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Finding Location of Mobile Vehicle Using GPL-Maps in the Absence of Network

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Abstract: *Usually, knowing the location is key role for Mobile vehicle users. Day-by-day technology is changing dynamically, beyond user expectations. For finding location of mobile users, current Techniques are using Google maps, A-GPS. Whatever the technology developing, without network it's tough and not possible for finding location of a mobile user. For finding location, many network providers are using many techniques provide services to the mobile users. But, of all these required network connection, power consumption and moreover costly. We designed and implemented a novel method, for locating a mobile vehicle user using G-PL Map software apps in a Smartphone. This method informs you the direction, position &speed of a vehicle.*
Keywords: *PL-Maps, G-PL, A-GPS,CG*

I. Introduction

Humans have always needed to travel—to find food, to explore and conquer new lands, to trade. Navigating safely to destination and back requires skilled use of knowledge and senses to determine current position and direction in which to travel to reach ones destination.

This chapter discusses the major types of compasses available to the navigator, their operating principles, their capabilities, and limitations of their use. As with other aspects of navigation, technology is rapidly revolutionizing the field of compasses. Amazingly, after at least a millennia of constant use, it is now possible (however advisable it may or may not be aboard any given vessel) to dispense with the traditional magnetic compass. For much of maritime history the only heading reference for navigators has been the magnetic compass. A great deal of effort and expense has gone into understanding the Magnetic compass scientifically and making it as accurate as possible through elaborate compensation techniques. The introduction of the electro-Mechanical gyrocompass relegated the magnetic compass to backup status for many large vessels. Later came the development of inertial navigation systems based on gyroscopic principles. The interruption of electrical power to the gyrocompass or inertial navigator, mechanical failure, or its physical destruction would instantly elevate the magnetic compass to primary status for most vessels. New technologies are both refining and replacing the magnetic compass as a heading reference and navigational tool. Although a magnetic compass for backup is certainly advisable, today's navigator can safely avoid nearly all of the effort and expense associated with the binnacle mounted magnetic compass, its compensation, adjustment, and maintenance. Similarly, electro-mechanical gyrocompasses are being supplanted by far lighter, cheaper, and more dependable ring laser gyrocompasses. These devices do not operate on the principle of the gyroscope (which is based on Newton's laws of motion), but instead rely on the principles of electromagnetic energy and wave theory. Magnetic flux gate compasses, while relying on the earth's magnetic field for reference, have no moving parts and can compensate themselves, adjusting for both deviation and variation to provide true heading, thus completely eliminating the process of compass correction.

To the extent that one depends on the magnetic compass for navigation, it should be checked regularly and adjusted when observed errors exceed certain minimal limits, usually a few degrees for most vessels. Compensation of a magnetic compass aboard vessels expected to rely on it offshore during long voyages is best left to professionals. However, this chapter will present enough material for the competent navigator to do a passable job.

Whatever type of compass is used, it is advisable to check it periodically against an error free reference to determine its error. This may be done when steering along any range during harbor and approach navigation, or by aligning any two charted objects and finding the difference between their observed and charted bearings. When navigating offshore, the use of azimuths and amplitudes of celestial bodies will also suffice.

The rest of this paper is organized as follows: in section II we discuss related works, in section III we explain a proposed method & Results using Java programming, in section IV, we conclude the paper

II. Related Works

A. Gyrocompass

Gyrocompass is a type of non-magnetic compass which is based on a fast-spinning disc and rotation of the Earth (or another planetary body if used elsewhere in the universe) to automatically find geographical direction. Although one important component of a gyrocompass is a gyroscope, these are not the same devices; a gyrocompass is built to use the effect of gyroscopic precession, which is a distinctive aspect of the general gyroscopic effect Gyrocompasses are widely used for navigation on ships, because they have two significant advantages over magnetic compasses:[2]

- they find true north as determined by Earth's rotation, which is different from, and navigationally more useful than, magnetic north, and
- they are unaffected by ferromagnetic materials, such as ship's steelhull, which change the magnetic field

B. Gyrocompass Operation

A magnetic compass like the one created on the previous page has several problems when used on moving platforms like ships and airplanes. It must be level, and it tends to correct itself rather slowly when the platform turns. Because of this tendency, most ships and airplanes use gyroscopic compasses instead. A spinning gyroscope, if supported in a gimbaled frame and spun up, will maintain the direction it is pointing toward even if the frame moves or rotates. In a gyrocompass, this tendency is used to emulate a magnetic compass. At the start of the trip, the axis of the gyrocompass is pointed toward north using a magnetic compass as a reference. A motor inside the gyrocompass keeps the gyroscope spinning, so the gyrocompass will continue pointing toward north and will adjust itself swiftly and accurately even if the boat is in rough seas or the plane hits turbulence. Periodically, the gyrocompass is checked against the magnetic compass to correct any error it might pick up.

The gyrocompass depends upon four natural phenomena: gyroscopic inertia, precession, earth’s rotation, and gravity. To make a gyroscope into a gyrocompass, the wheel or rotor is mounted in a sphere, called the gyro sphere, and the sphere is then supported in a vertical ring. The whole is mounted on a base called the phantom. The gyroscope in a gyrocompass can be pendulous or non-pendulous, according to design. The rotor may weigh as little as half a kilogram to over 25 kg. To make it seek and maintain true north, three things are necessary. First, the gyro must be made to stay on the plane of the meridian. Second, it must be made to remain horizontal. Third, it must stay in this position once it reaches it regardless of what the vessel on which it is mounted does or where it goes on the earth. To make it seek the meridian, a weight is added to the bottom of the vertical ring, causing it to swing on its vertical axis, and thus seek to align itself horizontally. It will tend to oscillate, so a second weight is added to the side of the sphere in which the rotor is contained, which dampens the oscillations until the gyro stays on the meridian. With these two weights, the only possible position of equilibrium is on the meridian with its spin axis horizontal. To make the gyro seek north, a system of reservoirs filled with mercury, known as mercury ballistics, is used to apply a force against the spin axis. The ballistics, usually four in number, are placed so that their centers of gravity exactly coincide with the CG of the gyroscope. Precession then causes the spin axis to trace an ellipse, one ellipse taking about 84 minutes to complete. (This is the period of oscillation of a pendulum with an arm equal to the radius of the earth.) To dampen this oscillation, the force is applied, not in the vertical plane, but slightly to the east of the vertical plane. This causes the spin axis to trace a spiral instead of an ellipse and eventually settle on the meridian pointing north.

C. Dead Reckoning

Dead reckoning is the process of navigation by advancing a known position using course, speed, time and distance to be traveled. In other words, figuring out where you will be at a certain tim if you hold the speed, time and course you plan to travel. Prior to the development of celestial navigation, sailors navigated by deduced (or dead) reckoning. Columbus and most other sailors of his era used this method. In dead reckoning, the navigator finds their position by estimating the course and distance they have sailed from some known point. Starting from a known point, such as a port, the navigator measures out their course and distance from that point on a chart, pricking the chart with a pin to mark the new position.

- **Speed, Time, and Direction**

How did they know their speed? In Columbus’ day, the ship's speed was measured by throwing a log over the side of the ship. There were two marks on the ship's rail a measured distance apart. When the log passed the forward mark, the pilot would start a quick chant, and when it passed the aft mark, the pilot would stop chanting. (The exact words to such a chant are part of a lost oral tradition of navigation.) The pilot would note the last syllable reached in the chant, and he had a mnemonic that would convert that syllable into a speed in miles per hour. This method would not work when the ship was moving very slowly, since the chant would run to the end before the log had reached the aft mark.

Speed x Time = Distance (1)

This makes sense when you look at the units:

(2)

The hours cancel to give your distance in miles.

Along with their speed and distance, they needed to know the direction of travel. This was one using a compass. They knew their distance and direction, so they could determine their current location based on their previous location.

III. Proposed Method

A. Proposed Method

Now a day's smart phones are many. Everywhere, every person is using latest android smart phones. This makes much helpful for supporting and finding location of a vehicular mobile user. When you talk about Smartphone, immediately come in to mind that apps. Many are downloading different apps like games, books, technology..Etc. Already we have many apps on finding direction such as magnetic compass. There are many drawbacks in magnetic compass like it won't work properly in the presence of ferromagnetic objects. But, gyroscope won't effect for that. so we are using the gyroscope apps for our novel method for finding location and direction.

Process to find our method:

1. Collecting a PL-MAPS
2. For Direction-Gyrocompass
3. For location-Dead Reckoning

1 PL- MAPS

PL maps are predefined location Maps, before itself we collected various different Route maps and these are inbuilt Maps in the any smart phone device, which are collect from various samples of locations. Moreover, Mostly Location of Road Maps will Not change, changes happen on road adjacent Infrastructure.

These are predefined maps are not worry about the Internetwork connection, or even Network connection. There is no need of Internet for finding location of vehicle using like PL- Maps. Thus our proposed PL Maps make more helpful in finding Location.

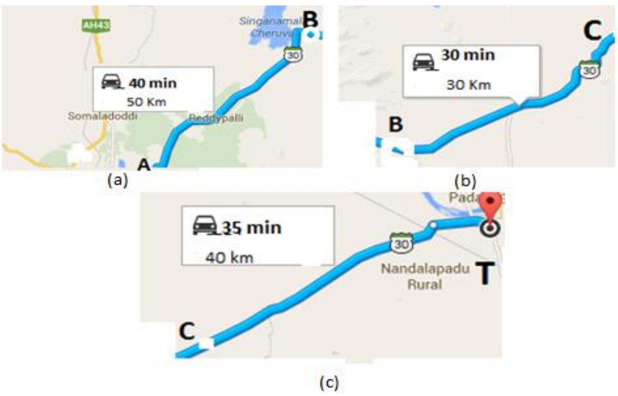

Figure 1. Sample PL_Maps

Fig. Sample PL-Maps (a) PL-Map from A to B location distance 50 Km. (b) PL-Map from B to C location distance 30 Km. (c) PL-Map from C to T location distance 40 Km.

2 Gyroscopes

Gyrocompass is similar to a gyroscope. It is a non-magnetic compass that finds true north by using an (electrically powered) fast-spinning wheel and friction forces in order to exploit the rotation of the Earth. Gyrocompasses are widely used on ships.

Already we have much gyroscope software. Which make help us in Gamings system for changing direction in Car race or many like that similar games. This concept we make used in our Novel proposed method for direction.

In this proposed method, we are taking already inbuilt predefined location (PL) maps of different places along with the gyroscope software. These predefined are updated automatically when you have a connection with Internet. This makes more help to us for find the current direction of your mobile vehicle.

3 Dead Reckoning

Before navigation by dead reckoning is possible, you need at least fours pieces of information.

1. Starting Point – where you were.
2. Course – what direction you are traveling.
3. Speed – how fast you are traveling.
4. Time – how long you have been traveling.

Using this information and the principle of dead reckoning, you can figure out where you are. If any of these pieces of information is missing, you will not know where you end up.

Firstly, starting point has to be known, this can be why because we know where to start, second, for direction we are using gyrocompass, third, we know speed this will automatically update. finally, time is lined to the gyrocompass for change of direction.

B. G-PL-Map working process

First, open the apps predefined location maps. When it opens it senses the direction with the help of Gyrocompass-software, next provide current location with the help of predefined location maps. From here onwards its starts it's working to find the location.

C. Algorithm for GPL-Map Apps

1. Open GPL Maps
2. Provide current location with the help of PL Maps
3. Gyroscope start work by changing direction
4. As the step 3 works, the vehicle is moving along the predefined Maps

5.Calculate the starting time

6.Observe the direction change in predefined Maps

7.After certain time you find the destination of current position from the ending time

8.End.

D. Acronyms and their meanings

1. S_t is Starting time 2. E_t is Ending time 3. D_{pl} is Distance of predefined location4. S_p is Starting position5. $E_p$is Ending position 6. P_D is Predefined distance 7. D_c is Direction change

E. G-PL Map location Results

Case 1: Straight Line Highway Path

Let us first, when you open the apps of GPL Maps it senses the direction, later on it ask for current location, after it starts navigating in following manner.

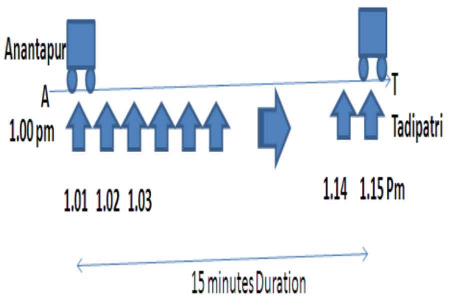

Figure 2. Sample illustration of vehicle moment

Case 2: Curve Line Highway Path

Calculation:

Distance (D) = 30 km (predefined distance from Location Anantapur to Tadipatri)

Time (T) = 15 min (S_t - E_t)

Speed (S) = D/T = 2 Km/M = 120 Km/H

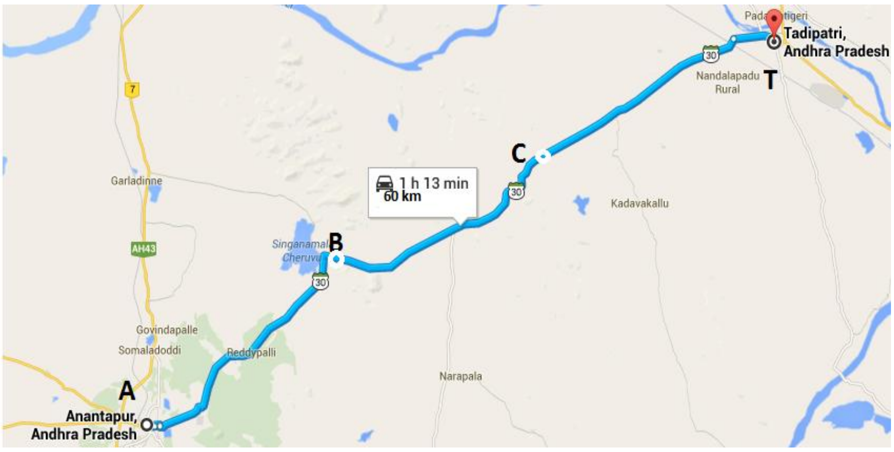

Figure 3. G-PL-Maps with gyro-software view

Table I. Sample Positions

Starting position is S_p	Predefined distance P_D in Km	Direction change D_c	Starting time S_t	Ending time E_t	Time (T) In Minutes	Speed of a vehicle	Ending position E_p
A	0	East	1.00 pm	-----	0	0	A
A-B	30	East	1.00 pm	1.45pm	45	40Km/H	B
B-C	20	SE	1.45pm	2.15pm	30	40 Km/H	C
C-T	10	E	2.15pm	2.30pm	15	40 Km/H	T

Table Ii. Advantages Of G-Pl Maps Method

	S. No	Advantages
G-PL Maps	1	Network less connection
	2	Less power consumption
	3	High-Security
	4	Low cost
	5	Well suit for disaster management

IV. Conclusion

The proposed, novel method explains the new way of finding location of a vehicular mobile position, where absence of network is present. This reduces the cost, high security less power consumption, and more economical. It only required the G-PL apps software has to be installed in the smart phone. This proposed method is high security because people can trap you, when you have network. But, with this method there is no possibility to trap you. More helpful, during the Natural calamities like earthquakes, because network may not present and also like hill, dense forest and remote rural areas.

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