

Geocaching - An Artistic Gaming Platform

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Abstract: An Artistic Gamification like geocaching explore experience in mental and physical activities to improve the potential of common people. Also, the geocaching activities can be used to improve the science educational outcomes from the students. This preamble study focuses on the technology of GPS in combination with geocaching. This knowledge can be reproduced to extend further research in past and current trends of geocaching.

Keywords: Gamification, Geocaching, GPS technology

1. Introduction

A. Global positioning system

The global positioning system is a satellite based navigation system and this system provides the position and timing accurately. It works anywhere in the world under any weather conditions. In this system the location can be tracked with the difference between timing and distance between the satellites with the help of satellite signals and receivers. The working principle of positioning technology is explained by elaborating the concepts of trilateration. The globe contains three layers of orbits

- Middle orbit layer
- Inclined geostationary orbit layer
- Geostationary orbit layer

Trilateration is the process of finding the accurate or relative location of point by measuring the distance using the geometry of circles sphere or triangles (2D trilateration, 3D trilateration). The time is calculated with the atomic clock and speed of light is considered as a speed. And the distance can be calculated by the formula.

$$d = s * t$$

The atomic time is calculated by reducing the 20 milliseconds from the original time in the inclined geostationary orbit layer. There are 6 orbits moving around the Earth. Each elliptical path contains 4 satellites with the 55 degree angle distance. Hence totally $6*4 = 24$ satellites are moving around the earth. Other possible methods to find positioning are

- Triangulation
- Multilateration

Triangulation is one of the processes that are used to pinpoint the exact location by the help of radio transmitter and measurement of radial distance and direction. Triangulation is

calculated through the angle given in the geographical position whereas Multi lateration is the technique that include multiple measurements for comparison and then it is used to calculate the exact location. The multi lateration is used in the civil and military applications by measuring the time difference of arrival (TODA) for locating the vehicles and aircraft accurately. If we simplify the processing, Trilateration is measuring distance, and Triangulation is measuring angles.

B. Geocaching

Geocaching is a kind of game using GPS enabled devices like mobile or geocacher. The geocachers can search for the geocache container with the help of GPS at the hidden location. People who are interested in playing geocaching have to register in the official website and next step is to select the geocache from the list and enter the coordinates into the GPS device. They can use their GPS enabled device to find the hidden item and when they got the cache they sign the log book and replace with some other things and place the cache container on same place. Geocaching is played everywhere on the earth, the only difference is the type of cache the players used. The well-known geocaches available are

- Traditional Geocache
- Mystery or Puzzle Cache
- Multi-Cache
- Earth Cache
- Letterbox Hybrid cache
- Event Cache
- Cache In Trash Out Event (CITO)
- Mega-Event Cache
- Giga-Event Cache
- Wherigo™ Cache
- Geocaching HQ Geocache
- GPS Adventures Maze Exhibit, and
- Lab Caches.

Some of the caches are defined below:

- *Grandfathered cache:* In geocaching there are different types of rules are followed in various cache type. The grandfathered cache means new version of caches that carried out the terms and conditions from old caches, that types of caches are named as grandfathered caches.
- *BIT cache:* It is type of cache, there is a card containing QR code in laminated type, it also contain

a URL as login ID and user password. We can login with this URL and password and get started to play.

- *Virtual caches:* It is a type of cache that is simply called grandfathered cache. We have to follow the previous geocacher's data and gather the information about that.
- *Earth caches:* It is a kind of virtual cache only. Geological society of America organized these kind of earth caches. It is usually collected for teaching the lesson about the caching and Earth Science.
- *Reverse cache:* It is a type of cache, there we find the particular location and things that located in the specific area. We can search with the cacher records and the device (GPS receiver). We have to place the container and register in the log book, this is a opposite term of usual geocaching method other cachers are not able to access the same location.
- *Webcam caches:* It is a type of cache which contain process like capturing image and verifying location. Cachers must have the Webcam for this type of caching. This is one kind of virtual cache, in which the user can take the picture of the location and find the same location by verifying it.
- *Multi cache:* This type of cache contains multiple steps to find different caches and finally sign in log book. The cacher should go for the next level and find out the multiple caches and get more experiences in this field
- *Night cache:* This type of cache conducted in night with the help of reflector and flashlight. Geocacher should carry the flash light and they have to find the cache container with reflector. This kind of process can be done in the night cache.
- *Chirp cache:* It is an advance technology that created by Garmin. There we used wireless technology that is called beacon. There they give the hints which contain multiple cache containers and countless visitors.
- *USB cache:* This type of cache contains some kind of device like USB and USB port. This kind of devices or embedded with particular location and places. The cacher have to connect the USB with USB port (cache) and find out the text file.
- *Cache in trash out event (CITO):* This type of cache focuses on litter cleaning while caching program and also planting a tree, preventing a nature. This kind of social activities are conducted through this process, the main term is to involve people into the social activities.

2. Benefits of geocaching

- *Obtaining Data:* For geocaching we have to work on some more technologies like fetching data and decoding and filtering data sets finally work on it,

first we have to obtain data for GPX data set which contains cache description and latest cacher information and experience. Raw data available in GPX , xml file format and also zip file. The user can make use of smart phones androids and I phones contain the GPS enabled device for caching and location tracking.

- *Metamorphose and filtering data:* There the data can be converted and filtered by their file type depends on cache types. There are different types of caches available in geocaching so that there are various procedure, terms and conditions that information can be segregated into different criteria that also filtered.
- *Real time scenario*
 - Before starting the geocaching we have to get the permission from land owner for further activities. First step to be, who are all interested in geocaching they have to register with required detail to create an account into the official website (or) an application.
 - After creating an account they will have their own user id and password, using the user id and password they can login into the official website (or) application for start their cache game.
 - You can also search for an old cacher experience on cache listing to get proper instructions to find, is there any cache still available or not.
 - Every home page contain the place where the cache and its Unicode or retrieve the coordinate. Cacher must find the Unicode for the nearby cache and enter into the advanced search.
 - Log files information into the GPS device.
 - There we have few steps to connect the device for the best caching. Enter the instruction cache place by manual if your device doesn't connected with the computer automatically.
 - You have the option send to GPS to connect the cache listing into the device. It will provide the proper instruction for handling we should follow the instructions carefully and get the details into the GPS device there we have the File type which that supports in the process that is LOG file for basic members and GPX file for the premium member.
- *About cache container:* In Geocaches, we have different size of cache container that contain various stuffs depends on the container size. The most

commonly used types are,

- Micro
- Small
- Regular
- Large and others

Before getting started we have to find out the cache container size and hint about the container.

The container may be look like the fake rocks and wood. We have to make sure about the appearance to get cache easier. The cache containers may contain the number of items and log book and cache list. If it is a large container that may contain some surprising items. There we should not place the item like explosive and dangerous thing like drugs, foods, and others.

- *Finding caches:* We can track the cache location by entering the code. Whenever you find out the cache, open the container and get the log book and sign it. If it is a large container you can get the item and you have to replace the item that equal to what you take from the container. Once you have done the cache you can go to the page called “log your find” at site (or) application and share your cache experience to others.

- *Rules and regulations*

There are some rules given to handle cache container. They are,

- We are not supposed to move the container from that original place, we have to place it on the same location after the cache activity done.
- If you are not able to find the container then you go the page and log with that status.
- If the container missing or you found the container on some other place please contact the cache owner via email or message.
- For the container missing or misplaced the owner should take the responsibility for the cache container

3. Benefits of geocaching

When they make use of geocaching, the people will get some kind of benefits from the cache event like physical benefits, social benefits and educational oriented benefits

- *Physical benefits:* While the cache event, they have to climb, jump, run this kind of physical activities are happened. From that, we have good kind of exercise to the body, it helps to be fit and gain more healthy benefits.
- *Boost Immunity Power:* It will boost the cachers' immunity power whenever they do their physical activities

- *Improve Memory Power:* It also helps to increase the memory power to the cachers
- *Relieves Stress and Depression:* While caching at the forest area we can get fresh air and healthy exercise, it gives you peace and helps to reduce the stress and get over from the depression
- *Social benefits:* By geocaching activities we can also get experience in cleaning area like parks, street and also forest areas.
- *Explore Nature:* Admire the nature and places while geocaching that can helps to get the pleasantly mind
- *Clean Environment:* We have that kind of caches in the geocaching that helps to clean the environment and protect the nature from the pollution
- *Educational benefits:* Geocaching really helps in much way to educate the students and it is used to teach the Global Positioning System and geography and also the mathematics
- *Developing a Learning Skill:* Its helps to develop the cachers learning skill and they can also find out their capacity of the learning
- *Learn GPS through Geocaching:* Geocaching may help to study about the GPS for students in school. Geocaching may help to study about mathematic calculation and satellite navigation
- *Team Work and Leadership Skill:* While geocaching, people can get more experience in leadership quality and best coordination and teamwork
- *Map Reading:* The children's can easily learn about map reading, navigating and also exploring the places
- *Problem Solving:* They can also get experiences in solving the problem and get better solution.

4. Applications

Geocaching is used in various types of application. They are:

- Science education at Sweden
- Improving digital culture through environment education at Australia
- E-learning
- Collecting creative experience in travelling and
- Forest camping for organizing facilities

5. Conclusion

This study has highlighted the working principles of GPS Technology and Geocaching, an application of GPS Technology. By analyzing the technology, the types of geocaching and the practical implementation, an application can be developed and tested with the students as end users to improve the high degree of understanding the geographical system to the physical world. For this objective, the preamble study has been done and led to the future enhancement of application development and analysis of the students experience in this expertise.

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