GPS Tracking, Monitoring and Controlling

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***Abstract*– This paper provides briefly how GPS works and how it can be controlled and measured the location of person or vehicle which is attached by GPS device and its services are used including geographical factors affecting its availability. One can use GPS for multiple purposes and using this facility in any of the electronic device can be use for monitoring, controlling and track back the specified device. We are providing a facility and ease for one's to control their electronic instrument simply with comfort and at ease.**

***Keywords*– GPS Constellation, GPS Receiver, Navigation Device and Microwave Signals**

I. INTRODUCTION

Global Positioning System (GPS) unit determines the precise location of person or vehicle which is attached to it after regular interval of time. The recorded data is stored on tracking unit or it may be transferred to central database which is connected to central computer through internet.

GPS uses GPNS (Global Navigational satellite system) network. Some system will store data within the tracking system known as passive tracking system and some system send information known as active tracking system.

Initially there is uncertainty between time and position for mankind. This problem creates life-threating for human beings. The result of this threating generates a diverse mixture of technologies of different organization and countries.

Originally GPS was designed for military purposes in 1960's.U.S Department of Dense (DOD) introduced this device by using satellite network. In 1967's transit was succeeded by timation satellite. In 1993 it was fully operational for private and public users. Today GPS network has 30 satellites in GPS constellation.

In this paper my purpose is to provide the readers the top level aspects on how GPS works and how its services are used. GPS performs a large contribution in international security system. In this paper first I reveals many aspects that how GPS operates that is easy to learn but difficult in implementation, next GPS mapping software on transport layer of Transmission control protocol(TCP/IP), how GPS receiver receive signals, GPS navigation device, pseudo code of GPS functions how it works on TCP layers here I discuss only transport layer, GPS accuracy and how errors are can be removed, application of GPS and in the end of this paper we will shortly explain that what can be done in GPS technology and how it can be improved by which one can easily access this device in near future.

II. LITERATURE REVIEW

NFC is standard for short range radio communication. It allows us to shear small payload of data between NFC tags and Android powered device. NFC tags ranges in complexity. Small tags offer just read and write semantics, while complex tags offer different math operations. NFC uses peer-to-peer (P2P) protocol which is wireless protocol. The data stored on tags can also be written in variety of formats such as NFC forums which are usually known as NFC data exchange format (NDEF) [1].

Network programming is a mechanism by which software running two or more computational device by which can exchange message such as desktop computer and PDA's. It uses the Internet Protocol (IPV4) for communication, all the traffic uses same rules to move from one machine to another machine. TCP socket have two types which are server and client socket. TCP connections to a server open a socket and connect to a port number [2].

A remote control vehicle is any mobile device that is controlled by a means of some special kind of radiations which uses the RC models. Its main components are: transmitter, receiver and electronic channels. It includes many vehicles such as planes, boats, helicopters and trains. The main part of radio-controlled cars is radio-controlled transmitter which operates many functions such as steering, brake and throttle [3].

Wireless data communication system fulfils what appears to be the most important requirement to today's civilization, enabling continual and unrestrained communication between people who are increasingly on the go and cannot be confined to one place of work or a single address. Eliminating wires eliminates restrictions to our communication. The freedom of being independent of physical, corded connectors and devices gives people unprecedented sense of mobility and all the power that comes with it [4].

Vehicle communication network are especially designed to provide drivers with real time information through vehicle to vehicle or vehicle to infrastructure communication. These methods depend upon the self-organizing network and hoc network (VANETs) which are especially designed to connect vehicle with fixed infrastructure and with each other. VANETs have found a lot of application in spare and rural areas. VANETs in urban areas are especially connected with low node density and high node mobility. Routing algorithms

are the appropriate for these circumstances have been less explored and the design of such a routing protocol is challenging [5].

The Chicken Little Program Office test organization was developed specifically for the purpose of foreign threat system exploitation to aid Department of Defense (DOD) organizations in the development of seeker/sensor systems. Exploitation consists of Surface to Air Missile (SAM), Millimeter Wave (MMW), infra-red, hyper-spectral, visual, automotive, and more [6].

III. HOW DOES GPS WORK?

There are three parts of GPS system: a constellation of between 24 and 32 solar-powered satellites orbiting the earth in orbits at an altitude of approximately 20000 kilometers, a master control station and four control and monitoring stations and GPS receiver such as the vehicle it may be car or any device at which with tracking unit.

Each of the satellite is in orbit that allows a receiver to detect at least four of the operational satellite. The satellite send microwave signals to a receiver where the built-in computer use these signals to work out precise distance from each of the four satellite and then triangulates the exact position on the planet to the nearest few meters based on these distance.

Fig 1: How GPS works

IV. PROTOCOL

This paper includes the transport layer protocol, which receives commands from application layer and add a payload in the form of packets of the transport layer and then sends it to the network layer by attaching a certain port number which elaborates the services which are performed by GPS tracking unit and which is handle by end user of central computer controller.

In this protocol I briefly expose the functionalities of GPS such as it calculate longitude and latitude by receiving signals from the GPS tracker that is attached with specific device it may be vehicle or wrist watch.

/*sigma for payload= {t, n}

Set of sigma header= {111,,,,,,,,,,,,, 140}
Set of sigma tailor= {222,,,,,,,,,, 240}

Sigma Explanation:

t t t t=Activate The GPS Tracker
t t n t =Calculate altitude
t t n n =calculate longitude
t n t t=De-activate the GPS Tracker
t n t n
t n n t
t n n n
n t t t
n t t n
n t n t
n t n n
n n t t
n n t n
n n n t
n n n n

.
.
.

Pseudo code:

```
for(int i=0;i<7;i++)
      {
TPDUs_for_Transport_layer[i]=new node;
TPDUs[i]>data=header+(1+i);
TPDUs_for_Transport_layer[i]->next=NULL;
node *p=new node;
p->data=translayer_sigma_seprator_header;
p->next=TPDUs_for_Transport_layer[i];
TPDUs_for_Transport_layer[i]=p;
      }
////////////////////////////////////////////////////////////
                For make TPDU's
////////////////////////////////////////////////////////////
first=new node;
   node *q=first;
   for(int i=0;i<7;i++)
   {
   node *p=TPDUs_for_Transport_layer[i];
   p=p->next;
   for(int j=0;j<16;j++)
   {
      if(q==NULL)
   {
      p->next=new node;
      p=p->next;
      p->data=0;
      p->next=NULL;
   }
      else
```

```
{
   p->next=new node;
   p=p->next;
   p->data=q->data;
   p->next=NULL;
   q=q->next;
   }
   }
   p->next=new node;
   p=p->next;
   p->data=tailer_of_Transport_Layer+i+1;
   p->next=new node;
   p=p->next;
   p->data=tailor;
   p->next=NULL;
   }
 }
////////////////////////////////////////////////////////////////
        For GPS Functionalities
////////////////////////////////////////////////////////////////
For(int it=0;i>7;i++)
{
If(a[i]=='t t t t')
Cout<<"Activate The GPS Tracker"<<endl;
Else if(a[i]=='t t n n')
Cout<<"Calculate longitude"<<endl;
Else if(a[i]=='t t n t')
Cout<<"Calculate altitude"<<endl;
Else if(a[i]=='t n t t')
Cout<<"De-acticvate the GPS Tracker"<<endl;
}
```

A) How does protocol works?

In this protocol I have four TPDU's of six elements which are sent by application layer of the TCP/IP protocol, first index contain the header of packets and four nodes (from two to five) contains the commands which contains the GPS functionalizes and last node contain the tailor of that TPDU unit.

Transport layer class contain "link-list" nodes of TPDU's and pointer of type node "first" which points the first node which is header of TPDU.

GPS Receiver Sender Side:

The GPS receiver sends the data from physical layer of TCP/IP but developer send data in application layer in the form of packets such are named as payload and before sending data in transport layer it attach the sigma header at first node of link-list and tailor at the last node of link-list, socket number and port number.

GPS Receiver Receiving Side:

The GPS receiver receives the data from physical layer of TCP/IP but developer send data in application layer in the form of packets such are named as payload and before sending data in transport layer it de-attach the sigma header at first node of link-list and tailor at the last node of link-list, socket number and port number.

For Making TPDU's:

Initially first node is assign to the ne node, then value of first is assign to a new pointer name as "*q", then starts loop, pointer p is assigning new node. First if check is true if value of new pointer q is zero (NULL), then q pointer creates a new node, otherwise the next node creates new node and data packets of TPDU's tailor assign and then creates a new node which assigns a tailor of transport layer.

For GPS Functionalities:

For loop runs on characters string, initially if condition passes parameters as "t t t t" which provokes the GPS tracker in activation state, then else if passes the parameters "t t n n" which provokes the GPS to calculate the precise longitude of object it may be car or anything else, else if passes the parameters "t t n t" which provokes the GPS to calculate the precise altitude of object and finally else if passes the parameters "t n t t" which provokes the GPS in de-activation state.

V. GPS MAPPING ON SOFTWARE

GPS satellite sends signals to GPS receiver and navigation device, giving them precise location, speed, if you are in aircraft or mountain altitude. For really useful the navigation system GPS mapping software has to be kept up-to-date. Every year our roads are changed in some way, new bypass are built, lanes are added to existing roads, speed limits are changed, one way system are introduced and Traffic signals are changed, that's why navigation devices are regularly updated. This is most advantage of digital mapping device. GPS mapping software make it available to navigation device for users as quickly and efficiently as possible. Digital maps come with street level detail to help you to find way from A to B as conveniently as possible.

VI. GPS ERROR AND ACCURACY

Although GPS provide precise location of specific object but it has intrinsic error which is taken into account when a GPS receiver reads the GPS signals from the constellation of satellite in orbit.

The main GPS error is due to inaccurate time which is kept by receiver's clock. Microwave radio signals travelling with the speed of light at least three satellites which are used by receiver built-in computer which is used to calculate the position, altitude and velocity of the specific object.

Moreover GPS receiver analyzes three signals from satellite in the GPS system and calculates how long it has taken time

to reach them. The signals are transmitted by satellite at a specific time.

Others errors arise because of atmospheric disturbances that distort the signals before they reach the receiver. Reflection form buildings as well as solids objects can lead to GPS accuracy problems too.

VII. POSITION DETERMINATION WITH GPS

For determine the position on earth, GPS receiver compares the time when the signals was sent by the satellite with the time the signals was received. By calculating the difference between receiver ad satellite time can be calculated. It means that at least three satellites are required to determine the position of GPS receiver on earth surface. The calculation of a position form three satellite signals is called 2D-position fix.

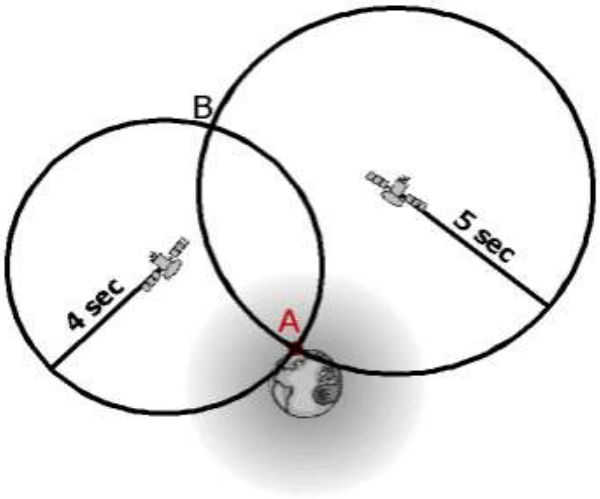

Fig. 2: Position determination with two satellites

VIII. HOW DOES GPS SIGNAL ARE USED?

Now-a-day there are currently 27 and 32 GPS satellite in orbit around the earth. Of these three act as backups. Each satellite transmits a regular GPS signal that is carried by radio-waves in the microwave part of electromagnetic spectrum.

GPS satellite gives the precise "time-of-week", according to the satellite's atomic clock, GPS week number and health report for the satellite so that it can be discounted if it fails. Each transmission lasts 30 seconds and carries 1500 bits of encrypted data. This is small amount of data is encoded with a high rate.

IX. COMPOSITION OF DATA

Navigational information is modulated into signals, this information consist of a 50 Hz signal and contains data like satellite orbits, clock and other parameters which include the information about the status of satellite. These signals are constantly transmitted by each satellite; data receiver receives three parameters that is: data, approximate time and position of satellite.

The data signals are divided into 25 frames, each having a length of 1500 bit including the interval of30 seconds for transmission.

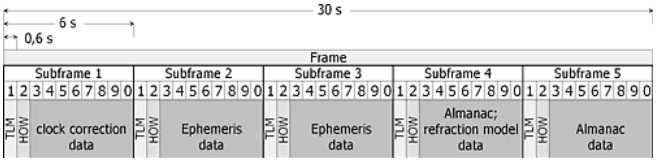

Fig. 3: Structure of the GPS data of one "frame"

The 25 frames are divided into sub frames (300 bit, 6 sec.), which are again divided into 10 words each (30 bit, 0.6 sec). The first word of each sub frame is the TLM (telemetry word). It contains information about the age of the ephemeris data. The next word is the HOW (hand over word), which contains the number of counted z-epochs. These data contain the time since last "restart" of the GPS time on the previous Sunday 0:00 o'clock.

X. FUNCTIONS OF GPS RECEIVER

GPS receivers are widely used for navigation and route planning. By modifying on to a constellation f satellite orbiting around the earth, the receiver can pin-point your exact position on the planet, calculate the speed and direction in which you are travelling whether you are in vehicle, a boat, or walking and if you are in aircraft it will tell your altitude too.

XI. APPLICATION OF GPS

Driver: most drivers, whether driving for business or pleasure can benefit from the satellite navigation made possible by a GPS receiver. They can find exact location and follow a specific route that is provided by the navigation device

Safety cameras: GPS based navigation device has made safety camera on the road that much easier is that a driver can make sure they stay within the roads with speed limit.

Traffic Jams: Some GPS receivers and navigation devices are able to access traffic news announcements and alerts for drivers that problems may occur on the road and help them in their journey to avoid accidents.

XII. FUTURE WORK

Initially GPS system was used for military purposes but now-a-days scientists and engineers are working to find out the means for using the GPS in common person access. We can make GPS not only for measuring the precise location of object but as well as for scientific purposes and monitoring geological activity such as earth tremors, earthquake and volcanic eruption. They can use strategically positioned GPS devices to assist them in tracking climate change and other phenomenon. Fundamentally we can use GPS to produce very accurate maps.

GPS can also be made for used in emergency services for instance, we can use GPS not only to find their way to an incident quicker than ever before but we can also to pinpoint the location of accidents and allow follow-up staff to find the scene quickly. This is particularly useful for search and rescue team at sea and in extreme weather on land where time can be a matter of life or death.

Now-a-day GPS just use only for outdoor activity, but In future we can also be used GPS for indoor activity, there is an obvious value to having device-driven navigation inside a building. But for business and organization, there are also benefits to offering such technology, namely location-based marketing and advertising. With the help of this idea we can use GPS in advertisement.

XIII. CONCLUSION

In this paper, we have attempted to elaborate the Global Positioning System (GPS) tracking, monitoring and controlling. We explained the transport layer protocol of GPS tracker both sender and receiver sides. Based on this document, we conclude that we can handle the GPS tracker and find out the precise location of person, vehicle or aircraft by using this transport layer protocol which is actually implemented on TCP/IP.

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