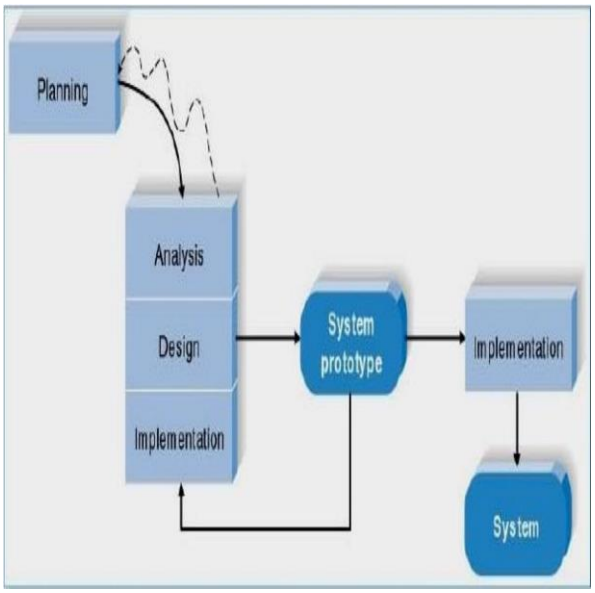


3 Methodology

This section includes detailed descriptions about the techniques and mechanism employed to make our "Smart City App" a reality. The descriptions include how software implementation of our project is carried out, what are the materials and data needed, and how they will be collected. It also includes time frames and schedules that are required in achieving its objectives. In addition to them, the research areas that we have identified to carry out this project are explained rationally.

Prototype methodology

The prototype methodology is used to achieve the goals of the project. In prototype methodology the three phases analysis, design, and implementation are performed concurrently, and they repeat until the whole system get completed. The prototype methodology provides an actual feeling to the users as it provides a quick system to users to interact with and it helps to refine real requirements more quickly. Figure 2 illustrates the phases of prototype methodology.



A Planning

Feasibility Analysis

Once the need for the system and its basic functionality has been clearly identified a feasibility analysis was carried out to determine whether the project is technically, economically and organizationally feasible. In technical feasibility, we cleared out that the project size is no more complex for the project team to complete within the time range and the familiarity with the application and the technology is excellent with the project team to carried out the project. The cost and benefits associated with the system were identified as the economic feasibility. The usage of the proposed system and whether the users will satisfy with the system were discussed for the organizational feasibility.

Identifying the business value

The research problem was identified, and scope of the project was discussed among the team and the supervisor. Business value was identified which will show why the system should be built. Finally, the project charter was created including a brief description of

the proposed system in order to get the approval for the project

There are considerable amount of people travelling daily in urbanized areas.

As a research team, we have planned to commercialize this business product,

- This proposed product can be promoted among all the daily travelers who has busy lifestyles in urban areas.
- This product can be used to maximize the traveler's efficiency by making daily plans and planning ahead.

.

Develop the work plan

A Work Breakdown Structure (WBS) was created after identified all the tasks that should be accomplished for the proposed project and a Gantt chart was prepared.

Staffing the project and control and directing the project

After identifying all the subtasks, a staffing plan was created. Project team members were divided according to their skills for different project functions in order to avoid future conflicts. Finally, the project team was discussed how to react to the future tasks of the project and a project proposal was prepared and submitted

B Design

In the designing phase, the research team were giving the higher priority for the interfaces of the mobile applications. In the mobile application the first interface will be the login one. If the user is new to the system, they must be registered by giving exact details through their mobile application. After that user will find the interfaces of main menu, Add Daily Plans/Event, Check available parking.

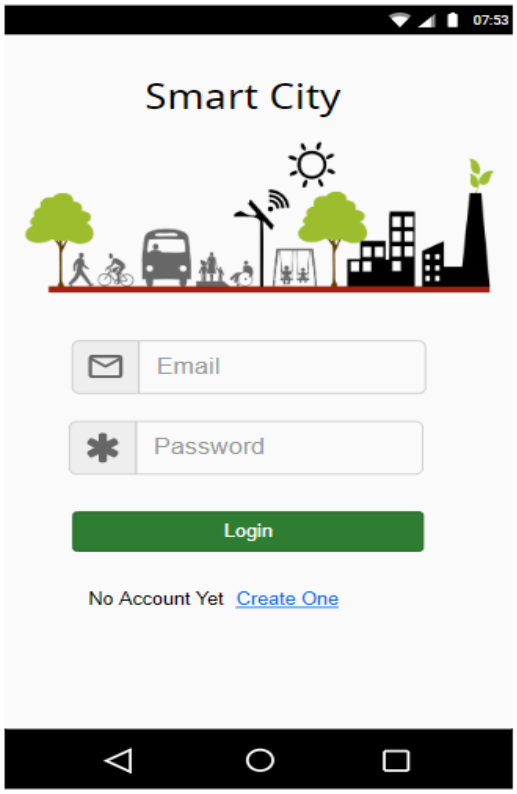
C Implementation

During the Implementation Phase, the automated system/application or other IT solution is moved from development status to production status. The process of implementation is dependent on the characteristics of the project and the IT solution, and thus may be synonymous with installation, deployment, rollout, or go-live. If necessary, data conversion, phased implementation, and training for using, operating, and maintaining the system are accomplished during the Implementation Phase. From a system security perspective, the final system must be certified and accredited for use in the production environment during the Implementation Phase. The Implementation Phase ends with a formal decision to release the final IT solution into the Operations and Maintenance Phase.

- Develop the website to register the account holders.
- Develop the database.
- Connect the database with the Android app

4 Results and Interface

Interface preview



1. Create a special automated function for the selected objects in google map to collect data automatically and store them in the database,

   Technology: -

   - Selenium tool
   - TestNG framework

2. Analyze weather data from weather API according to daily travelling root plans.

Implement an algorithm for calculate time delays happen in rain days.

Predict time= Historical time + (time delay)*p
(calculated normal day time)

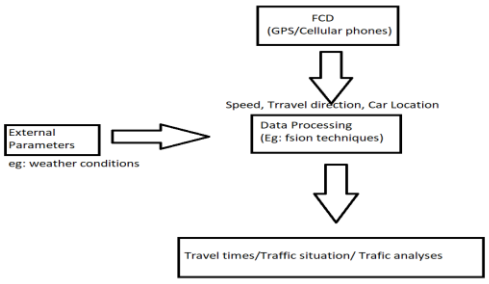
$$td = \frac{\sum_{i=1}^{n} (t_1 - t_2)}{n}$$

p=rain percentage of power
t1=rain time
t2=normal time

3. Providing the user with the easiest and the closest route to reach his/her destination by creating an algorithm with the traffic analysis data and the weather report data. Also, users will be able to share the situations using a chatroom.

Technology: -

- fusion techniques



4. Getting the user inputs through the app to collect the abnormal activity data and inform the users through an alert notification.

Technology: -

- Geofencing technology

5.Discussion

"Location based crisis analysis" project is mainly targeting to increase the accuracy level of the public transport system as well as the travel routes in urbanized areas in Sri Lanka.

People these days always look for the easiest way for them to accomplish a task. At the same time, they don't have time to spend on unnecessary complications. With the current situation of the country people nowadays look to lookout for each other. Therefore, it'll be much better if they can report an abnormal or a dangerous activity via an application so the others also get to know faster rather than report it to the police stations. Getting notification alerts when nearing to a dangerous or a complicated route location will be a great help for the people to save their time as well as their lives.

Getting to know the future climatic and traffic information through an application is also a time saver for a busy person. Because nowadays people refrain from watching television much.

While doing this project, the research team was faced some problem regarding to the implementation. They are given below.

1.Getting the correct details of climate and traffic data.

2.Locating the traffic areas using objects

3.There is no way to prove there is an abnormal activity in the area

4. User inputs cannot be always trusted

Finally, our research team met with few people who are travelling daily to discuss with those issues. After that research team was taken some ideas on the user's perspective and planned how the user's mobile application must be worked. So that the team was came through some solutions after the discussion. They are given below,

1. Getting users to upload an image while reporting something unusual.

2. Getting the user's National ID number so the information will be always trustworthy.

3.Provide the facility to the user's so they can quickly report the illegal or emergency activities through the application.

6. future work and Conclusion

I. Registration for both departments and users

When a user installs the mobile application, the user needs to register via the application using Name, NIC, Email, Phone number and other necessary details. At the same time, we need to register departments with a separate database with only the admin privileges.

II. Send alerts and notifications

Whenever a user submits a report about a disaster or a crime it will quickly send a notification alert to the relevant department with time and location. When a report is sent it will show the sender where it has sent and the closest route to take to reach there.

III. Newsfeed

Update every report on the front page as latest Posts in the newsfeed part of the application. So, whenever a user logged in he/she will be able to notice it.

IV. Show the user's location on the map

As GPS installed in every smart phone the application will interact with it to provide the user's current location and provide him/her with the closest locations and routes to destinations.

V. Show ambulance and emergency vehicle

When an emergency vehicle is deployed from a department it will show on the map. It will assume how long it will take to come and what route it takes to reach the destination.

VI. Traffic analysis

Take the live location of the user and by predicting movements of the user's vehicle while he is driving get the traffic details of the current location and distribute it with the other users when they request for the traffic data when making daily plans.

VII. Chatroom

Also, users will be able to share location status by chatting

7. Feature of the system

1. When we submit the time to reach the destination show the start time
2. When we start travelling show us the weather report on the passing areas
3. Identifying the closest department relevant to the report
4. Shows the closes route according to the weather and traffic data

8. Acknowledgement

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9. References

- [1] Md. Syedul Amin, Mohammad Arif Sobhan Bhuiyan,Mamun Bin Ibne Reaz and Salwa Sheikh Nasir, GPS and Map Matching Based Vehicle Accident Detection System. December 2013
- [2] https://stackoverflow.com/questions/4600656/access-googles-traffic-data-through-a-web-service
- [3] https://developer.accuweather.com
- [4] https://docs.microsoft.com/en-us/bingmaps/rest-services/getting-traffic-incident-data
- [5]. TripAdvisor Hotels Flights Restaurants Attractions Available:https://play.google.com/store/apps/details?id=com.tripadvisor.tripadvisor
- [6]. Machine Learning Applied to Weather Forecasting – Mark Holmstrom, Dylan Liu, Christopher Vo, Standford University (Dated: December 15, 2016)
- [7]. Improving the Accuracyof Weather Forecasting with Deep Learning By Bill Mannel, Vice President & General Manger – High Performance Computing & Artificial Intelligence, Hewlett Packard Enterprise : June 12, 2017
- [8]. RouteIT by NEUS- NEUS Technologies Travel & Local Available:https://play.google.com/store/apps/details?id=com.neus42.x220.main&hl=en