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Using of GIS Online technology in water resources management

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Abstract

In our country Iran, that climate of the most regions is arid and semi arid, due to limited water resources, optimal use of these valuable resources, is essential. Today, most organizations in decision making and planning are successful in having the correct information and quick and easy access to them. Because the basis of any short and long term plans, are having the correct and on time information from the current situation and prediction of future needs of the organization. The management of such valuable and non renewable resources is not possible without the use of Geographic Information System with respect to the distribution of resources and effectiveness of various factors in decision making. In this regard, the use of GIS Online technology is essential in water resources management. In this technology, a portable computer device connected to the GPS and software designed to partition the GIS environment, is associated with the satellites as online. In this technology, the user's instantaneous position is visible with flashing identify and recognizing of nearby resources were viewed from not viewed is possible as separately signs in the map. Therefore, field data completion is possible, only if the user placed in 25 meter boundary of defined resources. Using this method, while saving time and costs, ensure of information accuracy and user visits in a certain date from the desired resource, resources location and determination of their privacy and other factors, is done automatically.

Key words: GIS Online technology, GPS, water resources management.

1. Introduction

Population increase, urban development, industrial development and agricultural growth increased human needs for greater water. In our country Iran, that the climate of the most regions is arid and semi arid, due to limited water resources, optimal use of these valuable resources, is essential. For proper management of water resources, having accurate and reliable information with the appropriate time periods, can be an important factor in decision making and the policy. Today, most organizations in decision making and planning are successful in having the correct information and quick and easy access to them (Leukert and Reinhardt (2000)). Considering the distribution of water resources and how to collect data from them by the public and private sector agents, the use of GIS system is essential. In this regard, East Azarbaijan Regional Water Company, for the first time in the country, has used the GIS Online technology in information collection and completion.

2. Research Methodology

2.1 Geographical Information System (GIS)

For the first time in mid1960, working on first geographic information system began in the United States. In these systems, aerial photographs, agricultural, forestry, soils and geology maps and relevant information were used. In 1970 with progress of science and access to computer technology and other necessary technologies for working with spatial data, Geographical Information System or (GIS), was formed for providing power of analyze large volumes of spatial data (Alesheikh and Helali (2001)). In recent years, due to expansion of computer technology, geographic information systems can store the updated ground reference data and combine various data sets. Today, GIS will be applied for scientific investigation, resource management and development planning (Marshall (2001)).

2.2 History of GIS Online technology usage in East Azarbaijan Regional Water on the subject of water resources management

According to the mission and functions of regional water companies and Frequency and distribution of water resources, use of geographic information system is essential. Accordingly, has established water resources (surface water and groundwater) database in the company and special offices prepared the required layers and has been completed them and have produced required models and their analyses with respect to the existing layers. East Azarbaijan Regional Water has attempting to use the GIS online technology in the water resources national census in 2009 and on the subject of qualitative monitoring and to identify and protecting water resources in 2010.

3. Results and Analysis

3.1 Technology Description

Determination of Instantaneous position of all parts is possible by hand GPS and the situation of water resources are determined by using this device. In recent years, GPS of the cars are registered the traveled path as online and offline and used GPRS to send instantaneous position to the center (Hofmann et al (1992)). Instantaneous position of the vehicle as a moment on the map is recorded in the computer. East Azarbaijan Regional Water, for the first time in the country has attempted to provide software that targets of its preparation and its applications are mentioned as follows.

3.2 Software Design Purposes

One of the resource management and planning tools, is having complete and accurate information from their. Accordingly, from previous years, East Azarbaijan Regional Water using colleagues and consulting firms, has been collected periodic basic information of water resources. In recent years, the use of private sector has increased in water resources census and sometimes, with regard to lack of responsibility of statistic recorder, statistic collection is not done accurately and completely and causes statistic uncertainty. Because in some cases, without visit of water resources and using questions from informed local people, registered statistic of considered resources. In some other cases, have been completed water resources statistics, using the statistic of previous years without visit of them. Also, sometimes, regarding the distribution and abundance of water resources, their information recorded as wrong and was not recorded information of some of the water resources that had been identified in previously taken statistic courses. Therefore, to solve these problems, the software was designed and it was used in recent general census of the water resources.

3.3 Software Description

Software was designed in ArcGIS environment and installed on the Laptops and any of the Laptops connected to a manual GPS (Fig. 1). When software runs, appears statistic recorders position on the system maps by flashing.

Fig. 1. A Laptop connected to a manual GPS.

Prepared maps is including positions of all identified water resources and villages and roads and other relevant information (Fig. 2). Thus, the statistic recorder position is visible on the GIS environment and to the position of adjacent resources.

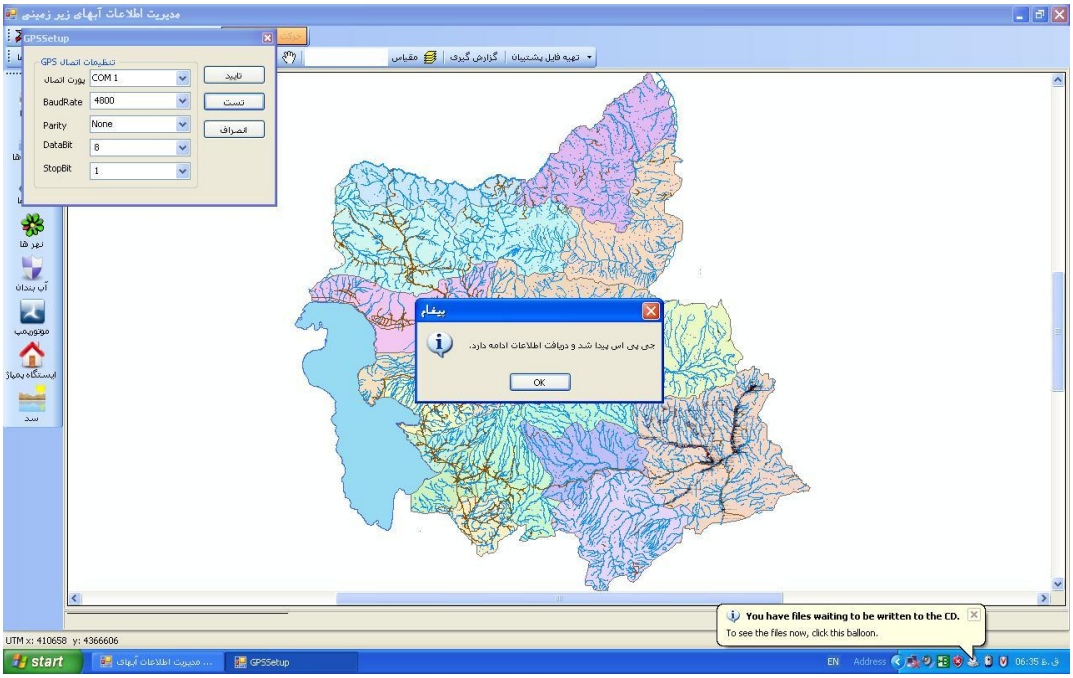

Fig. 2: View of the main window of software that shows how it communicate to a manual GPS.

The software is designed so, that when the statistic recorder is close to 25 meters of a water resource, the data entry forms of the resource and the owners and other

characteristics appears automatically and it provides to record other necessary information. Also, it received from satellite the visits date and resource point coordinates as UTM automatically, and registers without statistic recorder interference (Fig. 3). When the water resource field data were recorded, its color on the map will change to color of recorded resource and it will comes separate of not taken statistics resources . Also, if the statistics recorder is far from the resource, it will not be possible to records. In addition, for data recording of resources that have not been introduced in the system previously, designed this possibility to record the characteristics of such resources and appear the location of new resources on the software map.

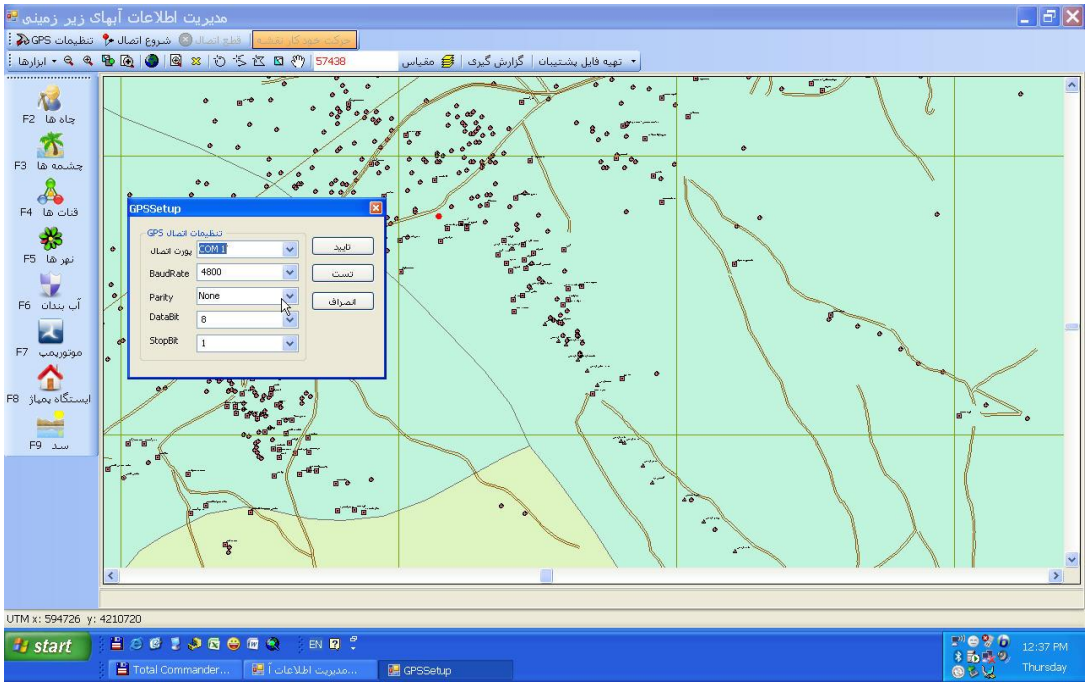

Fig. 3: Picture of the study area map with location of identified water resources and a new resource that is marked in red.

Therefore, using this software, you can achieve the following results.
- identify location of water resources and position of the visitor as flashing on the maps and identify distances of adjacent resources from visitor.
- identify new water resources.
- to ensure from water resources visiting in periodic visits, according to the automatic recording of instantaneous position and visits date from the satellite and impossibility of mistake in date and location recording.

One of the other activities of the regional water companies is licensing of exploitation of water resources (well, spring, qanat) that this work is done in accordance with the relevant process. In this process, after the applicant request, experts visit the desired site and prepare his expert reports and the commission that issuing the licenses issues the relevant licenses according to the report. In this process, sometimes, some problems are created that they cause some complaints against the regional water company's experts, or even in some cases, lead to a judicial ruling against them.

Sometimes, certain rights of some applicants are losing due to inaccurate expert reports and placement of new water resources in the adjacent water resources sub area. To avoid these problems, can be used this technology and prepared software. Thus, if the software runs at the site, the applicant desired location appears as flashing on the system maps. Also, the adjacent water resources (legal and illegal) locations are displayed with their

exact distance from the desired position of the applicant. Thus, as the computer draws an accurate croquis, can be realized the sub area of resources. Also, with respect to that maps and other information is available in the system, by using geological maps, allocation of water to the area and other necessary information, presented legal exploitation and other necessary proposals.

Therefore, using this technology, we can achieve the following results:

- Provide accurate croquis for estimating distances with adjacent resources and evaluate their sub area without navigation between resources.
- Provide accurate expert report and offer legal exploitation and other necessary proposals with regard to system information layers.
- Determination of observation wells position such that their proposed location is not in the water resources sub area for prevent effect of this water resources on the observational water surface.

4. Conclusions

Exist of water resources updated statistics and information, access to complete knowledge of their status and thus their correct management is of the important issues in the preservation of water resources. Geographic information system (GIS) is the only system that correctly analysis information using various factors and reporting results into spatial and statistical. Various features of GIS software had been used in Iran, but as OnLine did not use any except by cars Online GPS. This company for first time with integrating GPS and ArcGIS and his database prepared and exploited such software that with using that will be able to achieve the following applications. Identify instantaneous current position of visitors as flashing on the maps in the computer and identify visited resources form not visited, monitor and ensure that visitors viewed the desired resource, water resource identification and automatically recording of location and visits date from satellite, impossibility of data recording without referring to the resource position, carefully croquis drawing and providing expert report, precise recommendations on management and exploitation of water resources with integrating information layers.

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