

VISUAL POSITIONING ACADEMIC GUIDANCE SYSTEM

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Abstract: GPS is the most widely used technology when it comes to navigation but as each and every technology comes with its scope of improvement in terms of problems people face over the long time use of that technology. VPS – Visual Positioning System is an advanced version of conventional GPS system. VPS is a technology in which a user can open the camera pointing at places and get pop-up or detailed information about that place. This system thus facilitates an easy use of map-based system where a user experiences a more interactive environment in terms of user Interface. The best feature of this technology is that a user may get lost in an area and would just need to open camera and get detailed information about that place. Visual Positioning system is a promising technology and is the future of Navigational maps all over the World. Consider an example, if a person goes to a campus and they don't know where they're going, they simply can hold up the phone and launch the camera. Lens will then identify where you're standing and compare it to database of college buildings images in the campus. Proposed system is to design and develop VPS (Visual Positioning System) where a mobile app guide user with the help of dynamic pop-up information about view user is seeing using mobile camera currently.

IndexTerms–VPS – Visual Positioning System, GPS- Global Positioning System, Navigational Maps

I. INTRODUCTION

VPS (Visual Positioning System) is a system that makes use of Images on the basis of which Location is known. Let's take an example, if a person walks out of a local bus stop and they don't know where they're going, they simply hold up the phone and launch the camera. Lens will then identify where you're standing and compare it to Google's database of street view images in the region. Proposed system is to design and develop VPS (Visual Positioning System) where a mobile app guide user with the help of dynamic pop-up information about view user is seeing using mobile camera currently. The need to annotate the GPS latitudinal and longitudinal locations with directions is a must to create a database of images as Google has not yet released the version of its VPS. The proposed database was created of an academic Institution which was our own college. The VPS system is not just restricted to annotating the databases but it shall be beneficial in Indoor Navigation like malls, libraries, museums or any other public place which generally confuses a lot of people. Over the past ten years, Global Positioning System (GPS) has found widespread use in consumer vehicles. However, due to the satellite links required for obtaining a positional fix, accuracy and robustness are sensitive to environmental factors such as tall buildings, mountainous terrain or adverse weather. Recently, efforts have been made to improve on these issues by adding ground-ground communication channels, as used in assisted GPS and differential GPS. However, even these improvements are of limited use in difficult situations such as parking lots, and still rely on outside communication. A rudimentary calibration of the camera is required, consisting of both the intrinsic camera parameters and the extrinsic parameters, which define the mounting point and orientation of the camera relative to the place. There is no stringent accuracy requirement on this extrinsic calibration, as the algorithms are designed to cope with the additional pitch.

1.1 Existing System

- Google mapping system is helping user navigating on roads.
- It's showing user where he is moving and guide him towards the destination.
- Google also come up with the street view where user can see where he is roaming in 3D space or area.



Fig 1 – Existing System Map View

- Street view can show location but can't guide user in 3D space.
- It's bit easy to understand and develop a navigation or mapping system, if we looked at map from top view or by satellite in 2D manner using just a X, Y or Longitude, Latitude.
- But it's bit difficult to guiding user in 3D space cause it add another dimensions like direction, viewing angle, tentative location, distance from object.

1.2 Disadvantages of existing system

GPS failure: sometimes the GPS may fail due certain reason and in that case, you need to carry a backup map and direction

Battery failure if you are using GPS on a battery pirated device, there may be a battery failure and you may need a external power supply which is not always possible. Potential Hazard: another disadvantage of using GPS system while driving is obvious to anyone who has sat in the passenger seat while the driver fiddles with the unit's screen. Developing a VPS (Visual Positioning System) where a mobile application guide user with the help of dynamic pop-up information about view user is seeing using mobile camera. When your GPS is not enough, the new visual system in Google maps can also use the coined Visual positioning feature. With the help of geo-location, directional compass and accelerometer mobile application will show location information over camera frame about focused direction. The VPS use's your phone's camera and Google's extensive. With the help of different sensor and some complex mathematical algorithms system can calculate the user position information in 3D space and send a query to database and fetch relative information



Fig 2 – Street View of Map

2. METHODOLOGY

Design and Developing Visual Positioning System (VPS) where a mobile app guide user with the help of dynamic pop-up information about view user is seeing using mobile camera currently. User just need to hold a mobile camera toward the object it may be building, street, shop, mall, office, just a board, or any other object in street view. With the help of different sensor and complex mathematical algorithms system can calculate the user position information in 3D space and send a query to database and fetch relative information. The proposed work presents an interactive look for a quick and easy user interface.

2.1 System Requirements

Hardware: Supportable Android Mobile Phone with

- Magnetic Compass: it is an instrument that uses a magnetized steel bar to indicate direction relative to the earth's magnetic poles.
- Inbuilt GPS: GPS is a device that is capable of receiving information from GPS satellites and then to calculate the device geographical position.
- Inbuilt Accelerometer: is an electromechanical device used to measure acceleration forces.
- Inbuilt Camera: It is used to show the image.

Software:

- MS SQL Server: Is a rdbms developed by Microsoft. This product is built for the basic function of storing retrieving data as required by other applications.
- Android Studio: It is the official integrated development environment (IDE) for google android operating system.
- Java: Is a general, purpose computer programming language that is class-based, object oriented and specifically designed to have as few implementation dependencies as possible.
- Android Simulator:

2.2 Database

Once a database is created and saved in the system, the next process is to create an app-based system using Java as a programming tool. The whole system is divided into two stages, the first stage being the creation of database from scratch and then annotating it with the latitudinal, longitudinal as well as accurate direction along with pitch of that location.

Conceptual Modelling

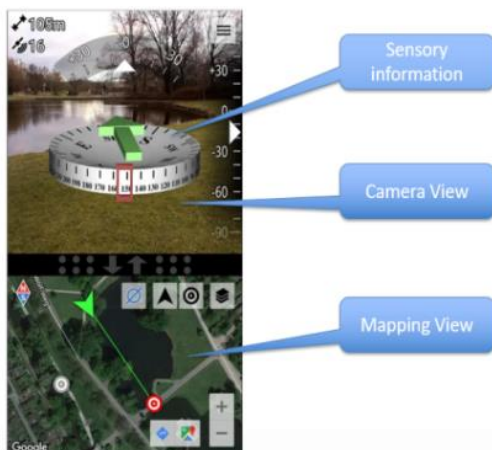


Fig 3 – Conceptual Modelling

Working

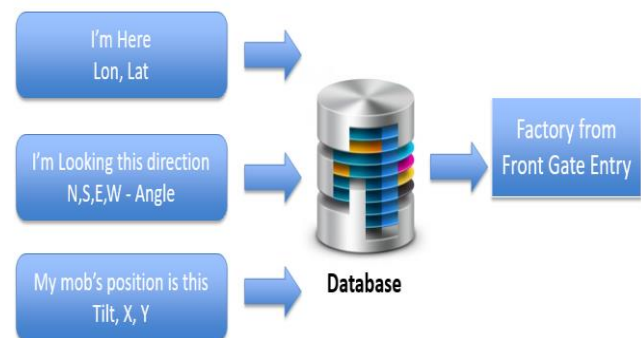


Fig 4 – Working

It becomes very important to maintain and update the database with the new records and information to enhance the rich library of locations and make more places accessible. The following system when placed and tested in academic institution gave good results in terms of identifying locations and giving correct detailed information as a popup window. The detailed information is obtained on the user's screen as the camera is placed at that location. The same system will be of use in Government buildings as well because generally they have a big area and departments in different buildings thus it will be very beneficial for a user to enter the premises and open the camera to get the detailed information of location and can be guided in a correct manner.

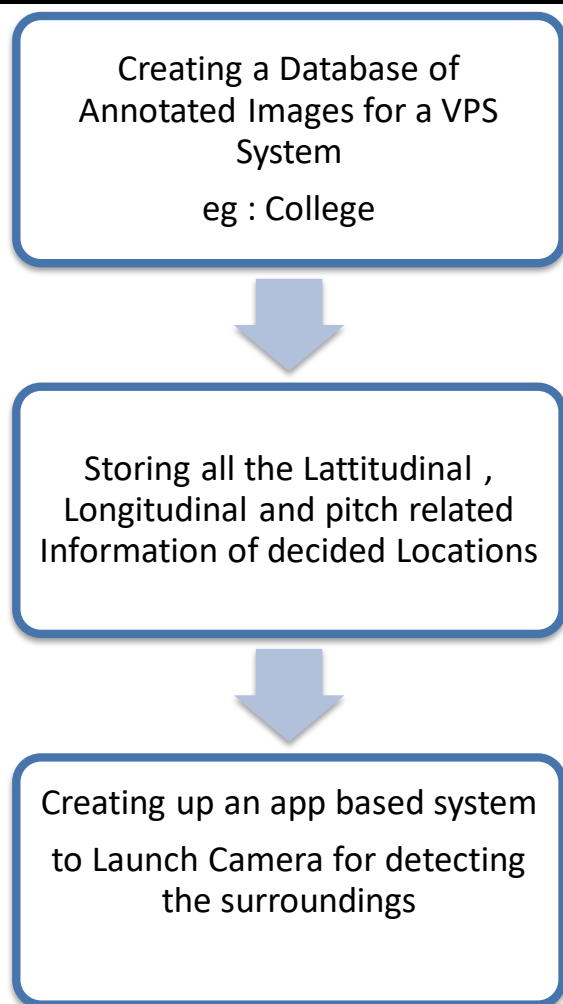


Fig 5- Procedural Flowchart

3 Working

Database is created by collecting information about a location with GPS in terms of Latitude and Longitude. The next process is getting the detailed direction with the use of magnetic compass in terms of North, East, West, South or South East, South West, North East and North West. The pitch of that location is obtained using an Accelerometer. After these three detailed location information is extracted and updated in the database, next process is to design an app which can help to realize the algorithm of comparing the live camera images with that of database and also providing a pop-up or textual information about that place in terms of name of that place, latitude, longitude and direction of that place. In this way a VPS can be realized to make an advanced version of Navigational Maps. The programming language used is Java as it is best suited for an application program.

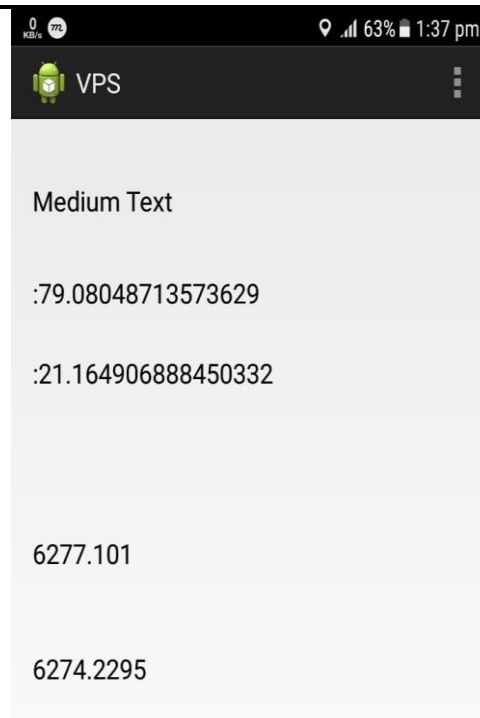


Fig 6 - Latitudinal and Longitudinal Information of a Location

The second stage is where we design an application through which a camera will launch and it shall determine the features of that image like latitude, longitude, direction, pitch and will compare it with the stored database. The comparison will lead to create a match amongst the many locations saved in that database. The visuals which will match with the database are then provided with information on the screen as shown in the results below

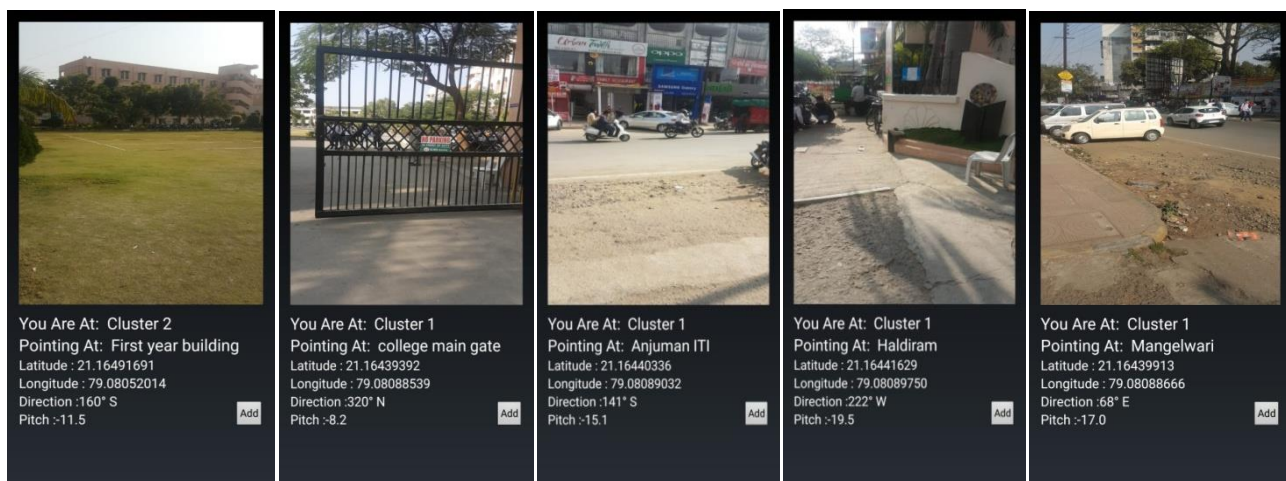


Fig 7- Images of results of locations that were identified by the system

The results obtained are thus quite accurate and the whole system is implementable. VPS system is thus a very innovative as well as a helpful solution according to the up gradations that our current GPS system requires. The system is hence very useful for all the Indoor units as well as buildings that create a confusion among visitors.

Conclusion

The proposed work presented a decent system for a VPS. With the world of technology evolving itself each day, it's high time our navigational maps get the feature of VPS which not only enhances the user interface of maps but also is very helpful in getting detailed exact location of that place. The work done under this project has been utilized in an academic institution but does not restricts it to this usage rather creates a scope of using this under a wide variety of places such as malls, schools, colleges, governmental buildings, hospitals, National Parks, Sanctuaries, Tourist places, Market areas. VPS is the future of our navigational maps system which will increase the ease of use as well as become more interactive for the user.

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