Study on Graduation Design of Undergraduates Majoring in Geographic Information System

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Abstract—Graduation design is an important part of undergraduate education, and it's a summative display of the undergraduate education quality. In this paper, on the basis of investigation, the current situation of GIS (Geographic Information System) major undergraduate graduation design was analyzed, and the deficiencies are summarized. Combined with major development, the requirements and standards of GIS major graduation design were researched, and the corresponding working method of graduation design was put forward, these works can be a good reference for development of GIS major.

Keywords—Geographic information system; undergraduate; graduation design

I. INTRODUCTION

The undergraduate major of Geographic Information System (GIS) has been established in Chinese colleges and universities for 20 years. Throughout the development in the past 20 years, it can be seen that the starting point and foundation for the establishment of this major are not the same among colleges and universities, which can be roughly divided into the following types: the first category is the geographic information system major created on the basis of the original surveying and mapping discipline to adapt to the development of informatization, such as Wuhan University, China University of Mining and Technology, Liaoning University of Engineering and Technology, etc; the second kind is established according to the development trend of geography on the basis of the original geography subject, such as normal university; the third category is developed on the basis of the typical application fields of geographic information systems such as transportation, agriculture, forestry and tourism, such as Shandong Jiaotong University and agricultural colleges. It is precisely because of the different foundation, starting point and subject of running a school, as well as the fact that geographic information system itself is an intersecting interdisciplinary subject, that the understanding, requirements and implementation of graduation design of geographic information system majors in colleges and universities are different. However, it should be realized that no matter in what kind of environment, the graduation design of geographic information system major should still start from the knowledge system of this discipline, training program and talent market demand, so as to establish a scientific and reasonable guiding ideology and implementation program of graduation design [1][2][3].

II. THE DEFICIENCY ANALYSIS OF THE CURRENT GRADUATION DESIGN WORK OF GEOGRAPHIC INFORMATION SYSTEM MAJOR

From the characteristics of graduation design work itself, it is not only a summary of the university undergraduate stage learning results, but also on the basis of the existing learning results to make a breakthrough and innovation, at the same time, the design results should also have a certain degree of practicality, that is, graduation design should be the unity of knowledge, innovation and practicality. According to this standard, the analysis of the current undergraduate graduation design work of geographic information system major in colleges and universities reveals the following deficiencies:

A. Deficiencies of Knowledge

For the major of GIS, it is relying on the subject of geography, cartography, surveying and mapping science, computer science and technology, but on this basis, it has its own subject system and knowledge system, it mainly studies the connotation of the geospatial information, management and use, therefore, should highlight the geographic information system in the graduation design subject knowledge. However, in the current work of graduation design, we find that a large number of graduation design of geographic information system major focuses on surveying, mapping and other directions, which has to said that there are certain deficiencies in knowledge.

B. Deficiencies of Innovation

Lack of innovation of the graduate design for GIS major mainly reflected in two aspects. One is the graduation design for the application of innovative shortcomings, GIS has been applied in the process of the development of the first is the shortest path search, graphical cadastral data management, traffic management, and other fields, but we found that, after years of development, the vast majority of GIS undergraduate course graduation design topic is still wandering in these areas, lack of innovation in the field of application. Secondly, the technical route adopted in the graduation design is not innovative enough [4]. So far, the development of geographic information system has been divided into four parts in terms of technology, one is desktop geographic information system, the other is component geographic information system, the third is network geographic information system, and the fourth is embedded geographic information system. Statistical analysis
of the graduation design topic, we can see that most of the current graduation design are still focused on desktop geographic information system and component geographic information system, and the network geographic information system and the proportion of embedded geographic information system is very rare, but the two technical direction are the current hot spots of geographic information system development.

C. Deficiencies of Practicality

At present, the biggest obstacle to the application of information systems is the lack of practicality, which often leads to the embarrassment of "too much ornamental value, too little practicality". This is also inevitable in the use of geographic information systems. From the point of view of the results of graduation design, also reflects this characteristic, many of the results of graduation design can only meet the basic laboratory demonstration, whether from the technical route, data basis, operation environment or the actual role to investigate, basically do not have the value of promoting practical. Of course, the reason is that there is a basic constraint that students do not have the conditions to obtain basic data completely in the process of graduation design, and they do not have the opportunity to debug the results of graduation design in the practical application environment. This difficulty remains to be overcome by schools and teachers to help students [5][6].

D. The Cause of These Deficiencies

In the process of graduation design, there are some reasons for these deficiencies, which are embodied in the following aspects:

Firstly, the direction of mayor development is unclear. In China, the universities which established GIS mayor include three sources: base on GIS, base on industry application and base on geography education, as shown in TABLE I.

<table>
<thead>
<tr>
<th>Category</th>
<th>Numbers</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base on GIS</td>
<td>3</td>
<td>Wuhan University</td>
</tr>
<tr>
<td>Base on industry application</td>
<td>49</td>
<td>China University of Geosciences</td>
</tr>
<tr>
<td>Base on geography education</td>
<td>68</td>
<td>Beijing Normal University</td>
</tr>
</tbody>
</table>

It is because GIS majors in various universities rely on different foundations, which made the mayor development directions different in various universities. For example, universities which based on industry application pay more attention to the practical application in their background industries, universities which based on geography education pay more attention on the principles of geography. The difference of focus leads to the difference of training emphasis and the defect of graduation design in some aspects.

Secondly, insufficient of teaching staff. The major of GIS has been established for a short time, so the number of high-level talents such as doctor or professor is extremely rare compared with other traditional majors. But the introduction of teachers in colleges and universities requires a high degree or professional title, which makes the construction of GIS major teachers in colleges and universities face great difficulties. The dilemma of teacher staff construction is also reflected in another aspect, that is, at present, many teachers majoring in GIS in colleges and universities are transferred from related majors such as geography, surveying and mapping engineering, remote sensing, land management, urban and rural zoning, etc. The difference in academic background leads to the difficult transformation of many teachers in academic direction. This phenomenon makes teachers of GIS major have some shortcomings when guiding students' graduation design.

Thirdly, Deficiencies of practical teaching equipment. As a major that pays equal attention to both theory and practice, and requires high practical ability, the major of GIS has high requirements for practical teaching environment and equipment in the process of running a school. In the process of graduation design, it is necessary to have data acquisition equipment, computer room, and large number of relevant professional software, a large number of valuable professional instruments and equipment, such as digital photogrammetry system, color drawing system, graphics workstation, etc. However, due to the constraints of internship conditions, students may not be able to obtain the use of these devices in the graduation design process, which, to a certain extent, limits the results of the graduation design.

III. ANALYSIS OF REQUIREMENTS FOR GRADUATION DESIGN OF GIS MAJOR

Aiming at the shortcomings of the current geographic information systems mayor graduation design, considering the project of cultivating professional knowledge system, and talent market demand, we can claim to the graduation design is analyzed and summarized, namely the geographic information system professional undergraduate graduation design should be the unity of technical, creative and practical.

From the technical requirements, graduate design should be just around the two major focus of geographical information system, one is the spatial data organization and management, the second is the development and application of geographic information system, so as to creatively put forward some graduation project propositions, in order to avoid the design subject limited to some traditional geographic information system application field.

From the perspective of innovative requirements, the creative thinking of instructors and students should be given play to on the basis of full research to expand the application field of geographic information system, so as to creatively put forward some graduation project propositions, in order to avoid the design subject limited to some traditional geographic information system application field.

As far as practicability is concerned, many information systems, including geographic information system, are often criticized for their excessive ornamental value and insufficient practicability. Needs us to solve the short board, in the process of graduation design more visit to the actual production environment, the demand of the real mining application unit.
and use of process, completes the design of requirement analysis and software engineering, the graduation design of the practical performance is greatly improved, so that the graduation design is not only a summary of knowledge, but really has a certain practical design, in recent years, many schools through cooperation in running schools between colleges and students went to production line for graduation design, hire a mentor for the graduation design related enterprises and technical personnel and good results have been achieved on this issue, worthy of our reference and promotion.

IV. OBJECTIVE DESIGN AND SCHEME DESIGN OF GIS MAJOR GRADUATION DESIGN

A. Object Design

The object is the guidance point of graduation design work, so object design is the key step of whole graduation design. Based on the above analysis, we can design the object of GIS major graduation design. It includes the following aspects:

The test of learning achievement in undergraduate period. As the last important training link in the undergraduate stage, the graduation design should be able to test the professional knowledge in the undergraduate stage. The main areas of expertise in GIS major include spatial data acquisition, spatial data store and management, application system development, the graduation project should contain these three knowledge fields comprehensively. For the spatial data acquisition, it can be accomplished by total station mapping, GPS, remote sense, or screen vectorization, for the spatial store and management, it can be accomplished by spatial database management software or GIS platform software, for the application system development, it can be accomplished by GIS application software develop tool, such as ArcGIS, SuperMap, etc. In a word, the graduation design should cover the subject knowledge field of GIS major in undergraduate period, the test of learning achievement in undergraduate period object can be realized [8].

Comprehensive application of professional knowledge. As an interdisciplinary subject, GIS major has a complex technical systems, the object of graduation design should highlight the comprehensive application of each technical link, that is to say, for the proposition of graduation design, multiple knowledge links need to be integrated to solve the problem, rather than just solve a single problem. For example, the typical problem of GIS application, site selection problem, if the task of graduation design is this problem, spatial data process, digital mapping, spatial analysis, and other related technology will be used to solve the problem, that means comprehensive application of professional knowledge.

Lay the foundation for future work. After graduated, most students will sign up to work, the graduation design is the last and important chance for them to improve professional skill, and is also an important chance to lay the foundation for there future work, so the graduation design must consider their future career development. This object required to consider where students will work in the future. The students in GIS major have four main destinations: study for a master degree, data engineer, application engineer, development engineer. For the four different career, we need to highlight different features.

For the students which go to study for a master degree, the graduation design task should highlight the scientific and exploratory, to help them carry out scientific research in the future. For the students which will work as a data engineer, the graduation design task should highlight the data acquisition, store and management, which means we can set more design mission in the step of spatial data process, such as spatial database design and application, or use the survey equipment to get spatial data. For the students which go to work as an application engineer, the graduation design task should highlight the combination of specialty and application, in particular, we should pay attention to make students understand the specific application industry, for the application of information technology, the level of understanding of the application industry determines whether the application can be successful, in the process of graduation design, students should have a deep understanding of this point. For the students which to go work as a development engineer, the graduation design should highlight the program develop ability, students should accomplished all the code, on this issue, special attention should be paid to the adoption of mainstream industry development tools, so that students can successfully enter the industry after graduation.

B. Scheme Design

Scheme design of graduation design include four aspects: title set, tutor equip, process monitor and defense organization.

Title set should highlight several key points: scientific, practical and feasible. The scientific means that the graduation project title can represent certain scientific difficulty, meet the requirements of undergraduate teaching, can represent the professional standards of a qualified undergraduate, and the title can contain enough work and have appropriate difficulty. The practical means the work of title can be used in future practical work. Tutor is the key factor of graduation design, they are responsible for guiding the students to complete the task, because GIS major is a multidisciplinary, we can have multiple teachers for each student, and these teachers are good at different subjects, they work together to guide students accomplished their graduation design task. The graduation design lasts for half a year, so the process monitor is necessary, we can monitor the process in the form of weekly reviews or meetings, summary or meeting content recorded into a file for optimization at any time. Defense organization is the last and important link of the whole graduation design work, this is an assessment of student work, the defense team shall be composed of 2-7 persons, and the leader shall have the title of associate professor or above, the student's score is jointly determined by the defense team, the student's defense is composed of two parts, one is the student introduces their own work content, the other is the defense team according to the student's report to ask questions, then the student to answer these question, the total time should be no less than half an hour. The final result shall be approved by the chairman of the defense committee

V. CONCLUSION

As a developing interdisciplinary, the cultivation of GIS major undergraduates is a process of continuous development and innovation. For improve the quality of graduates, the
whole process of teaching needs careful organization and planning. In view of the important training link of graduation design, we should strengthen the training from the perspectives of technology, innovation and practicality. Based on the professional knowledge system and facing all the fields that the major can serve, we should consolidate the foundation and make bold innovation, which is the right way to cultivate comprehensive and excellent undergraduate graduates.

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REFERENCES


