Application of Computer Aided Mapping Technology In Urban Planning

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Abstract. Since entering the 21st century, computer has been fully developed and applied in the field of engineering design. Urban planning, a highly professional work, has its unique characteristics. This paper analyzes and discusses how to better combine computer and urban planning.

Keywords: Urban Planning, Auxiliary Design, Digitization

In recent years, with the rapid development of China’s economy and the increasing efforts of urban construction, urban planning has become the leader of urban construction, and urban planning has been vigorously carried out. However, there are great differences in the working methods of urban planning and design work in different regions and units, and many problems will be encountered in the design work. Different design methods will lead to the difference between the advantages and disadvantages of design results. This paper presents some views on the application of the combination of urban planning and computer-aided design [1]. The results of urban planning are basically composed of two parts: planning drawings and text description. The planning drawing is the most intuitive thing in the planning. The planning drawing design can be roughly divided into three stages: preparation stage, production stage and completion stage. Now the working procedures of each stage are analyzed as follows:

1. Research methods and technical process of system development
The system is divided into three sub-system modules by modular method, and each module is relatively independent for the convenience of development and maintenance. In the development process of the system, the following research methods are mainly used.

1.1. System analysis
Urban ecosystem is an open and complex giant system. It is very difficult to identify each component of the system clearly. Therefore, it is necessary to explore the ecological planning approach to solve the problem by using the analysis method of system theory, starting from the overall problems of ecology and system, centering on the ecological problems, so as to systematize the problems at all levels [2].
1.2. Qualitative and quantitative methods
It is difficult to quantify the planning research, which has been a big problem for the scientificity of urban planning academic research. The system combines environmental assessment and ecological factor evaluation to determine the planning model, which combines quantitative and qualitative methods.

1.3. Introduction of related disciplines
On the one hand, learn from the successful experience of some ecological city planning, combined with the reality of Harbin ecological planning, form a set of planning methods suitable for the ecological construction of Harbin; on the other hand, introduce the theories of relevant disciplines (such as ecology, economic geography, landscape science, urban science, regional geography, system engineering, etc.) to solve the urban ecological planning problems [3].

2. Specific process of system development
The system development process is shown in Figure 1.

![Technical flow chart of system development](image)

Figure 1. Technical flow chart of system development.

3. General conception of system development
The research content of this system involves the current situation evaluation, planning analysis, planning prediction and other stages in the process of urban ecological planning and construction. Therefore, it is an information system, that is to collect, input, store, transform, sort and calculate the information, and output it in various forms (screen, chart, drawing, etc.). In this system, two types of information, data and graphics, are mainly stored and processed. From the analysis of the work content
and information processing process of urban ecological planning and construction, the structure process of the system can be more clear, as shown in Figure 2.

Figure 2. System structure flow chart.

4. Preliminary preparation stage
The preparation stage is the most important stage. Whether it is well prepared or not will directly affect the planning results.

4.1. Collect status map
Urban planning is a science, the more detailed the planning, the more strict the requirements of the drawings, the smaller the error should be. Digital electronic map is the topographic map with the smallest error. Therefore, if possible, electronic map should be used as planning topographic map. Then it can be directly imported into the CAD software for use [4].

4.2. Digital scanning of raster drawings
After years of preservation, the paper topographic map will have a large deformation, and at the same time, it will have a certain degree of deformation when the drawing is scanned, resulting in the increase of its error. In addition, the paper topographic map can also be digitized, but it takes a long time and costs a lot, and it can not solve the problem of large error. The best way to deal with paper maps is still "scanning".

4.3. Raster image trimming, splicing, CAD software correction
In urban planning, ten to dozens of topographic maps from 1:5000 to 1:50000 are often needed to be used. The mosaicking that can reduce the error is completed by using some domestic "urban planning software". These softwares are developed on the platform of "Auto CAD" and have the function of processing raster map. You can use "direction correction" and "coordinate correction" to adjust. At this time, each drawing will be adjusted to the minimum error state according to its own coordinate position. However, this method also has some disadvantages. If the raster images inserted separately are larger than the view frame frame, they cannot be clipped. Another method is to use special image processing software to make a complete topographic map, and then insert the design software for correction. However, the disadvantage is that the error is large because of the large correction area.
However, for large-scale "urban master plan", it does not need high-precision terrain. Therefore, I suggest that the second method should be used in urban master planning or zoning planning. When making regulatory detailed planning or constructive detailed planning, electronic map should be selected first. Secondly, they select the first raster processing method.

The second method also has some advantages. For example, when the drawings are put together in the image processing software, the use of them will be affected because there are some "spots" on the drawing surface during the scanning process [5]. At this time, we need to use the software "remove the clutter" and other functions. "Automatic removal" can be used for scattered spots, and "manual removal" can be used for continuous pieces. The lines in the image mosaic can also be deleted. After these works, the raster can be used as planning and design drawings. In the process of using AutoCAD, the raster map will not be damaged. Moreover, the raster topographic map with large capacity will not be damaged. It is also much faster than the vector graph with the same capacity.

5. Production stage
The use of computer to complete the design of planning drawings has the advantages of high efficiency and repeatable adjustment. But in the production stage of planning, the speed is related to the proficiency level. The following five steps are the work content in the production stage.

5.1. Analysis and evaluation of current regional space and determination of development direction of spatial structure
After the topographic map is processed, the first thing to do is to make the current situation map. The status map is basically made according to the feature mark on the topographic map, but according to the surveying and mapping time of the drawing, it is necessary to supplement the surface feature changes after the mapping. Then according to the current situation map, the paper analyzes the development direction, spatial constraints, land use evaluation and so on. These analyses can only be done manually. The "urban planning" software can only provide the calculation of the current land use. The accuracy of these calculation results is very high, and the minimum unit can be "square millimeter", which is better than the labor volume drawing. It's much higher. Moreover, the measurement speed is very fast.

5.2. Conception and demonstration of single line network system
In the stage of making general plan, the advantages of auxiliary design are obvious. On the terrain, a road network structure is formed by single line first, and then feasibility analysis and demonstration are carried out, which avoids repeated work.

5.3. Conception and demonstration of land use structure
After the road network is determined, the land use structure is conceived. Through the use of "urban planning" software, we can immediately and quickly calculate the land use index, and then confirm the total amount of land and per capita index. It is also easy to adjust after demonstration.

5.4. Form general plan
After the auxiliary facilities and surrounding land use are expressed, the "general layout plan" can be formed. If it is a detailed planning, after this stage, we can make a bird's-eye view. Similarly, the use of three-dimensional production software can be from different angles, different locations after the completion of the landscape, intuitive and vivid.

5.5. Index calculation and feasibility demonstration
After the "general plan scheme" is formed, the land use indicators are calculated to form the final demonstration results, and then the results can be submitted after modification.
6. Completion stage
In fact, the completion stage is the stage in which the planning results are adjusted on the computer. It is impossible for every plan to be comprehensive, but the goal we are pursuing is "all-round". After listening to the opinions of all parties through the review meeting, it is very important to make strict amendments. Once the planning is confirmed, it is a legal document, which guides the development of a town for more than ten years. In the past, it was very troublesome to modify the planning after the review. For major changes, it was necessary to draw several or more drawings manually. Each drawing took about a week to complete [6].

Computer plays a very important role in the application of urban planning. Computer plays a very important role in the application of urban planning. It not only improves the efficiency, but also makes our work more intuitive, more accurate and easier to implement. Its application plays an important role in the development of cities and the improvement of people's living standards in China. Therefore, planners should be more proficient in the use of computers in order to make the achievements more mature.

7. Conclusion
With the continuous development of science and technology, mathematical methods and computer technology are more widely used in urban planning, which plays a more effective auxiliary role in the design of urban planning. In the future development of urban planning, designers need to integrate computer technology and mathematical method technology into urban planning, and combine them organically, so as to ensure the rationality of urban planning and provide better living environment for people.

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