KANTIPUR ENGINEERING COLLEGE

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Dhapakhel, Lalitpur

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A MAJOR PROJECT PROPOSAL REPORT ON

VEHICLE TRACER

Submitted by:

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A MAJOR PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF BACHELOR IN COMPUTER ENGINEERING

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CHAPTER 1
ABSTRACT

The GPS based Vehicle Monitoring/Tracking and Routing system is the system that makes use of GPS to provide the exact location of the vehicle. This project aims at creating an application which allows a vehicle administrator or any authentic party to monitor the vehicle in real-time using a GPS-based device possessed by its driver. This system can continuously track a vehicle and show its exact position using GPS. The proposed system is also capable of finding the shortest route to reach the destination passing through all the checkpoints which uses our proposed algorithm to find the same. This system also possesses the facility of speed monitoring and giving sound alerts to the driver if he over speeds his vehicle. Also, the system gives accident alerts to the vehicle admin via SMS.

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CHAPTER 2
INTRODUCTION

2.1 Background

In today's world GPS (Global positioning system) is the most widely used technology in vehicle monitoring and Routing System. Security of public and private vehicles like school buses is of prime importance. There are various cases encountered in recent times where the children don't reach home in time or the vehicles loaded with goods are hijacked. Because of which the parents or the vehicle owners get worried. GPS technology can be used to solve this problem. Using GPS and GIS (Global information system) we can find the exact location of the vehicle. Time is an important factor considered while traveling. Reaching on destination as soon as possible is always admirable. Google Maps provides all the routes from a source to destination. The routes provided by Google Maps are may not be the shortest/fastest route available. There needs to be a system devised which can help a person to reach from source to destination in minimal amount of time. An efficient algorithm is devised for these purposes. In recent times, the rate in road accidents has increased considerably. For helping the victims of road accidents a quick service should be provided. We have proposed an alert system module in our project. This module is based on GPS, GPRS/GSM technology. A GSM mobile device with active GPRS connection is installed in the vehicle. The position of the vehicle which is received through GPS is sent to the concerned person and to the ambulance hotline number through SMS (Short Message Service). Immediate attention will be provided to the victim through the proposed system.

2.2 Problem Statement

Daily, drivers face problems while traveling on highways, unknown routes and different terrains. Some more problems might be of spare settlement, carjacking or accidents. When the vehicle leaves from its source for its journey, until he reaches its destination, an analyst may rely completely on the previous reports or logs that were generated. No real time information regarding the state of vehicle can ever be transmitted to the

analyst. So real time tracking of the vehicle is necessary for safety and security purpose. Real time monitoring of the vehicle is important these days due to an increasing number of accidents and robbery. Whenever such an incident takes place, the vehicle admin if monitoring on real time basis, can immediately notify nearby hospitals or police stations according to the situation he will be notified with. Also, the parents of school going kids can be informed so that they can take a sigh or for the owner of the good being travelled via transport vehicle. VMARS is a project that covers most important and rare feature of alerts. Succinctly put, the developed system will be able to Provide real-time tracking and monitoring of the vehicle[1]. Show the shortest path to the driver by applying our proposed algorithm considering all the real-time factors[2]. Alerting the driver whenever he exceeds the safe speed[3]. Proving quick and timely alert to the vehicle admin to take actions in case of an accident[4].

The motivation behind undertaking this project is mainly for the benefit of the parents of school-going children and notifies them about their children's whereabouts as well as their safety in a real time environment.

2.3 Objectives

Security is very important in some activities. Freeride, mountain walking or climbing, paragliding are those where accidents can be serious or fatal. Having the possibility to follow physically the position of a person on regular basis can be comfortable for family, relatives or others. The project is meant to propose a simple and portable solution for people to get traced during a trip. The application is web based and should be available for every people who have the possibility to 1. Run a small Java application on its mobile phone. 2. Has link between a GPS device and its mobile phone. 3. Has Internet access. This concept is not new and a lot of applications involving GPS are available on the market: nowadays almost every new car is equipped with a GPS on board and help people in city or country side to end their road. The concept of this project is a bit different. We are not focusing on "where are we?" but more on "where he/she is?". For this the idea is to use a cell phone which accepts to receive GPS coordinates and send them to a server able to record them under the account of a register user (tracked person). Then from a web client, the user can be followed on a map in real time mode.

2.4 Applications

The system is made up of four main modules and they are:

- Location Module
- Routing Module
- Speed Alerts
- Accident Alerts

Location Module

Google Map APIs are available for accessing the location from the device. These APIs are integrated within the software which allows us to access Google's Location Services. The device location is extracted in terms of latitude and longitude. The location module will trace the current location from the GPS enabled device without the need of user specifically entering it. The obtained latitude and longitude will be converted to specific location by GIS (Global Information System).After mapping this Location service, one can easily see the visual display of the road map with provided location.

Routing Module

is the most important module of this project. It will provide the driver with the path from the extracted location from location module to the destination which is supposed to be entered by the user. The main task of routing is not just to provide the path, but to provide the shortest possible distance from source to destination. For initial routing MDSP (Modified Dijkstra's shortest path) algorithm is used. The routing from a source to destination depends on various factors such as congestion, distance, time etc. If there is any disturbance in normal course of travel, there will be frequent updation of routes. The route will be updated dynamically by applying the algorithm giving better results among MDSP and A* algorithms.

Speed Alert Module

Providing speed alerts helps in maintaining security and safety of the kids as well as driver. This module will have predefined threshold values depending on the road type. Whenever the driver exceeds the speed and crosses this threshold value, speed alert in terms of notification will pop up on his cell phone. This will notify the driver that he

has to slow down the vehicle which has crossed the permissible speed limit. The speed alert module comprises of various thresholds. These thresholds will vary according to the various factors. Like highways will have higher values as the roads are broader and congestion free; whereas the local streets might have more congestion, so the threshold needs to be low. This will improve the safety measure of the school buses.

Accident Alert Module

If the system detects a high probability of the occurrence of an accident, SMS will be sent on urgent basis to the Vehicle Admin with the current location of the vehicle. Then, the vehicle admin is responsible to find out the cause by contacting the driver and taking appropriate actions. The occurrence of an accident can be noticed by the vehicle admin as the admin is watching over the complete journey of bus. The moment a vehicle stops moving for certain period, admin is expected to follow up about it as there is a chance of accident. Also if actual accident happens, driver is supposed to contact the admin regarding incident if he is able to. The admin will get the location of the place where the accident took place and then, he can take appropriate actions depending on the circumstances present.

2.5 Project Features

1. Routing.
2. Speed Monitoring.
3. Location.
4. Feedback.

2.6 Feasibility Analysis

A highly brief summary of the report and results are given below.

2.6.1 Technical Feasibility

To develop such an application, the following technical skills and tools are required:

- Java Programming Language

- Android Software Development Kit
- Eclipse IDE (optional but recommended)
- Android Emulator and/or Android device with GPS facility

All of the above technical requirements are fulfilled. The project is technically feasible.

2.6.2 Economic Feasibility

Considering that this is an under-grad project, ROI and profit in terms of money is not expected. However, we must and did take into consideration whether developing the product itself was within budget. The cost of libraries, test device (or emulator), and other components was found to be within budget. The project is indeed economically feasible.

2.6.3 Operational Feasibility

The product has high applicability among a variety of users. Being lightweight, accurate, and easy to use, a wide user base is expected. If we were to compare this application with other applications in the field of GPS, we would find that most applications are limited to a specific type, such as tracking or speed alerts. But no application may be as versatile as this one providind these mant functionalities to the user which are useful too for enhancing te overall user experience. The operational environment specifications were taken at the lowest level possible (lowest API level of Android that would support all the basic features needed in the application). Simply stated, this means that the application will run on a lot of devices. Choosing a higher API level would have meant a richer, more efficient feature set, but that would reduce the possible user base by 40

2.7 System Requirement

2.7.1 Software Requirement

System Software

- Operating System: Android 2.3.6 or more.

Development Software

- Languages: Java.
- Database: MS SQL server.

2.7.2 Hardware Requirement

The application can be used on a android mobile phone which has the following specifications:

Memory: 25MB or more

GPS, Internet facilities (preferably 3G or more)

Internet is needed for running the application. All hardware are required to get connected to internet for hardware side interfacing.

CHAPTER 3
LITERATURE REVIEW

S. Sivakumar and Dr. C.Chandrasekar formulated a real-time algorithm called Modified Dijkstra's algorithm whose basic idea was to modify the Dijkstra's algorithm to make it suitably useful for finding shortest route between source and destination considering other real-time factors like traffic congestion, time and distance. They developed a tool using Java and compared the proposed Modified Dijkstra's algorithm with the existing algorithms like DKA ((sivakumar)on Jaipur database. Comparisons were made based on number of nodes visited and time taken to reach the solution. Another author Liang Dai made a comparison between Dijkstra's algorithm and A* algorithm by implementing both of them on Ottawa city road network. He compared the running times of both the algorithms and concluded that A* can have better running time than Dijkstra's if it uses Eucledian distance as its heuristic function. Though, their time complexities are almost same, they may be chosen depending on the road network chosen . A.Renugambal and V.Adilakshmi Kameswari made an android application which can be run on GPS-driven mobile phones equipped by the taxi drivers. These phones send their location via GPS which also has the capacity of finding an optimal route by using min-max algorithm. Paul Benjamin Et Al designed a GPS-based vehicle monitoring and alert system. They included a management system, fuel usage monitor and an onboard location display along with an accident and robbery alert system. Their project used Google Maps API, SMS gateway server which triggers sending SMS to nearby hospital when the inbuilt air-bags open, a panic button that can be pressed by the driver which is easily accessible to him that sends an SMS to a nearby police station. They formulated a C code for sending location through GPS to the database. M.A Hannanet Et Al implemented a bus monitoring system which used radio frequency identification tag (RFID) along with GPS, GPRS and GIS to monitor bus. They used an RFID reader which continuously sends an operating energy or isotropic radiated power to the RFID tag. Based on the calculated distance between the tag and the reader, it is decided whether to obtain the data from the tag or not and whether to send data to the control center or not. The time of the arrivals of the readings can be recorded too along with other processed data which is saved in the database. Then, this data is shown to the bus drivers.

CHAPTER 4
METHODOLOGY

4.1 Main Algorithm

The vehicle routing problem is a different from normal shortest path problem, which are having links that will represent road maps with its junctions.

Many shortest paths algorithms are proposed but according to research work, Dijkstra's shortest path algorithm is the most accurate when there is a single source - single destination problem. Normal Dijkstra's algorithm considers only the weights or distance between the nodes for selection of the shortest path. Taking the real world networks into consideration, there is need to modified original Dijkstra's algorithm to modified one which is known as "multi-parameter Dijkstra's algorithm" (MDSP) that considers multiple parameters into consideration. Along with the distance between any two nodes, it considers time factor taken to travel from the source to the destination, congestion at path etc. so that the user can select the desired optimum route based on his/her preferences.

The available time to provide an alternate path must be limited due to road network constraints. It should take very less time to provide the alternative path. Thus, we will classify the existing solutions into two categories and they are : MDSP and Heuristic.

4.1.1 Modified Dijkstra's Shortest Path Algorithm(MDSP)

Researchers proposed a new shortest path algorithm named as "Modified Dijkstra's Shortest Path algorithm" (MDSP). In this algorithm not only single parameter of weight is considered but multiple parameters need to be considered.

Researchers identified that there was a need to find an efficient shortest path route for the road network. Hence, they developed a new shortest path algorithm by modifying the Dijkstra's shortest path algorithm. This algorithm shows the better results than the existing Dijkstra's shortest path algorithm but it take high computational time than the existing algorithm. This algorithm shows better results than the existing Dijkstra's shortest path algorithm on real time road network.

This algorithm considers multiple parameters like time, distance and congestion for finding possible shortest route from the source to destination. The algorithm's pseudo code is as below:

1. Let source be the origin vertex and initialize Visited and ShortestDistance[u] as
   Visited := source
   ShortestDistance[source] := 0
2. Let user choose any preference among Distance, Time and Congestion factors
   ACCEPT Choice
3. Update distance between every nodes as per their corresponding factors
   FOR each vertex pair [u,v]
   Case Distance: //Do nothing
   Case Time: //Update according to time factor
   Distance[u,v] := Distance[u,v] * time factor
   Case Congestion: //Update according to congestion factor
   Distance[u,v] := Distance[u,v] * congestion factor
   END FOR
   FOR each vertex in V - source
   ShortestDistance[u] := Distance[source,u]
   END FOR
4. Add vertices to Visited until Visited includes all vertices in V
   WHILE Visited not equal to V
5. Find the vertex w among remaining vertices closest to the source
   MinimumDistance := INFINITE
   FOR each v in remaining vertices
   IF ShortestDistance[v] ¡(smaller than) MinimumDistance
   MinimumDistance = ShortestDistance[v]
   w := v
   END IF
   END FOR
   Add w to Visited list
   Visited:= Visited union w

Update the minimum distance to vertices in remaining vertices

FOR each u in remaining vertices

ShortestDistance[u] :=

Minimum of (ShortestDistance[u],ShortestDistance[w] + Distance[w,u])

END FOR

END WHILE

4.1.2 Heuristic Algorithms (HA)

The A* algorithm is used to integrate a heuristic function into a search procedure. Instead of selecting next node with the least cost (which is measured from the start point), the selection of the node is based on the cost from the start node plus an estimate of proximity to the destination (a heuristic estimate). This project uses Euclidean distance as estimated distance to the destination. In the searching, the cost of a node V could be calculated as:

The proposed strategy is a combination of both MDSP and A* which helps in meeting requirement of dynamic time constraints of real road traffic scenarios.

4.2 Usecase Diagram

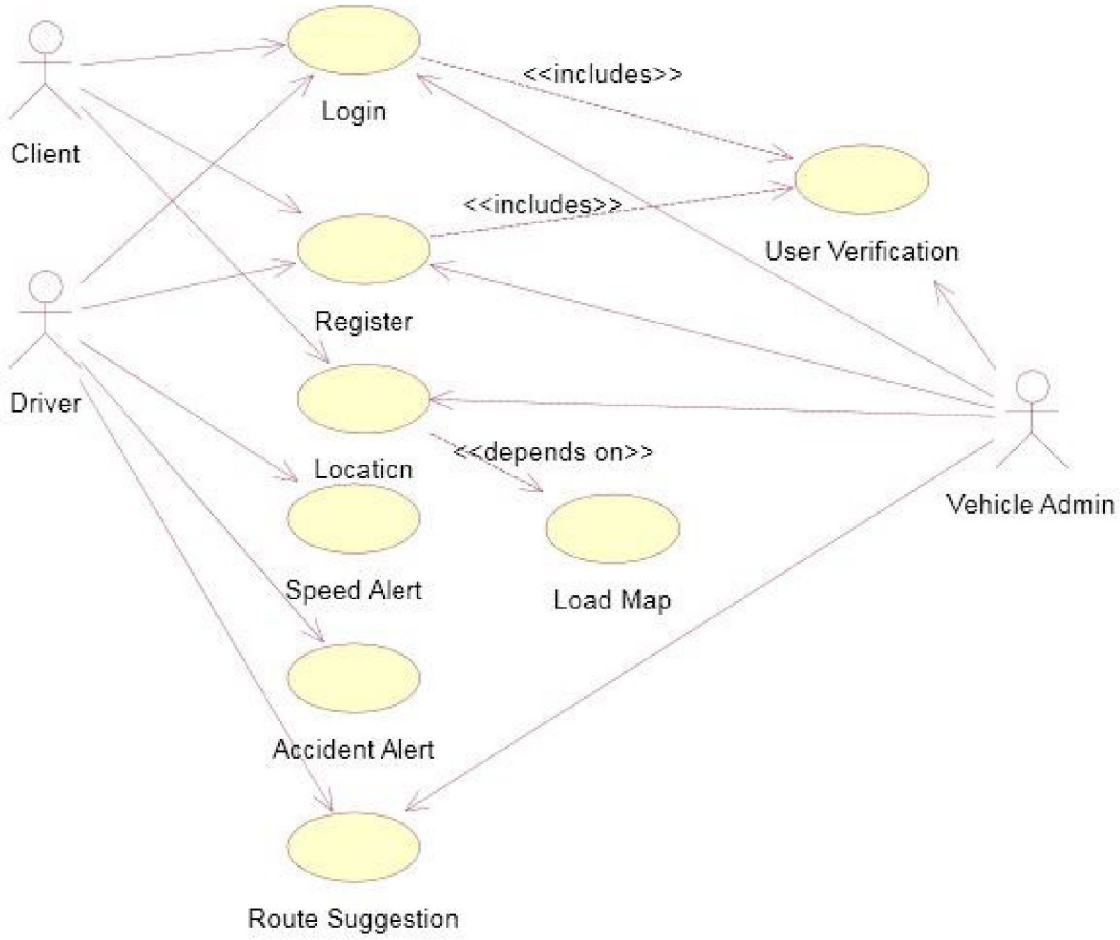

Figure 4.1: Use Case Diagram

4.3 Software Development Method

The waterfall model can be used for development of project; the following phases are followed in order:

- Requirements specification resulting in the product requirements document.
- Design resulting in the software architecture.
- Construction (implementation or coding) resulting in the actual software.
- Integration.
- Testing and debugging.
- Installation.
- Maintenance.

Thus the waterfall model maintains that one should move to a phase only when it's proceeding phase is reviewed and verified. Various modified waterfall models (including Royce's final model), however, can include slight or major variations on this process. These variations included returning to the previous cycle after flaws were found downstream or returning all the way to the design phase if downstream phases deemed insufficient.

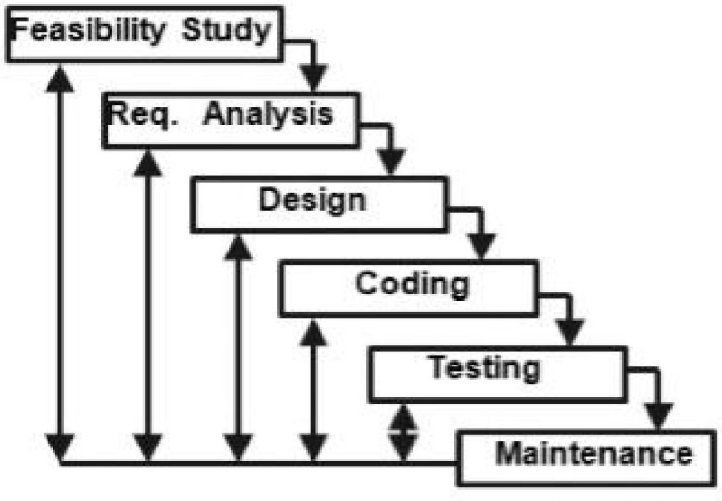

Figure 4.2: Waterfall Software Development Model

It places emphasis on documentation (such as requirements documents and design documents) as well as source code. In less thoroughly designed and documented methodologies, knowledge is lost if team members leave before the project is completed, and it may be difficult for a project to recover from the loss. If a fully working design document is present (as is the intent of Big Design Up Front and the waterfall model), new team members or even entirely new teams should be able to familiarize themselves by reading the documents.

CHAPTER 5

EXPECTED OUTPUT

5.1 Works Schedule

We have planned our schedule as per the requirements.Our proposed project is expected to be completed as accordance to the gantt chart shown.

5.2 Gantt Chart

Gantt Chart for our project is given below:

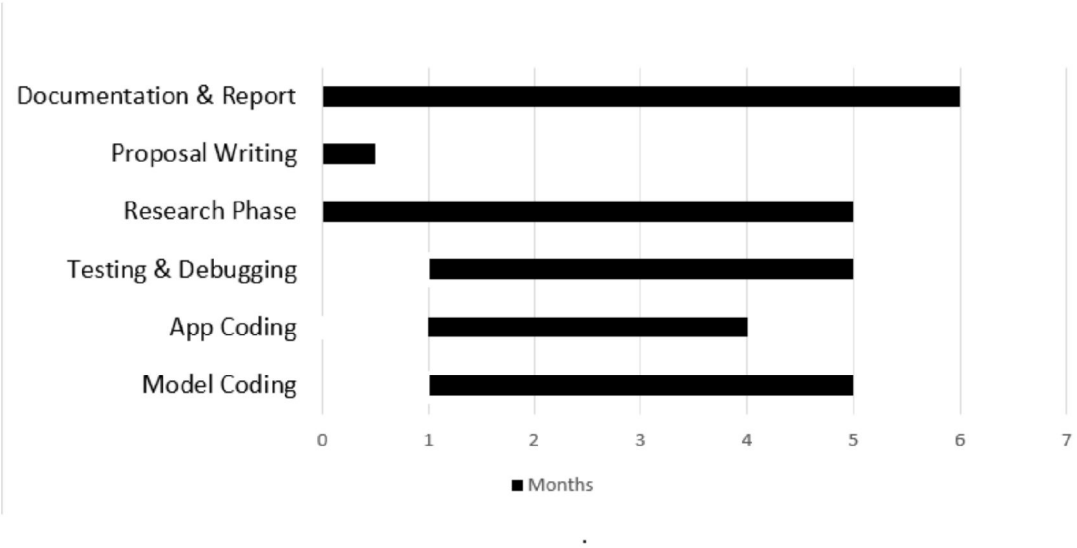

Figure 5.1: Gantt Chart

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