

Application of Global Positioning System (GPS) in Earth Sciences teaching

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Abstract: The purpose of this article is use GPS(Global Positioning System) equipment to applying in GIS teaching. To find the best way on using GPS. GPS device combine the software Google Earth , it will provide the whole world map for us. People can use GPS relation device for science explorer, recording objection on earth move track. The Global position system applying on everywhere become more and more popular. The price of GPS relation equipment. Using GPS equipment was impossible on the early time, but now it became a convenient equipment that every can use it in every field. It became more che aper and useful. Teachers can use GPS equipment on their teaching activity, and make study with it. There are 4 paragraph in this article: preface, the theory of GPS, GPS apply, the future of GPS, and conc lusion.

Keyword: global positioning system, GPS, google earth

1 Introduction

GPS(Global Positioning System) equipments have been used more and more general in the society now. In the past, it was a kind of expensive equipment, Just few people used it, like professional researcher, or person of special job . Now, the GPS equipments price is become more cheaper. The application in life is more and more general. It's a kind of new scientific and technological equipment, can help people solve problems and make life to be convenient . This text apply on GPS to geo-science make application. To explorer the function of GPS equipments and apply in the other field.

2 GPS

2.1 about GPS

GPS (Global Positioning System) Started in it in the global space navigation system coming out in development of American Ministry of National Defence of 1980s , as military use originally, navigate like fighter plane, application, guided missile of remote control, etc.:. transfer to the commercial use of all kinds gradually in recent years. No matter the user can measure the position longitude and latitude and height where one stays accurately through GPS in the land, sea or sky. It must include three major parts to finish the satellite fix of GPS, the first is a space part: Made a detour on the earth by 24 satellites, serve as the role who conveys the signal, is conveying

the position information of satellites for 24 hours. The second part is to control some on the ground: Because need of satellite manage and control, set up ground is it is it is it responsible for whole operation of system to come to stand to control with place in the whole world. The third part is some of users: The user needs a special GPS receiver to receive several satellite signals, calculate out position information through the microcomputer, because the signal passes the satellite transmission, so has no limited about the restrictions of the area, topography and number of people.

2.2 How does GPS work?

There are 24 satellites in GPS system are distributed six tracks equally. By moving round the speeds of two circles of the earth each day. So, any place, any time on the earth, all have 4 satellites exist, holds the work that the signal launches at least in the sky of its site. Each satellite, through accurate instrument and ground control the revision standing have a very perfect time-recorder, each satellite sends out the signal at the same moment, but because the user is different from distance between each satellite, it is different too that the signal of each satellite produces the degree postponed. And the user searches these signals through the receiver, utilize postponement degree of different signals to try to get the distance between each satellite of distance, and

then with the triangulation theory, calculate out the user's position coordinate. Because GPS satellite launches these and orients information constantly, so long as the receiver can be received continuously, can calculate, upgrade materials of it at any time, can offer the latest information to users one every other second, because of so quick newer speed, we can calculate orienting information, to get the user's other space movement information, for instance move the speed, move the direction.

3 Teaching in geo-science subject

According to Ministry of Education in Taiwan studying the goal and defining to geo-science of course standard of basic geo-science of Taiwan high school issued for enforcement is as follows:

3.1 Total goal

1. Excite will and consciousness of treasuring the earth environment concernedly to study geosciences.
2. Realize the relevant geology of geo-science, important basic conception of ocean, meteorological phenomena, astronomy, in order to is it probe into the excitement of discipline and learn foundation to promote.
3. Understand geo-science about observing, analysis, inference, summing up and dealing with the method to judge problem, in order to promote the ability that students solve the problem.

3.2 Sub goal

1. Promote interest and will to study geo-science, train and care about, treasure the correct attitude of the earth environment.
2. Understand about such basic conception as the earth shape, making up, constructing, activity, history and position in the universe, etc..
3. Train and study and live it with basic conception of geo-science and the method and ability to solve problem.

Use GPS equipment to learn to know the relevant topics on the earth, contribute to understanding Taiwan, finding out about the relevant knowledge of every geography of every world continent further. Research points out Taiwan teaches the north, middle part, southern teacher some views of accomplishment knowledge have nothing in common with each other to geo-science, it is obvious the teacher is limited to living environment is different and different to some

extent too to the accomplishment of geo-science; The man, women still call unanimity on the view to geo-science knowledge; Teach in junior middle school or high school, roughly the same on some views of the accomplishment knowledge of geo-science; Teach age and service seniority to be different, in geo-science part, accomplishment of knowledge, difference, teach teacher view of one year such as age and service seniority and teach the age and service seniority while being other especially (4-10 years; 11-20; More than 21 years) Teacher obviously different. It is obvious in lack the scientific instrument and limited local experience of life cases, the understanding of geo-science will be different to the others.[1]

4 Application

4.1 General use of GPS:

Use of GPS very extensive, every need to do the work oriented in region, make use of GPS to reach, main application is like:

1. The land is surveyed, resources are investigated. The forest district, hillside violate legal provisions and develop and check the work of the newspaper. Can use GPS can is it a bit, inquire to suspicious variation person who transfer and read book picture, etc. relevant materials in order to study and judge directly to navigate smoothly.
2. The navigation makes a reservation: The vehicle, aviation, the navigation. Plane, ship use satellite navigation systems to be already competent for many years; But general in automobile, automobile satellite navigation systems, In the advanced country, for instance: U.S.A., Japan have already quite prevailed, in Taiwan has prevailed gradually too.
3. Earth measurement. Traditional measurement is a very arduous thing, when the land mark is not obvious, it becomes very difficult that measurement works. Use the GPS's positioning to become easy, needn't rely on control point on the ground, so long as can use GPS as the tool measured in case of not covering, have improved the inconvenience of traditional measurement. Measurement work of the accuracy with the higher demand.
4. Making of the electronic map and making of the rough topographic map. Finish making electronic map fast and conveniently through GPS.

5. Sending task: Freight transportation, give first aid, fire control, alert policy. Cooperate with radio transmit GPS, is it accuse of every vehicle position to in charge of, is it send in the center to pass the coordinate back.
6. Mountaineering makes a reservation, the difficult association of mountain seeks. Use the GPS's positioning in the open place, cooperate with the position at present of understanding that the topographic map can be very accurate, but will not be lost because of judging the mistake artificially. We can cooperate with GPS the radio is transmitted, will climb the mountain in personnel's position and convey to the difficult association of mountain and seek the centre, in order to help rescuing the difficult search.
7. Accurate timing. GPS can convey each GPS satellite have accurate atom time of clock too, so can receive the accurate time message through GPS receiver.
8. Military affairs. The development of GPS, it is a military use to be early, so and attack the accurate localization of the target thing to fighter plane, warship, combat tank, guided missile, relevant military personnel, rely on GPS to finish.

4.3 Relevant research about GPS

4.3.1 Once use GPS as a kind of tool on teaching with Junior high school and senior high school student. To apply to, probe into and make up the increasing to four geographical information systems into a result of intension, find or outdoor GPS equipment is an educational aid that has helping hand very much no matter indoors.[2] Assess three kinds of GPS cell-phones to the method of innovation that the navigation feature offer, the following detailed. Comparison of different PDA cell-phones[3]



TELENAV is the first GPS navigational service on the BlackBerry platform



GATES SMART2GO Mobile Navigator provides reviews from W Cities on venues like hotels



MAPQUEST FIND ME, installed here on Motorola's i830, delivers maps, listings, and a way for people to find your location

They have different innovative function each, first navigate the PDA cell-phone standard automobile, the necessary equipment has been set up, it is more convenient to use; The second is a navigation system of automobiles too, but need more complicated establishment, includes the outer blue bud GPS to set up, the map software was installed and installed the memory card additional; The third can be conveyed one's own coordinate for other cell-phones.

4.3.2 Gps can monitor personnel's whereabouts out in the office at the home, offer and drive a vehicle to the system of the best route, the main system is divided into three parts: server system, mobile system and monitor system. This system can be calculated and reached the best route of the destination. In order to shorten the time of driving a vehicle, and match GPS receiver [4].

4.3.3 In traditional measurement teaching, because the weather is not good, such factors as the instrument is limited of regular meeting, it is low to result in asking the scholar's study interest, the results of learning is not good. Use the computer multimedia to combine, have high independence, inter-dynamic, feedback with it Wait for the characteristic, to assist tradition type teaching, can excite the study interest of asking the scholar even more, improve teaching quality [5].

4.3.4 In recent years with electronic fast development of industry, communication and orient relevant ripe day by day even technology, and in the acquisition cost of relevant equipment is dropping year by year, use GPS to be applied to people's car resource management, can reduce the expenditure of much cost, can improve the efficiency of management at the same time [6]

4.3.5 GPS is monitored and monitored in the geological calamity speciality in reservoir area of Three Gorges of the continent to have an effect

too, design and structure tertiary GPS monitoring net of reservoir area of Three Gorges, has responded to the request that the country monitors prewarning to the body of geological calamity of reservoir area [7] Combine the characteristic that GPS measures, the comparatively detailed discussion GPS static behavior makes a reservation relatively and RTK (make a reservation real-timely dynamically) Application of technology in the measurement of the expressway, and prove through the instance it is totally feasible that GPS is used in the measurement of the expressway, it can improve the working efficiency measured and save the expenses to a great extent [8]

4.3.6 GPS is applied to the air pollution of controlling the city too, uses the low-priced global positioning system (GPS) The recipient follows the sensor and in a good geographical position, can be engaged in making a reservation and chasing in very perfect air pollution? [9]

4.3.7 Use guests to make the software of melting and combine GPS receiver and a hand-held computer equipment, the family that the persons who are used for helping the pulmonary tuberculosis to accuse of controlling found the patient fast, carry on essential treatment. Studying in Johannesburg, South Africa goes on in two communities. In the course of this research it show use by pieces of PDA that is simple and orient satellite not global there aren't system equipment [10]

5 Combining GPS with Google Earth

5.1 Google Earth

Google Earth is one software running on personal computer that we can see all over the world from it with satellite photo, we can download to free Google earth software in the network, it has a clear image and can be watched to every large city, every big civilization historic site on the earth .

5.2 GPS relevant equipment

Reach the function of defending the location, must select GPS receiver for use, GPS receiver used for and receives the satellite signal mainly, up to the result orientateds, most occasions must cooperat e with PDA to use, or the note-book computer comes to use. The common one can be divided into an outer type, receiving type inside, etc. like:

Bluetooth GPS	Windows mobile
CF interface GPS	Windows mobile
Build-in GPS	Windows mobile

Build-in GPS Symbian system

5.3 Application example with Google Earth

Through Google Earth software, combine GPS hardware and relevant software, can apply to the understanding of geo-science, the common application way, in compliance :

1. A single geographical position is had a look around: Own environment, Geography of Taiwan, World-famous environment
2. Measurement of distance between 2 point-to-point straight lines: Long measurement by the large-scale building, Range of district of school measurement, Distance measurement between two beauty spots, Transnational rooms of two city from measurement
3. Measurement of distance between point-to-point routes: Beauty spot reach beauty spot from route to measurement, Route distance measurement of the city that the city reach
4. travel earth seat marks recording: Book the land mark by oneself
5. 3D Buildings: Taipei 101 building, Shanghai Oriental Pearl tower, Tian-An-men of Beijing, Statue of Liberty of New York.

6 Conclusion

It has been already very extensive that GPS is used at present, its discipline related to space, area, for instance geography, natural resources, forest, animals and plants, etc. have already used the global positioning system too on research (GPS) It is engaged in the investigation and collection of the materials to come. It is believed that the GPS will come application will be more extensive, not only in scientific research and project will be used, various types of activities of even daily life, the deep one is influenced, like current computer network science and technology. Do not use more at present in education, believe that there is very large application space, for example: GPS city leads and recommends the system, several and takes pictures and combines the GPS's positioning automatically, makes a reservation in Google Earth again, with share can wait for, the earth edition change note down, navigate, defend things of losing etc. Near future, the equipment cost of GPS will be cheaper, will become everybody to afford, the scientific and technological equipment which everybody will use, no matter in teaching

or in life, will be very practical scientific and technological products.

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