

# A Survey of Vehicle Position Prediction System based on GSM and ANN Structure

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**Abstract** – The need for determining the positioning information of any vehicle is becoming popular in recent year. This survey paper compares and summarizes the different techniques used to find the position of any vehicle using Received Signal Strength (RSS) from Global System for Mobile Communication (GSM) network available at the instant, GSM and Global Positioning System (GPS) modem, GSM and Google Map and other positioning Algorithms. The existing system uses the GSM and Artificial Neural Network (ANN) structure in location estimation so that the positioning accuracy of the overall system is increased. The role of ANN structure in location estimation is that it not only a substitute for positioning algorithms but it will also substitute of overloaded map-matching.

**Keywords**— Artificial Neural Network (ANNs), Global System for Mobile Communication (GSM)

## I. INTRODUCTION

Location Based Services gives idea about the geographic location of mobile telecommunication devices. This comprises mobile Telephones and the device connected to other movable device such as people or vehicle. Location based service include the application which depend on the location of users to the users information, so that it gives the information which is applicable to the users at the location[5].

In order to track the vehicle in an entire area, the Global Positioning System (GPS) module is used, which gives the vehicle's Coordinate in terms of Latitude and Longitude this information is further processed with GSM module that will transmit the location through the available network [3].

To evaluate the vehicle position in an entire environment, Global Positioning System is the most widely used system in the satellite infrastructure. GPS provides better accuracy than the other positioning technologies but there are certain issues with GPS that the GPS devices will give problem if they are surrounded by tall building and if the sky is not clear. There may be chance that the GPS signal is get affected due to other radio signals [1]. So in this case GSM is used for vehicle location, GSM provides location by using closely connected bases stations even in the tunnels and in the dense network where the GPS can't provide information [2]. Localization using GSM will work to provide the general position and it will also save the cell

phone battery but it doesn't give the exact position information.

Artificial Neural Network (ANNs) are universally adopted techniques in certain areas that will overcome the problem of exclusive and non-linear relationship [8]. The Cascade-Connected ANN architecture has several advantages over single ANN structure: it learns very quickly, the network determines its own size, it maintains the structures it has built even if the training set changes, and it demands no back-propagation of error signals through the connections of the network.

The proposed System gives the position of moving vehicle using the GSM and the Cascade-Connected ANN structure. The cascaded-connected ANN structure increases the performance of the system because it limit the search space and this results that the vehicle may be found only in a subspace of the entire area.

The remaining paper is organized as follows: Section II describes the previous work. Section III presents the proposed work. Section IV describes the expected outcome of the proposed system. Lastly section V drawn the conclusion.

## II. RELATED WORK

Milos Borenovie, Aleksander Neskovie, and Natasa Neskovie [1], evaluates the performance of various space partitioning patterns and Cascade Connected Artificial Neural Network as well as other positioning models suitable to use Automatic Vehicle Location. The positioning model herein is capable of both position estimation and reporting the position using a GSM Terminal. The presented model in this paper can be used as a development with no additional hardware cost of the GPS-base system for the situation where GPS is not available like in tunnels and dense area.

Muhammad Ridhwan Ahmad Faud and Micheal Drieberg [2], developed and determine a remote vehicle tracking system with its prototype. This system fuses a GSM modem which will receive SMS containing the location information and display it on the Google Map application. The remote vehicle tracking system indicates the feasibility of real time tracking of vehicle which can be used in vehicle security.

Pham Hoang Dat, Mecheal Drieberg and Nguyen Chi Cuong[3], presents the development of vehicle Tracking system hardware prototype. Precisely, the system will employ GPS to obtain a vehicle's coordinate and transmit it using GSM modem to the user phone through the mobile network.

Borenovic, M. Vlatacom d.o.o., Belgrade, Serbia Neskovic, Aleksandar [4], explores models based on Artificial Neural Networks (ANNs): single ANN positioning models with RSSI, SNR and N values as inputs, and a range of cascade-connected ANN positioning models, utilizing various space-partitioning patterns. The benefits from using cascade-connected structure is that, the optimal cascade-connected ANN structure with space partitioning shows 41% decrease in median error and 12% decrease in the average error with respect to the best-performing single ANN model.

Claude Takenga, Chen Xi Kyandoghere Kyamakya, [5],exploits the advantage of position estimations from different sources in a robust fusion algorithm to reduce the positioning error. A hybrid neural network (NN)-data base correlation method (DC) is discussed. Before the fusion process, the DC position estimates are post-processed using an extra NN in order to reduce its error. Function approximation and classification properties of the NN will be examine and the best NN architecture will be applied in the positioning algorithm. Results show that, the post processing of the DC results has a big impact on the positioning accuracy and the fusion process gets the MT estimate within a better accuracy

Teemu Tonteri[6], explores the Solutions based on generic technologies not intended for location estimation purposes, such as the cell-ID method in GSM/GPRS cellular networks, are usually problematic due to their poor location estimation accuracy. In order to facilitate accurate location estimation when only inaccurate measurements are available, this present an approach to location estimation that is different from the current geometric one.

Chien-Sheng Chen[8], proposed a novel positioning algorithm which is based on Artificial Neural Network that determines the Mobile Station (MS) location in Non Line of Sight (NLOS) environments. For establishing the non-linear relationship between the feasible interaction and the MS location, the numbers of neural networks are trained so that the algorithm can reduce the NLOS errors so that the accuracy of the estimation of MS localization is increased.

### III. PROPOSED WORK

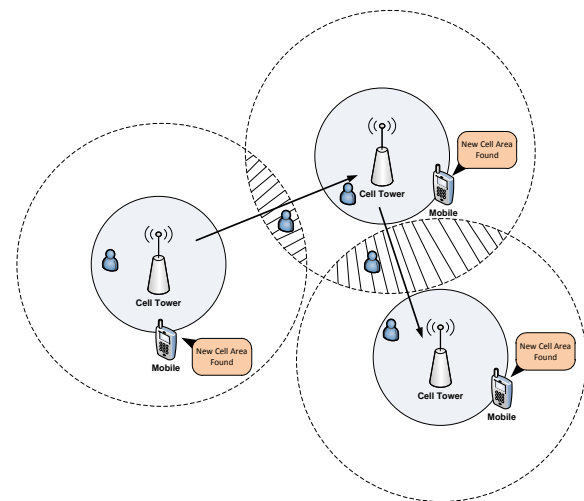


Figure 5.1 Working process of Vehicle Position Prediction System

Fig 5.1 shows the basic working flow of system where it shows three different towers with maximum coverage and whenever mobile user came inside this coverage, system will get the detected Tower ID. Consider user start travelling from first tower area, here user can get his tentative location in wide circular area but if user start travelling and he found another Tower ID, in this case, system can calculate approximate location at the intersection of coverage of two towers. And same will be applicable with next available tower. In this way system can find travelling path also.

Proposed system performs following phases of execution:

- Develop a mobile application to get the mobile tower ID and connection strength of communication of current connected tower.
- Develop a mobile module to get the Geo-Location information from Google server.
- Develop a mapping application to plot or show the map of the passed geo-location using Google mapping API scripts.
- Get the list of multiple tower location and calculate the object travelling path.
- Develop the Cascade-Connected ANN structure for pattern matching so that the accuracy of a system is increased.

#### IV. PROPOSED SOLUTION

It is expected that the proposed system should fetch following information properly.

- GSM Connected Tower ID.
- Connection strength of connected tower
- Location of Tower ID from Google tower data server
- Calculate the approx. location or travel path of object on the basis of minimum two travel point in between two different cellular towers.
- Pattern matching is done via Cascade-Connected ANN structure so that the accuracy of a system is increased.

#### V. CONCLUSION

This paper has presented and compares the various positioning techniques for calculating and determining the position of any moving vehicle. GPS is the best solution in satellite infrastructure for tracking any vehicle having the GPS chip but if the device having GPS chip is turned off, then GSM localization will calculate the position of the vehicle using the nearest connected tower with its tower ID. Further the cascaded-connected ANN structure is used in place of single ANN for pattern matching, so that the proposed system will calculate the position using GSM localization with increased accuracy.

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