

APPLICATION OF GIS IN ESTABLISHING 3D MODEL FOR SPATIAL URBAN MANAGEMENT AT THUAN THANH WARD, HUE CITY, VIETNAM

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ABSTRACT

The goal of this research is build 3D-GIS map current and from that to manage spatial urban at a ward belong to Hue city – a tourism and heritage city – central region of Vietnam. Base on the cadastral map, all of data, including spatial and attributes was changed to shape file format to use in ArcMap and ArcSence. Then, by the survey and collecting secondary data, the research indicates the conviction in space of building. Among 600 houses of research area, there are 104 building overlap outside of constructional boundary and 5 houses violate in high space (higher than rules for heritage area is 11 meters)

The management of spatial urban in 3D –GIS environment help planners to have a reality view about the real world which they give suitable orientations for planning and renovation of urban areas in the future and give a warning for constructional activities.

Keywords: 3D –GIS map, Spatial Urban Management, ArcMap, ArcSence

1. INTRODUCTION

Nowadays, Hue city is developing rapidly and this development drawing people come to city more and more. This situation is one of reason make the urban management has many difficulties likes: traffic jam, environmental pollution, spatial urban planning...etc. Especially for within the city an area there is a limit about the high of constructions due to the Royal place (a cultural heritage). There are many offences in urban management recorded in the past.

Until now, the main methodology to manage in spatial urban is rely on 2D map, drawing and the state's documents. These documents not present the situation of trees network; electric system, blank space in urban and the high of house. In front of this challenge, change in the management in urban is necessary. Therefore, GPS; GIS and the development of 3D-GIS are one of best choice to solve this problem. Mapping 3D map to server spatial urban planning is very meaningful and very important for managers have real vision and make good decision.

2. MATERIAL AND METHODOLOGY

2.1. Research area

Thuan Thanh is one of 4 wards in the city itseft- in the north of city-with the area is 104.98ha (16^o28'10" N and 107^o34'14" E). In general, the landscape of Thuan Thanh is quite beautiful and well-ariied due to there are many trees long the road as well as there are many beauty spots and tuorist places as citadel, place of State worship.

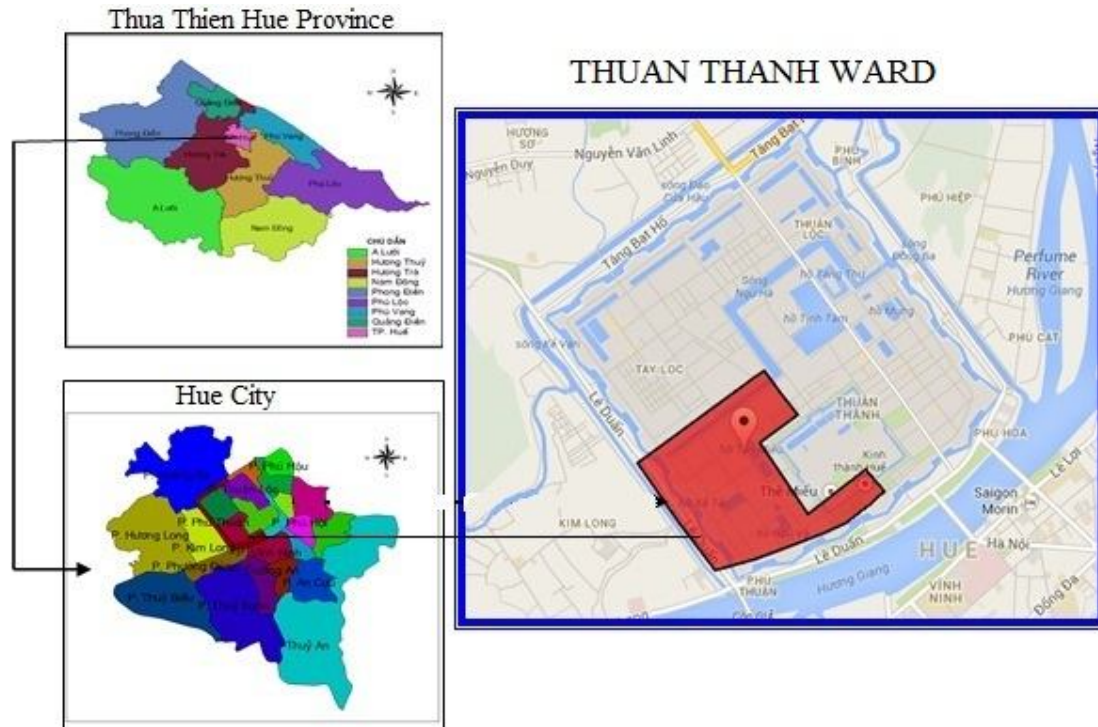


Fig 1. Research area

2.2. Material

- Spatial data: 31 cadastral maps with scale 1/500 established in 2010 and current land use map in 2010 from Department of land management of city.
- Attribute data: Land use information like: Name of house owner; address; high of house; legal situation; data of land use changed; trees network and traffic system. All of data updated by state office yearly.

2.3. Methodology

2.3.1. Data collecting

- Secondary data: Collect the eco-social data of Thuan Thanh ward by yearly report. Edit the kinds of map related with the research, include: Topographical map; cadastral map and land use map.
- Primary data: Check the accuracy of data; revise and supplement the spatial data and attribute data by survey with GPS technology. Interview household and officer who has responsibility in urban management. In total, we interviewed 73 people by semi-structure questionnaire

2.3.2. GIS and 3D Map

Rely on basic map in 2D format, all of data transfered to 3D format and present by 3D-GIS. Attribute linked with spatial data by location (point) is the center of house.

This method presented by diagram is as belows.

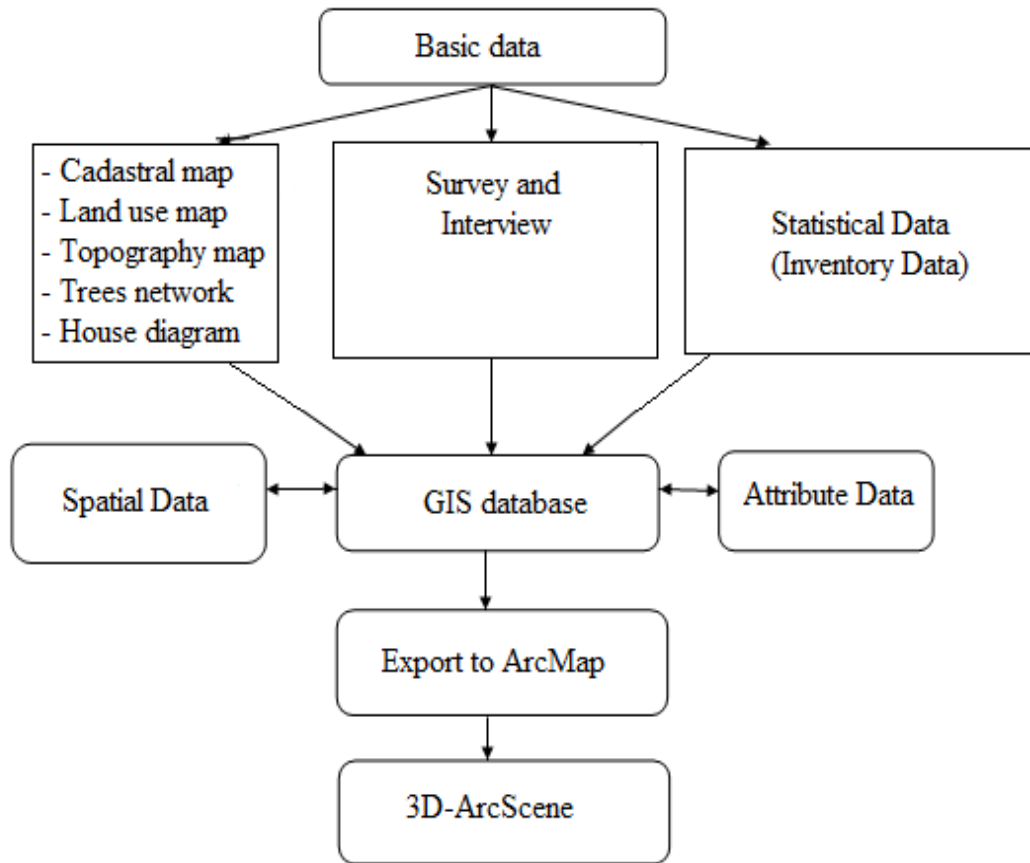


Fig 2. Process to build the 3D data map

3. RESULT AND DISCUSSION

3.1. Building and design spatial and attribute database

3.1.1. Spatial data

Because mapdata collected from another resources like: MicroStation; Mapinfor and AutoCad software, therefore, first, must be transfer data to shape file and standardize coordinate system. The result of these steps is a spatial database follows VN2000 coordinate system and present all the feature include house, tree network, traffic.



Fig 3. Traffic layer



Fig 4. House layer

3.1.2. Attribute data

Attribute data are all of information relate with the spatial data and they connected together by the location. Table attribute is as follows:

Table 1. House information

Field Nam	Type	Description
STT	Integer	Ordinal number
Thua	Integer	Number of land plot
Docao	Decimal (10,2)	Height of house
Sotang	Integer	Number floor
Chusudung	Character(100)	Name of owner
Diachi	Character(100)	Address
Muc dich su dung	Character (10)	Land use purpose

Table 2. Tree information

Field Nam	Type	Description
ID	Integer	Number of tree
X	Decimal (10,2)	X value
Y	Decimal (10,2)	Y value
Ten	Character(100)	Name of tree
Docao	Decimal (10,2)	Height of house

3.2. Building and design 3D Map to serve urban planning

3.2.1. House layer

Rely on house diagram on 2D Map and the height value get from the department of house management of city concurrently survey data, we already make a house layer as fig. 5.

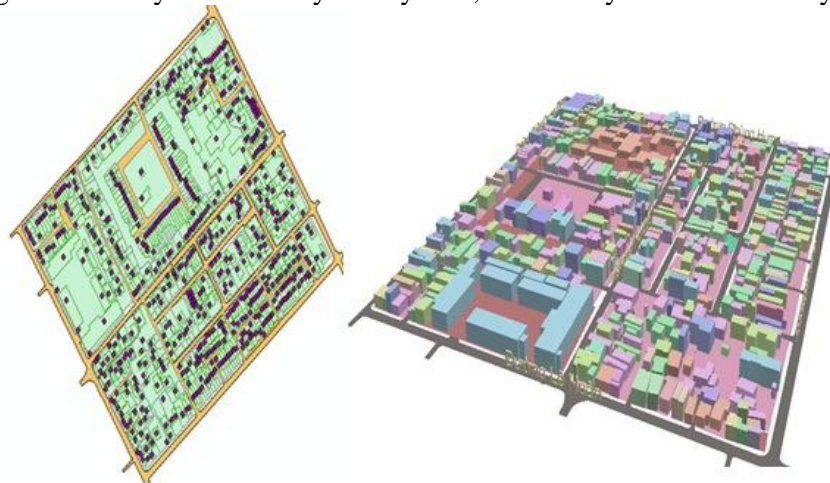


Fig 5. House layer in 3D format

3.2.2. Designing 3D model for Thuan Thanh ward

Overlap layer: house, tree, traffic and DEM of research area; we have a 3D-Map for Thuan Thanh ward in year 2013. In this map, we present the color by ranking of height of house.



Fig 6. 3D-Map for Thuan Thanh ward

3.3. Application 3D Map in urban management

3.3.1. Determine the construction exceed high limit

According to the No 2318/QĐ-UB decision of Thua Thien Hue people's committees; the height of construction inside the center of city not over 11 meter. Therefore, we make a layer with the name is "high limit" and overlap to the spatial data to find the construction over high limit. The result indicates that, there are 4 houses among 600 houses in research area offend the rule.



Fig 7. The construction offend the high limit

3.3.2. Determine the construction overlap traffic landmark

Traffic landmark is a line, clipping the spatial data and this line will show the construction overlap the traffic landmark and we can calculate how many squatter meter of house in offence. The result of research indicates that, in total, there are 104 houses offend this rule.

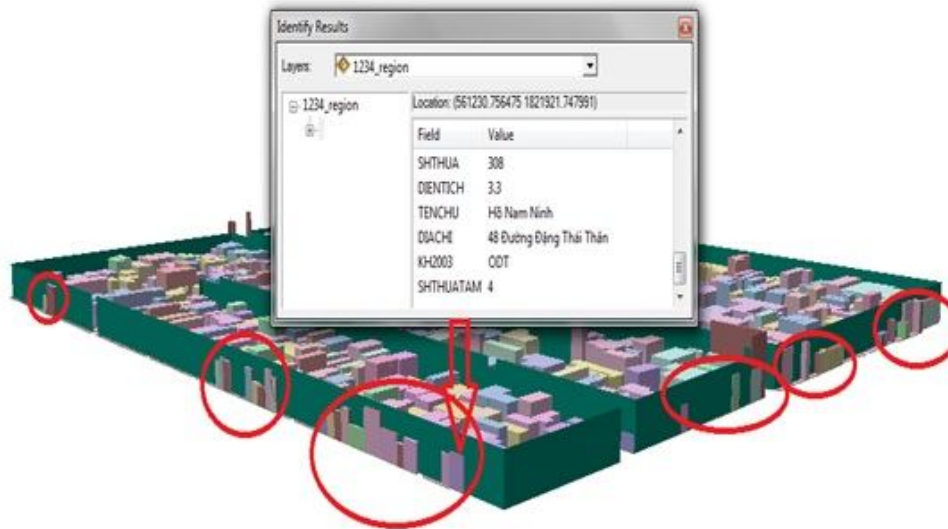


Fig 8. The construction offend the traffic landmark

4. CONCLUSION

The 3D model has proven to be remarkably convenient for the management of urban space, helping managers always capture information about the violations in the construction of buildings, provide spatial and attribute data to state manager.

However, need to see that to build the database is accurate, it is necessary to calibrate the input data, as well as regular updates of additional information.

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