

Analysis of 3S Technology Application in Land Improvement Project

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Abstract: In the process of land improvement project implementation, field survey and reconnaissance studio in the early stage is an important link for the whole project to be completed efficiently and with high quality. Traditional field expeditions need to carry different instruments and equipment and paper drawings. The data obtained is slow in efficiency and low in accuracy. The diverse and complex data generated is not conducive to data integration in the later stage, and the team's information sharing and cooperation ability are greatly reduced. Using GIS, RS, GPS combination of 3 s technology, with high penetration rate, low cost of mobile terminal pad, mobile phone to gather in the early period of the carrier used in land reclamation engineering reconnaissance survey work, from the information acquisition, storage, management, analysis and sharing of multiple link efficiency are enhanced greatly, this article is based on 3 s technology and intelligent mobile side field reconnaissance work patterns of designing new land control, forming new tools and means, to reduce costs, improve efficiency colleagues better serve the construction of land reclamation engineering

1. Introduction

Field work is the main method and content of modern geography research, and obtaining geographic information data is one of the important purposes of field work. Under the background of "Internet +" era, people's demand for geographic information has become an opportunity for the transformation of traditional geographic industry. The basis of traditional geographical field work need to carry a certain amount of different resolution image data such as satellite image data, maps and geographic information data and some necessary geographic information acquisition device, which bring many difficulties to field workers, such as poor equipment portability, caused by a variety of low resolution image data integration using inconvenience, poor field records the

precision of the geospatial information efficiency is low. At the same time, there is a lack of effective communication between field workers and indoor commanders. To change the traditional mode of geographical field work and improve the efficiency and accuracy of geoscientific scientific research work is a problem to be solved for geoscientific workers.

In recent years, the development of mobile intelligent terminal equipment integration technology key components, and smart phones a powerful network communication ability and the ability to calculate greatly promoted the intelligent navigation, the application and development of mobile map service, of which smartphone portability, intelligent and cost-effective, deeply loved the masses, high penetration rate. Thus, it is equipped with Globe Navigation Satellite System (GNSS), multi-resolution Satellite map and multi-source geographic information mobile intelligent terminal. Its rich mobile map application services provide technical support for solving the difficult problems encountered in the traditional mode of geographical field work and provide possibilities for the construction of new mode. This paper puts forward a new mode of Internet + intelligent mobile terminal auxiliary geographical field work. Through the construction, feasibility analysis and application analysis of the new mode, it provides reference for improving the field work method of geosciences and develops new ideas.

2. Research content and technical model

Combined with the practical experience in land remediation project, this paper designs a new working mode of field survey and survey, analyzes the feasibility of the new mode through the practical application effect of 3S technology and intelligent mobile terminal technology, and verifies the feasibility and effectiveness of the new mode through examples of actual research project areas. For traditional field of reconnaissance work requires a lot of surveying and mapping, the acquisition equipment, all kinds of related paper data maps, high cost, carrying the inconvenience, and the viewpoints of this paper is to take a new generation of information technology, the combination of 3 s technique integration and mobile devices to sleep this problem better, the more efficient and more accurate finish the land reclamation project prophase preparatory work. The new field work mode of land remediation engineering is to integrate the global positioning function of GPS, multi-scale and multi-source satellite remote sensing data of RS, spatial data processing, management and analysis capabilities of GIS into mobile devices to assist field exploration. Specific research contents include the following:

2.1 GPS global positioning function

Traditional field reconnaissance is a very important technical link for spatial positioning and plays a crucial role in determining the actual location, track route and project area scope of land remediation accurately. A little old field work using the compass, for example, a compass positioning tools, such as to judging direction and general location, accuracy is very poor, often later adopted such as handheld GPS positioning, theodolite, level and RTK surveying and mapping equipment such as positioning, pay-off, have a much higher precision than ever before, but he is still behind in terms of cost and convenience, but this mode, the use of smart mobile GPS tracing, its precision and signal coverage to ensure, field work, easy to carry cost is lower. In this paper, through the analysis of commonly used integrated mobile app (Ove map, High Map, Baidu Map, Google Map) and other applications, the accuracy of the same acquisition location is compared with the data collected by conventional devices to determine whether the accuracy can meet the requirements of conventional geographical field work.

2.2 RS multi-scale multi-source satellite remote sensing data

In the early stage of field exploration of land remediation project, the methods of field survey are usually natural condition survey, topographic and geomorphic survey, population and economy questionnaire survey, etc. Its main purpose is to investigate the authenticity, legality, compliance, natural conditions, land use status and infrastructure status of the proposed remediation area, so as to objectively reflect the situation on the ground when compiling the project proposal. When it comes to natural conditions, landforms and landforms, land use status and distribution status of basic farmland, RS multi-scale and multi-source data intervention can be adopted from the overall and macro perspectives to obtain the required information more efficiently, comprehensively and in real time. Survey technology is usually small watershed project area is live km unit grid figure spot as the basic unit, including topography, soil, vegetation, hydrology, the basic indicators such as land use status quo, through the analysis and the depth of the secondary data processing for land development degree, development potential, new spatial distribution of arable land and water resources under the surface and shallow, transportation network, the distribution of forest distribution more detailed information, such as better provide data support for the follow-up construction. In this paper, the quality and reliability of the image provided by the commonly used smart mobile apps, as well as the resolution and scale of the data source of the smart mobile terminal map service will be used to determine whether the accuracy can meet the requirements of conventional geographical field work.

2.3 Spatial data processing, management and analysis functions of GIS

Before facing the application of GPS and RS in land reclamation engineering most for real-time acquisition and collection of data, and based on the application of GIS technology is through smart move side, to the class data space, and will have space according to the characteristics of this paper, data transformation, data and other survey data transmission to the GIS platform, for the acquisition of GPS, RS extract information for spatial data storage and management, form will help the construction of the electronic data and electronic maps, such as temperature data form of space distribution, the quality of agricultural land after land reclamation and other spatial distribution, based on the economic data of crop production capacity, etc., Can improve the whole construction process of the project, the project to produce economic, social, ecological and other benefits to provide strong evidence for the evaluation. Now can download for free in the related website numerous national geospatial data (the national administrative map, river system, the DEM elevation data, the types of vegetation distribution, landscape type map, etc.), through the GIS software can quickly share their own data resources to land reclamation project, thus understanding the large-scale renovation project area landform type, drainage, land use and other relevant information.

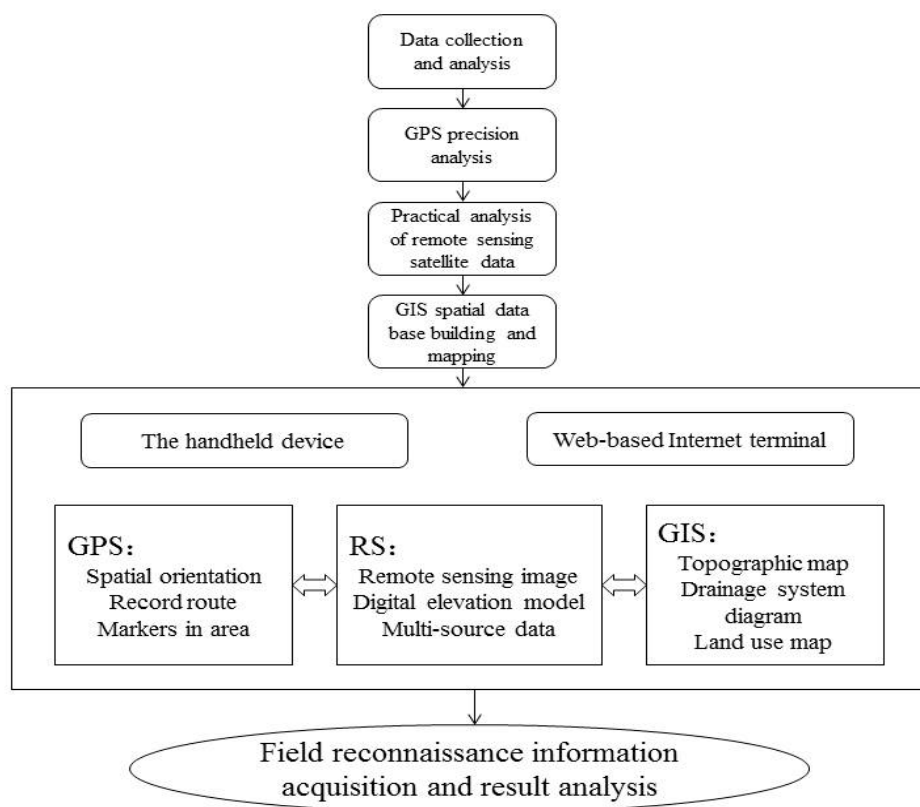


Figure. 1 Technical pattern design drawing

3. An application example of the new pattern

3.1 Overview of the research area

Baota district is located in the northern part of Shaanxi province and the central part of Yan 'an city. It is a transitional zone between hilly gully region and plateau gully region in the middle loess Plateau of Northern Shaanxi Province. It belongs to the middle and lower reaches of Yanhe river, a tributary of the Yellow River. The terrain of Baota district is high in the northwest and southwest, and the middle part is uplifted. In the territory, the loess beam and red basically show a continuous distribution, and gully and gully land interact and crisscrossed, the northern vegetation is poor, soil and water loss is serious, the southern vegetation is good, soil and water loss is slight. Taking matong Chuan land reclamation project in Baota District as an example, this paper conducts feasibility analysis and research on the application of 3S and intelligent mobile terminal combined with new mode of field reconnaissance in gulch reclamation project.

3.2 GPS data analysis -- Take Ove Interactive Map as an example

GPS is the main source of outdoor positioning information. At the same time, more and more intelligent terminals are embedded with this technology, aiming at adapting to users' diversified and multi-space positioning requirements. No matter indoor or outdoor, any scene and space can achieve better positioning. Most mobile phones already have this function, this paper USES the field

data collection of Ove Mutual Aid map to carry out the feasibility analysis.

Ove map is a multi-source, multi-format map tool that supports IOS, Android, and Windows, WindowsPhone and Web and other large platforms. It is a cross-platform map browser based on Google API, BaiduAPI and Sogou API, with real-time location, view, tracking, location sharing, information transfer, voice navigation, track record, ranging and area and other functions. The main technical advantages include cross-platform compatibility with multi-source data; Support multiple data formats and good compatibility; Navigation and communication integration and sharing; Easy navigation and application.

(1) Spatial positioning analysis

In traditional field survey, handheld GPS positioning is mostly adopted, and RTK achieves absolute position positioning. The following is a comparative analysis of some points in Matong Chuan Land regulation area, Baota District, Yan 'an city:

Table 1 Comparison of difference values of different acquired data

| The dot | With RTK | | With Handheld GPS | |
|--------------|--------------------|-------------------|-------------------|-------------------|
| | Latitude | Longitude | Latitude | Longitude |
| 1 | -0.00004684 | 0.00019800 | -0.00003607 | 0.00088271 |
| 2 | 0.00000151 | 0.00044930 | 0.00003208 | 0.00054128 |
| 3 | 0.00002516 | -0.00001100 | 0.00003727 | 0.00011370 |
| 4 | 0.00000390 | 0.00006022 | 0.00001058 | 0.00007599 |
| 5 | -0.00007329 | -0.00001315 | -0.00008031 | -0.00005243 |
| 6 | 0.00003434 | 0.00002163 | 0.00004265 | -0.00000351 |
| 7 | -0.00002592 | -0.00000694 | 0.00003535 | 0.00005645 |
| 8 | -0.00004279 | 0.00000277 | -0.00006619 | 0.00000487 |
| 9 | 0.00001375 | 0.00002763 | -0.00003087 | 0.00001567 |
| 10 | 0.00003854 | 0.00007621 | 0.00006243 | 0.00008253 |
| The mean | -0.00000716 | 0.00008047 | 0.00000069 | 0.00017173 |
| The variance | 0.00003809 | 0.00014428 | 0.00005008 | 0.00029981 |

From above the sample data of latitude and longitude of the chart can be analyzed and calculated results, the three-dimensional interactive map collection precision was lower than those of the other two, but the overall variance in the controllable range, precision figure also reflects the variance of the two small, ups and downs fluctuation is not big, the accuracy is about 10-6, latitude in 10-5, warp/weft after conversion difference approximate error for accuracy at about 4 meters, latitude at 2 m, and it is concluded that the three-dimensional interactive map in the aspect of data precision meet the requirements of field reconnaissance.

(2) Navigation route

Based on the application of GPS in another important function is to use the navigation function, we can quickly find the project area is located in the field reconnaissance destination, can real-time interaction on the map the identity of the route, the location of the key and the distance between around measurement, good to improve the efficiency of exploration in the field of, in addition, based on the three-dimensional interactive map of GPS navigation, you can cache the data in advance, when there is no communication signals in relatively remote place also can locate and tracing.

3.3 RS data analysis -- Take STRM-DEM data source as an example

In the preliminary survey of land reclamation project, the investigation of natural conditions is a very important work. Only the understanding of the natural environment of the area can better

ensure the follow-up construction progress of the project, which is also an important argument for the feasibility report of a project. Usually natural conditions including topography, geomorphology, soil, water, vegetation, climate, temperature, and other indicators, most of these factors is the macro, to get the data information, we can only rely on remote sensing image, so that it can be real-time, dynamic and large-scale acquisition, because now a lot of the emergence of high resolution images on the accuracy of the information, also become more detailed resolution, reliability of the information is greatly improved.

Table 2 Field survey index parameter table

| Survey Content | Gathering Indicators |
|----------------------|---|
| terrain | Elevation, slope length, slope, slope direction, etc |
| soil | Type, texture, thickness, layer |
| vegetation | Species, hierarchy, vegetation coverage |
| The land use | Type, quantity, spatial distribution |
| hydrological | Surface water distribution, groundwater distribution, rivers, water situation |
| Engineering measures | Gully management project, vegetation slope protection project |
| Farming system | Straw mulching, crop rotation and intercropping |

(1) Reliable data source type analysis

Reconnaissance survey in the field, intelligent integration of multi-source geographic data in mobile devices, including half of satellite remote sensing data, aerial photography, digital elevation model data, traffic road map, administrative map, drainage distribution thematic map, soil type thematic map, etc., these data sources belongs to the field of various industries, also have different storage format, but also often in order to avoid a lot of field reconnaissance carry paper maps, you need to all kinds of heterogeneous data source integration in intelligent mobile terminal services for us, For example, Google Earth, Baidu Map, Ove Interactive Map and other mature map data interactive app. However, under the premise of guaranteeing the quality and accuracy of all kinds of data based on OGC standard, standard format can also be used for cross-platform transmission and transformation, so that field explorers can obtain high precision and share high data information under the conditions of different devices and different apps.

(2) Resolution of data source

The resolution of remote sensing data and geographic data sources integrated by different intelligent mobile terminals is different. It relies heavily on the satellite behind the remote sensing data, and the data quality, scale and scale obtained by different satellite parameters and shooting lens are also different. So far Google Earth can provide high resolution satellite images, a global scale free client software, has the massive satellite image storage and processing technology, simple operation, powerful function, support secondary development [] zyGoogle Earth provide multi-source data, satellite images, aerial data, photos, digital elevation model (DEM), data stream data, contour data, etc., is a multi-source, multi-scale, multi-resolution, long phase of data volume. Can also be based on time axis through time module at the same place and get with the position of geographic data information under different time, can let we learned in the present engineering construction region of space-time change situation, found that the change of the image space resolution and time resolution, can do related analysis based on the feature and application. Due to the use need VPN, so at home when we work on field reconnaissance, can replace use the interactive map, he is to such as baidu, Google, Bing, OpenCycle data provider of data integration, functional and powerful.



Figure. 2 Satellite images of different time series

3.4 GIS data analysis -- taking various thematic data sources as examples

Based on spatial data source of GIS in the field reconnaissance survey work can according to different project and needs, improve the vector data and a lot of rich POI (interest) data, provide a lot of detailed property data, labeling requirements by the point in the field, can also be colleagues attribute data, and save it management, follow-up through the export the data mapping and produce all kinds of auxiliary project type map. By collecting and inputting results in real time and using algorithm annotation with address reverse translation, the efficiency can be greatly improved and the cost can be reduced.

(1) Integration of thematic data

Commonly used based on the thematic information of PoI vector data including water distribution, based on DEM extraction elevation contours of topography, vegetation coverage map based on remote sensing data extraction, administrative map, the temperature distribution, and so on, some using satellite remote sensing data extract vector thematic information, the other part is according to the properties of the field collection, document information form data with the help of GIS platform on formation of secondary processing and thematic data information, the information based on GIS data sources are play a key role in the field reconnaissance work, due to the different to the intelligent mobile app data provider, With the help of integrated platform apps, such as Ove Interactive map, the required data can be supplemented to each other to achieve the exchange of needed goods.

4. Conclusion

With the continuous development of information technology, the traditional reconnaissance means and methods in the field of land reclamation engineering also needs to be updated in a timely manner, to learn more intelligent, convenient technical tool and thought, based on the intelligent mobile terminal equipment and the combination of 3 s technology thought, with the tools of map

service APP, form a kind of new technology of field reconnaissance and working mode, and analyzes the feasibility of the method, reliability, richness and accuracy. Using integrated positioning navigation system (GPS), remote sensing (RS) and vector map (GIS) data of the intelligent mobile terminal equipment, combined with the characteristics of 3 s integration, making navigation and positioning to give accurate location information and track service, remote sensing image can be intuitive features real character and environment, vector map simple purpose is strong, the various technical means and multi-source data to support the common to deal with land reclamation engineering field reconnaissance in the phase of the work task.

In addition, in the implementation of the new mode, the intelligent mobile terminal serves as an important medium and tool, and its performance, function and implementation effect are the key. Only when the positioning accuracy is within the acceptable range of error, can the function replacement be truly realized. The support of geographic data, such as satellite remote sensing data, terrain data, etc. At present, the Internet provides a large number of remote sensing images, terrain and other geographic data, so it is particularly important to scientifically judge the source, accuracy and timeliness of these images. Mobile map service has become an important application to realize location-based service in people's life. Under the basic premise of location-based service, different information with different emphasis can be collected through these maps and different DATA can be mastered through different POI. The development of intelligent mobile terminal operation APP tends to be specialized and refined. In particular, the development of mobile map service has changed the traditional geographical field work mode, freeing up part of human resources and replacing some tedious tools and maps. Through the analysis of map-based APP data sources, their scales and resolutions, Internet maps can meet the needs of conventional field planning routes, visual observation and data collection. With the help of new communication transmission means, the collected data is uploaded and Shared, which makes the field data processing work change from a single-line operation to a two-way interaction. Big data on the online Internet and rich Internet maps become a strong background and data support for geographical field work. In this way, the combination of several can be better, more efficient, more quality of support and land engineering.

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