ATM Card Tracking Using GPS System

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Abstract: In this paper, A new technique is deployed to track the location of ATM card. Till now, there is no way to get back ATM card if it's lost. A new model is devised that shows how to keep track of locations of ATM card. GPS system is used to keep track the locations of card. A database is maintained and GPS satellite is connected to the Internet Service Provider. A new entry in Passbook fields is there. The new field added will show the locations of ATM card. This new field will be updated time to time as the database maintained by GPS is updated.

Keywords: GPS, ATM, DoD, Satellite, Segments, 2D, 3D

I.   INTRODUCTION

Fundamental information about GPS system must be there. What is GPS and how it works. How GPS tracks the locations. This all is explained below [1].

GPS: Global Positioning System

The Global Positioning System (GPS) is a satellite based navigation system that can be used to locate positions anywhere on earth. Designed and operated by the U.S. Department of Defense, it consists of satellites, control and monitor stations, and receivers. GPS receivers take information transmitted from the satellites and uses triangulation to calculate a user's exact location. GPS is used on incidents in a variety of ways, such as:

- To determine position locations; for example, you need to radio a helicopter pilot the coordinates of your position location so the pilot can pick you up.
- To navigate from one location to another; for example, you need to travel from a lookout to the fire perimeter.
- To create digitized maps; for example, you are assigned to plot the fire perimeter and hot spots.
- To determine distance between two points or how far you are from another location.

II.   How the Global Positioning System Works

The basis of the GPS is a constellation of satellites that are continuously orbiting the earth. These satellites, which are equipped with atomic clocks, transmit radio signals that contain their exact location, time, and other information. The radio signals from the satellites, which are monitored and corrected by control stations, are picked up by the GPS receiver. A GPS receiver needs only three satellites to plot a rough, 2D position, which will not be very accurate. Ideally, four or more satellites are needed to plot a 3D position, which is much more accurate.

Three Segments of GPS

The three segments of GPS are the space, control, and user (Figure 1).
1. Space Segment — Satellites orbiting the earth The space segment consists of 29 satellites circling the earth every 12 hours at 12,000 miles in altitude. This high altitude allows the signals to cover a greater area. The satellites are arranged in their orbits so a GPS receiver on earth can receive a signal from at least four satellites at any given time. Each satellite contains several atomic clocks. The satellites transmit low radio signals with a unique code on different frequencies, allowing the GPS receiver to identify the signals. The main purpose of these coded signals is to allow the GPS receiver to calculate travel time of the radio signal from the satellite to the receiver. The travel time multiplied by the speed of light equals the distance from the satellite to the GPS receiver.

2. Control Segment — The control and monitoring stations
    The control segment tracks the satellites and then provides them with corrected orbital and time information. The control segment consists of five unmanned monitor stations and one Master Control Station. The five unmanned stations monitor GPS satellite signals and then send that information to the Master Control Station where anomalies are corrected and sent back to the GPS satellites through ground antennas.

3. User Segment — The GPS receivers owned by civilians and military The user segment consists of the users and their GPS receivers. The number of simultaneous users is limitless.
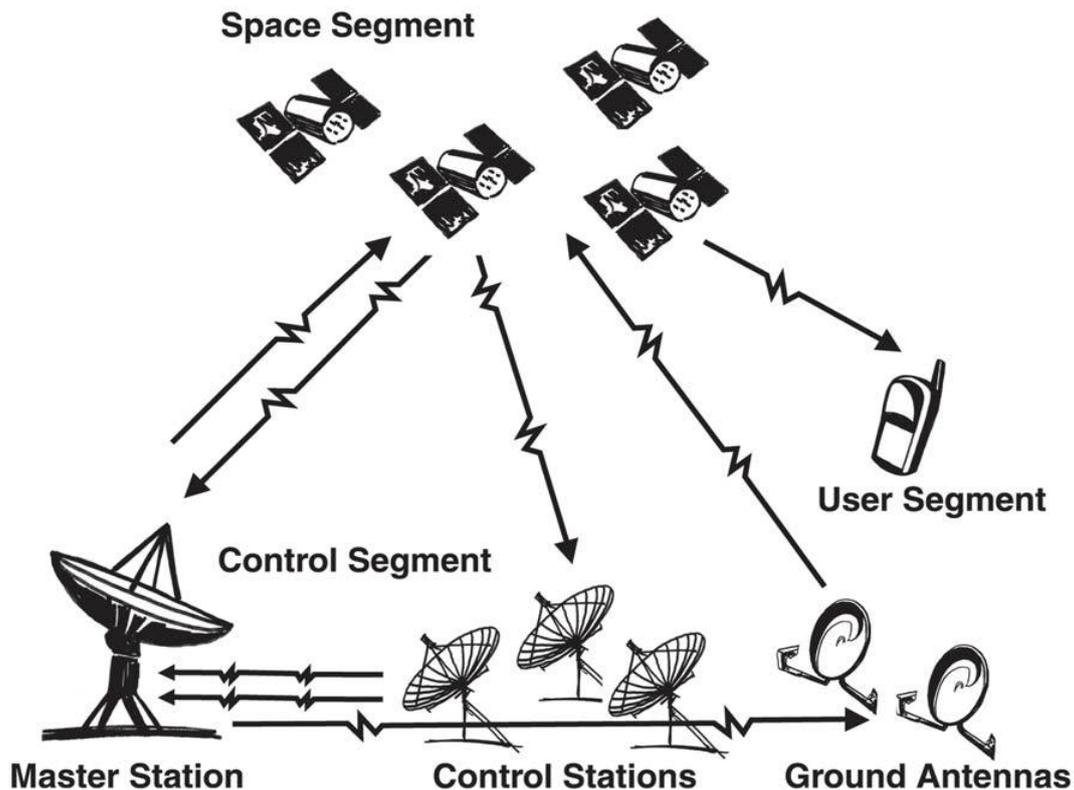
Space Segment

Figure 1: Three Segments of GPS.

How GPS Determines a Position

The GPS receiver uses the following information to determine a position.

- Precise location of satellites

    When a GPS receiver is first turned on, it downloads orbit information from all the satellites called an almanac. This process, the first time, can take as long as 12 minutes; but once this information is downloaded; it is stored in the receiver's memory for future use.

- Distance from each satellite

    The GPS receiver calculates the distance from each satellite to the receiver by using the distance formula: distance = velocity x time. The receiver already knows the velocity, which is the speed of a radio wave or 186,000 miles per second (the speed of light). To determine the time part of the formula, the receiver times how long it takes for a signal from the satellite to arrive at the receiver. The GPS receiver multiplies the velocity of the transmitted signal by the time it takes the signal to reach the receiver to determine distance.

- Triangulation to determine position

    The receiver determines position by using triangulation. When it receives signals from at least three satellites the receiver should be able to calculate its approximate position (a 2D position). The receiver needs at least four or more satellites to calculate a more accurate 3D position. The position can be reported in latitude/longitude, UTM, or other coordinate system.

Now a Detailed Information about ATM and ATM card is explained below.

III.   ATM: Automated Teller Machine

An **ATM card** (also known as a **bank card**, **client card**, **key card**, or **cash card**) is a payment card provided by a financial institution to its customers which enables the customer to use an automated teller machine (ATM) for transactions such as: deposits, cash withdrawals, obtaining account information, and other types of banking transactions, often through interbank networks.

How Do ATMs Work?

 An ATM is simply a **data terminal** with two input and four output devices. Like any other data terminal, the ATM has to connect to, and communicate through, a **host processor**. The host processor is analogous to an Internet service provider (ISP) in that it is the gateway through which all the various ATM networks become available to the cardholder (the person wanting the cash).

Most host processors can support either **leased-line** or **dial-up** machines. Leased-line machines connect directly to the host processor through a four-wire, point-to-point, and dedicated telephone line. Dial-up ATMs connect to the host processor through a normal phone line using a modem and a toll-free number, or through an Internet service provider using a local access number dialed by modem.
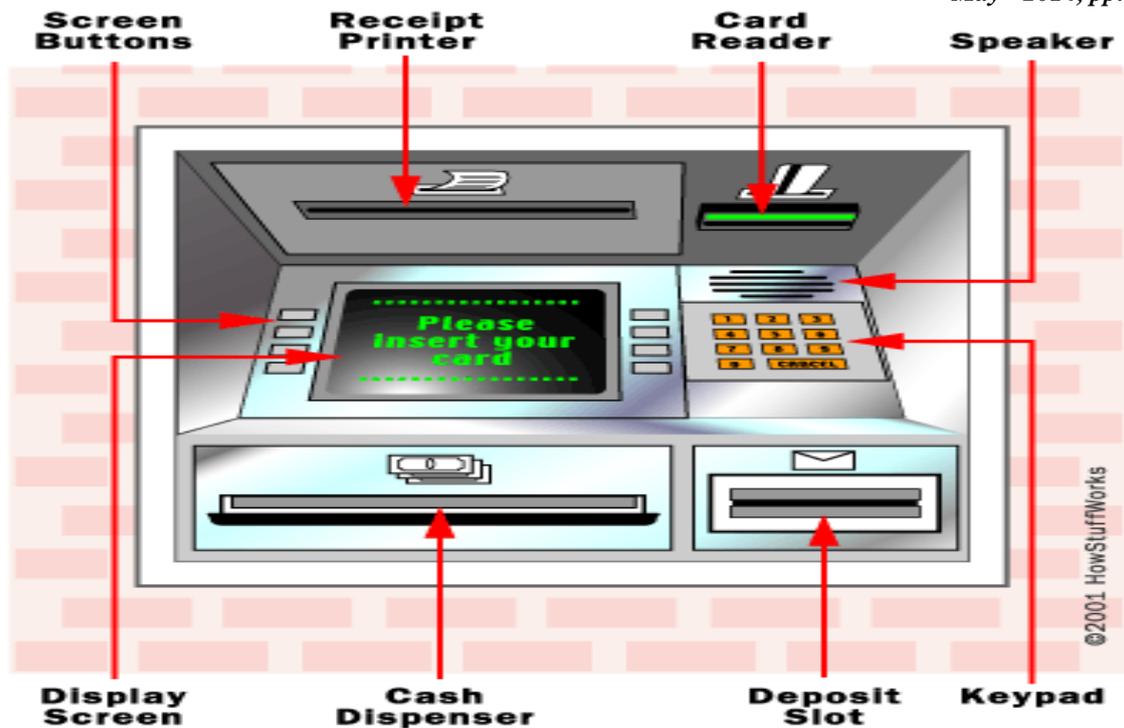
Leased-line ATMs are preferred for very high-volume locations because of their **thru-put** capability and dial-up ATMs are preferred for retail merchant locations where cost is a greater factor than thru-put. The initial cost for a dial-up machine is less than half that for a leased-line machine. The monthly operating costs for dial-up are only a fraction of the costs for leased-line.

The host processor may be owned by a bank or financial institution, or it may be owned by an independent service provider. Bank-owned processors normally support only bank-owned machines, whereas the independent processors support merchant-owned machines.

Dimensions

The size of ATM cards is 85.60 × 53.98 mm (3.370 × 2.125 in) and rounded corners with a radius of 2.88–3.48 mm, in accordance with [ISO/IEC 7810#ID-1](), the same size as other payment cards, such as credit, debit and other cards.

A **credit card** is a payment card issued to users as a system of payment. It allows the cardholder to pay for goods and services based on the holder's promise to pay for them.[1] The issuer of the card creates a revolving account and grants a line of credit to the consumer (or the user) from which the user can borrow money for payment to a merchant or as a cash advance to the user.

A **debit card** (also known as a **bank card** or **check card**) is a plastic payment card that provides the cardholder electronic access to his or her bank account(s) at a financial institution. Some cards have a stored value with which a payment is made, while most relay a message to the cardholder's bank to withdraw funds from a payer's designated bank account. The card, where accepted, can be used instead of cash when making purchases. In some cases, the primary account number is assigned exclusively for use on the Internet and there is no physical card.

Unlike credit and charge cards, payments using a debit card are immediately transferred from the cardholder's designated bank account, instead of them paying the money back at a later date.
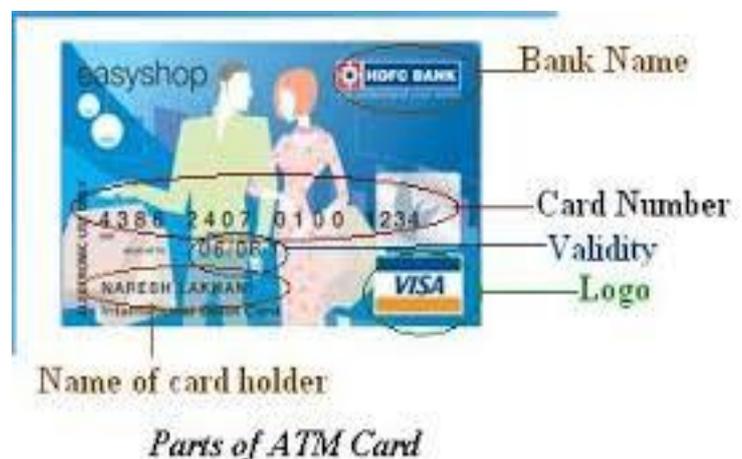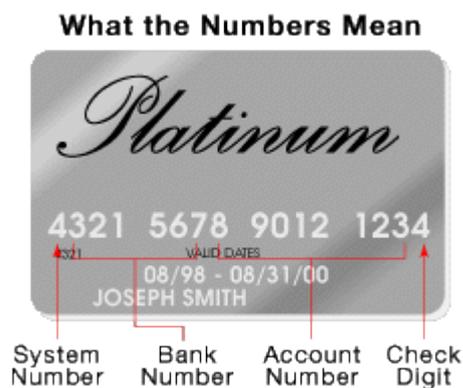
Figure 2: numbers on ATM Card   Figure 3: Parts of ATM card

Now the matter came, what the numbers on ATM card means. (Figure 2)

1st digit shows the System Number

2-7 digits shows the Bank Number

8-15 digits shows the Account number

And Last 16th digit is the Check Digit.

ATM Cards Parts (Figure 3)

An ATM card Contains the Name of Bank, Card Number, Validity, Logo, AS well as the name of the Card Holder.

Methodology:

A chip will be embedded on ATM card.

Figure:4 Place for Chip
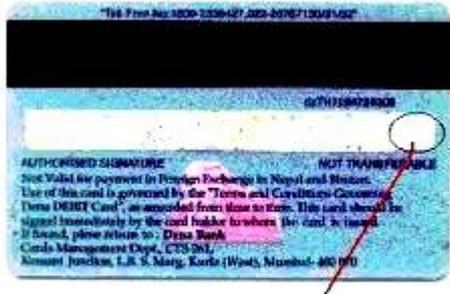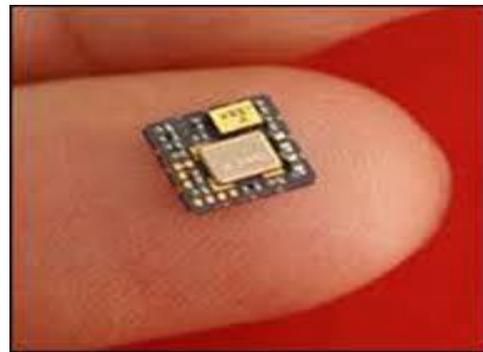
Figure 5: Small GPS Chip
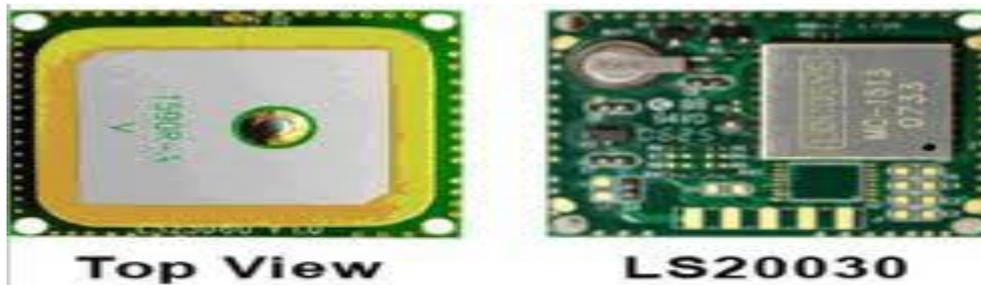
Figure 6: Wiring circuit of GPS chip. Its Top View and layout

This GPS Chip will keep track the location of ATM card and store them in a file. Locations will be updated time to time as the ATM card will moves from one location to other. As the passbook contain fields about all credits and debits.

Table 1: Shows the fields of a Passbook

DATE	PARTICULARS	CHEQUE NO.	DEBIT	CREDIT	BALANCE

Figure 7 : Maintained Passbook

A new field is added along with all fields that will tell us about the locations of ATM card.

DATE	PARTICULARS	CHEQUE NO.	DEBIT	CREDIT	BALANCE	LOCATIONS

While updating passbook, this new field also have updated locations. On the behalf of location someone can track his ATM card if it's lost.

The GPS chip is connected GPS Satellite. And GPS satellite is connected to the Internet Service Provider. That makes the file as stored in cloud computing. When the associated bank updates or maintains the passbook. It will takes take the record from the database and the new field LOCATIONS gets updated. If someone has lost its ATM card then he can take the card from the latest location.
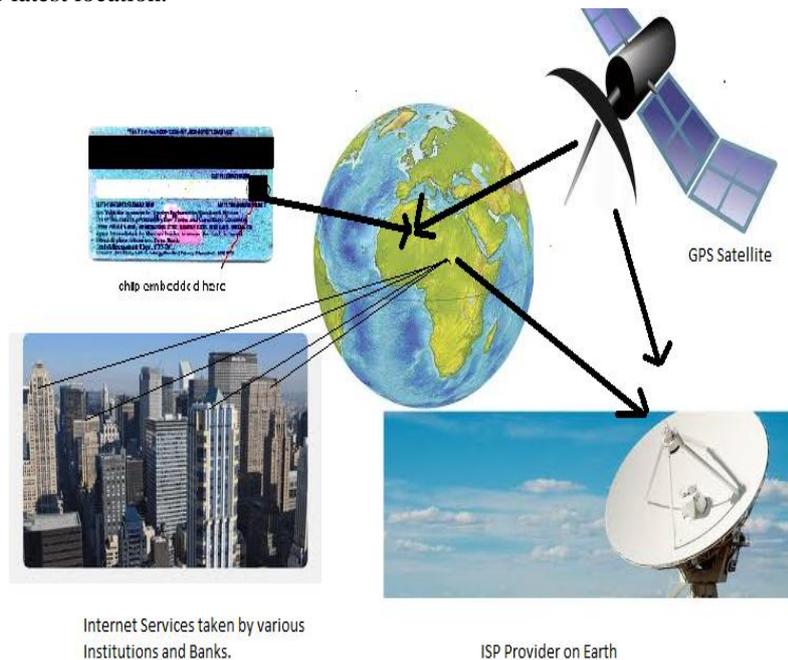

Figure 8: Connections Between GPS and ISP.

Figure 8 describes the whole procedure. Firstly location of AM card having GPS chip is tracked by GPS satellite and then GPS satellite is connected with the ISP on earth, which will make a file of the locations of the ATM card. Then effect of Cloud Computing the file of location will be taken from any Bank as the field of LOCATIONS is updated automatically.

So at last there is less chance of get stolen anyone's ATM card. Or if someone forgets where he has placed his ATM card mistakenly, he can easily track the location of its ATM card.

IV.   Future Scope:
 This model will give very accurate result about the location of ATM card.
A lot of work can be performed on this, as this is a new model and a wide range of functionalities can be added to this model to enhance the performance of the model.
A charging system to GPS chip can be added.

V.   Conclusion:
A very helpful model in finding the location of ATM card if it's lost or if stolen by someone. If the exact location is tracked then it can be safely taken back. If someone forgets after placing it somewhere it can be tracked using GPS tracker

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