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A Method of Segmentation and Organization of Multi-section Video Data

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Abstract

The purpose of this invention is to provide a method for the segmentation organization of multi-section videos based on GPS in the GIS (Geographical Information System). The topological relationship is gained by integrating the geographical information with the video information, extracting the information of nodes in the road network and every section. By segmenting and organizing the videos according to the topological relationship to obtain rapid retrieval and positioning between the geographical coordinates and the video frames so as to provide roaming based on the actual scene for users. This invention is mainly suitable for the application of GIS based on videos in the traffic management. With this method, GPS positioning information and real-time collection & video playback of the road video images can be realized, including searching & positioning and synchrocontrol with E-maps of videos.

Keywords- GIS ;GPS; the geographical information; the video data (key words)

1. Introduction

GIS refers to a type of technological system about the scientific management and the synthetical analysis of geographical data which has the space content to provide management, inquiry, computation, analysis and visualization of the geographical data. Not only is it convenient to search and analyze the road information that supervisors are interested in, but also to manage and share the information by introducing GPS and the full-range video images of roads into GIS so as to develop the video GIS suitable for the road networks. The use of the road videos GIS based on GPS in the emergent traffic accidents makes us rapidly know the various situations of accident sites and work out the effective emergency response plans. It is significant to develop the road video GIS based on GPS, therefore, it is one of the important factors that worth consideration for the videos GIS about how to effectively integrate the geographical information with the video data.

2.   Details

This invention presents a method of multi-section video segmentation, to speak specifically, which is the one of segmentation management of the geographical data and video data in GIS. This method includes two parts: see Fig1.
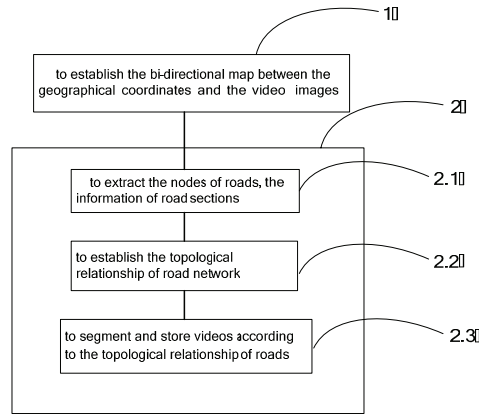

Figure1.

1) establishment of map between the geographical coordinates and video images, i.e., the map among the geographical location (X,Y), mileage(M) and video frame(F) see Fig2.
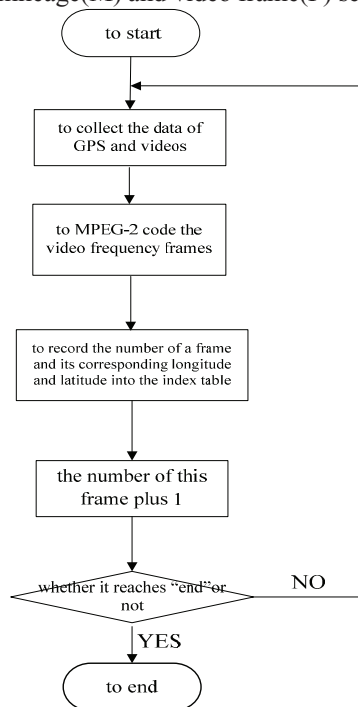

Figure2.

2) segmentation of multi-section video data based on the road network. The processing of segmentation of the video data can further be divided into

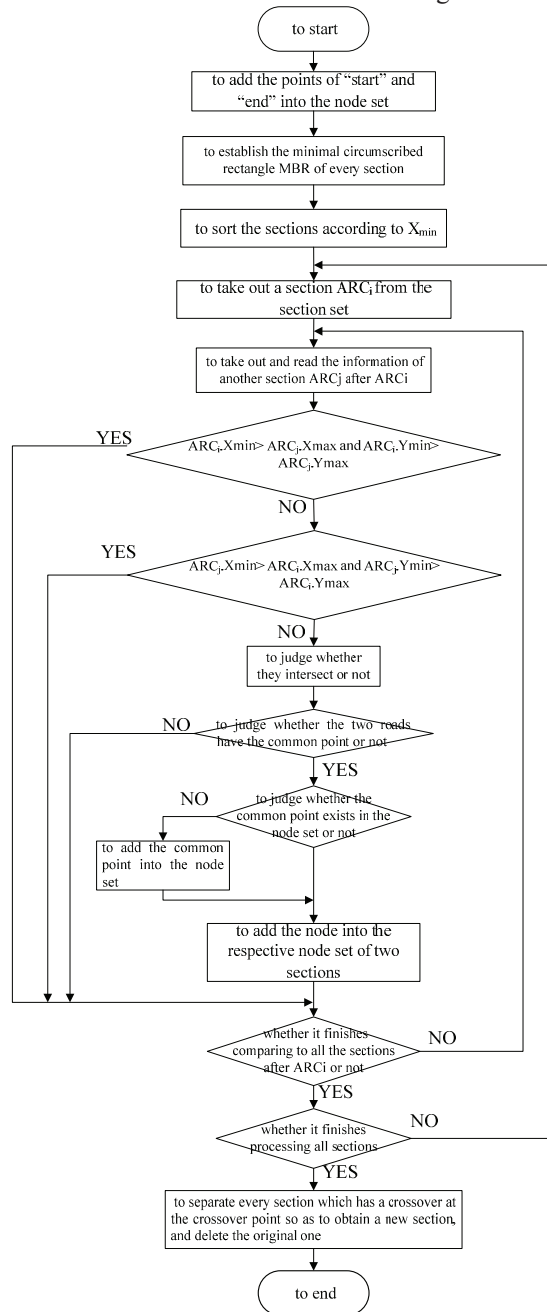*a)* extraction of the road nodes and the sectional information . see Fig3

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                    ┌──────────────┐
                    │   to start   │
                    └──────┬───────┘
                    ┌──────┴───────────────┐
                    │ to add the points of │
                    │ "start" and "end"    │
                    │ into the node set     │
                    └──────┬───────────────┘
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to add the points of "start" and "end" into the node set

to establish the minimal circumscribed rectangle MBR of every section

to sort the sections according to X_{min}

to take out a section ARC_i from the section set

to take out and read the information of another section ARC_j after ARC_i

$ARC_i.Xmin> ARC_j.Xmax$ and $ARC_i.Ymin> ARC_j.Ymax$　YES

NO

$ARC_j.Xmin> ARC_i.Xmax$ and $ARC_j.Ymin> ARC_i.Ymax$　YES

NO

to judge whether they intersect or not

to judge whether the two roads have the common point or not　NO

YES

to judge whether the common point exists in the node set or not　NO

to add the common point into the node set

to add the node into the respective node set of two sections

whether it finishes comparing to all the sections after ARC_i or not　NO

YES

whether it finishes processing all sections　NO

YES

to separate every section which has a crossover at the crossover point so as to obtain a new section, and delete the original one

to end

Figure3.

b) establishment of the topological relationship of road network . see Fig4
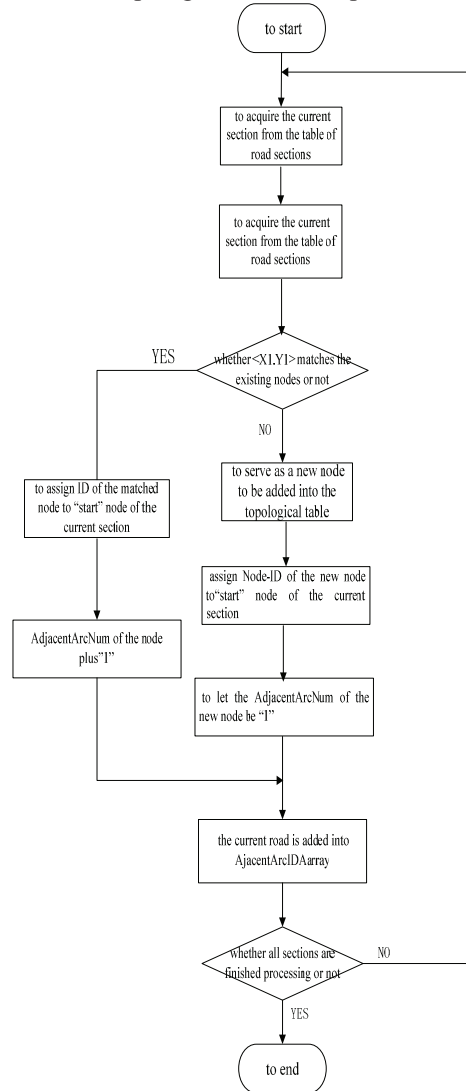

Figure4

c) segmentation and storage of the videos according to the topological relationship of roads.. see Fig5.
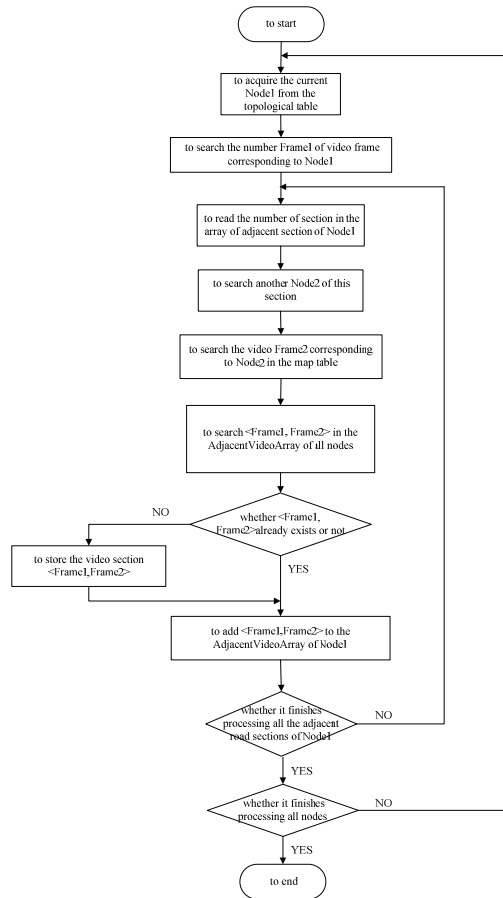
Figure5.

The following, combined with graphs, is the details of this invention

 The first part is the collection of GPS data, the video data and the bi-directional map.

In the process of data collecting, the real scene and geographical data are obtained by adopting GPS and the video-collecting card. The video-collecting card collects 30-frame images per second, after collecting every frame, the data is conducted compression-coding according to the MPEG-2 video standard, and the basic information of this frame, including the frame number, the collecting time and so forth, is recorded into the XML index file. Meanwhile, the GPS positioning information recorded once per second, as well as the subsequent extracted longitude and latitude are recorded into the XML index files. The collected video images are put into the video images library in the form of video files, while the correlated information is put into the index file according to an increasingly consecutive order when collecting the road video information, the data must be conducted the real-time compression-coding due to the great amount of information. In addition, the MPEG-2 compression-coding is adopted in order to attain a higher image quality. The resolution of the coding image is 720X576.

The second part is the method of video segmentation and organization based on the road network topology.

During the process of data collecting, the collected videos are likely to be repeated, and thus causes the redundancy of data due to the coexistence of multiple sections on the pictured roads and crossovers among

these roads. This invention first extracts the nodes of road and the sectional information according to the collected GPS data, as well as adopts Arc-Node model to organize the road data, and then the topological relationship of the road network is generated. Meanwhile, in the process of roaming, it is necessary to quickly obtain the videos corresponding to the current locations. As shown in Fig.1. There are repeated sections in the process of data collecting, which leads to the redundancy of data, and effects the real-time positioning and searching of videos in the roaming process. Therefore, it is a must to segmentally processing the collected video data according to the geographical information so as to realize the rapid positioning of the videos with the geographical information. In GIS, the content of video data attaches to the geographical location of road. Hence, rapid piecewised processing of video can be attained by analyzing and processing the geographical coordinate in terms of the mapping relationship between the geographical locations and videos..

3.   Conclusions

Generally speaking, it is one of the important problems existing in the field of GIS about how to design a method of segmentation of multi-section video data so as to achieve the rapidly interactive retrieval of the geographical information and the video data.

Compared to the present technological method, the good effects of this invention---the collection of data and the method of management in the video GIS are:

A. To generate the bi-directional map between the geographical coordinates and the video frames through the real-time collection.

B. In the process of extraction of road nodes and sections, pair-wise comparisons of all sections are avoided, the efficiency of processing is enhanced by conducting judgment of intersection for the minimal circumscribed rectangle in the first place. Meanwhile, the method that is adopted to firstly acquire crossover points of all sections, then to conduct segmentations, avoids sorting many times for the sections information in the processing.

C. To conduct segmentation for the full-range pictured videos according to the topological relationship of roads, and store the results into table of topological relationship so as to facilitate the positioning of videos in the process of roaming.

4.   References

[1]   Geoff Blewitt, "Intelligent Positioning: GIS-GPS Unification," Wiley, May 19, 2006..

[2]   ThomasK.Poiker, and J.Patrick Moore, "Integrated Geospatial Technologies: A Guide to GPS, GIS, and Data Logging," Wiley , September 22, 2003

[3]   Christian Harder, "Serving Maps on the Internet: Geographic Information on the World Wide Web ," Esri Press , July 28, 11998.