

Using 3D Geographic Information System to Improve Sales Comparison Approach for Real Estate Valuation

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Outline



Part 1 — Introduction

Part 2 — Solution

Part 3 — Case study

Part 4 — Conclusion

Sales Comparison Approach

- Widely adopted approach for real estate valuation
- For certain types of properties
- Expert knowledge
- Data quantity and quality requirements
- Field survey work

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Challenges: Data

- Inadequate (real time update)
- Data integrity and data fusion (multi-subject, multi-source, multi-scale, multi-structure...)

Challenges: Technology

- Vulnerable in analysis, lack of spatial analysis
- Subject to personal judgment

Challenges: Informatization

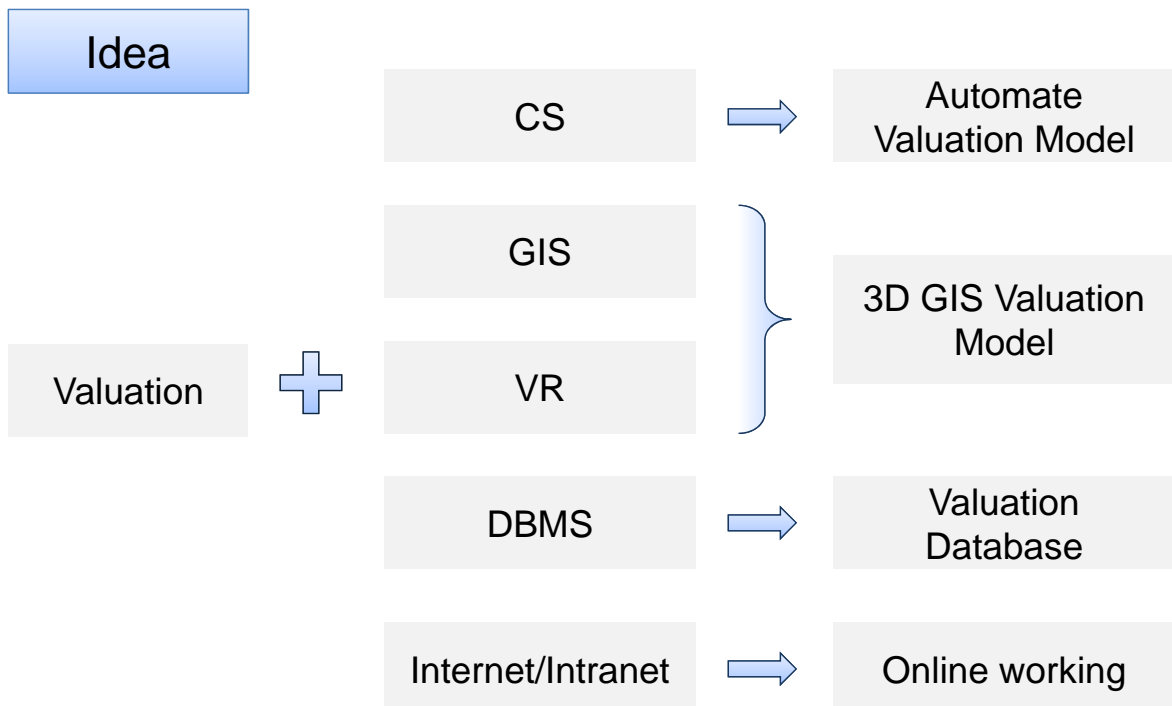
- Manual work
- Lack of valuation standardization & unified platform

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New technologies

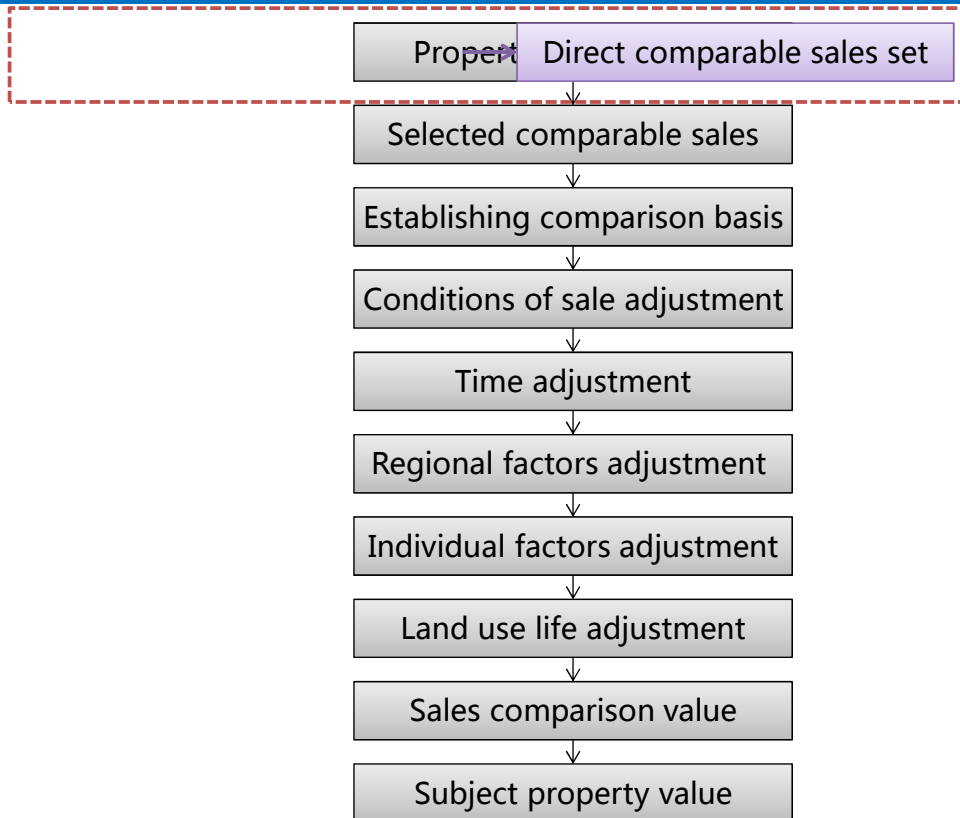
- Computer Science (CS)
- Geographic Information System (GIS)
- Database Management System (DBMS)
- Virtual Reality (VR)
- Internet/Intranet

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Modelling

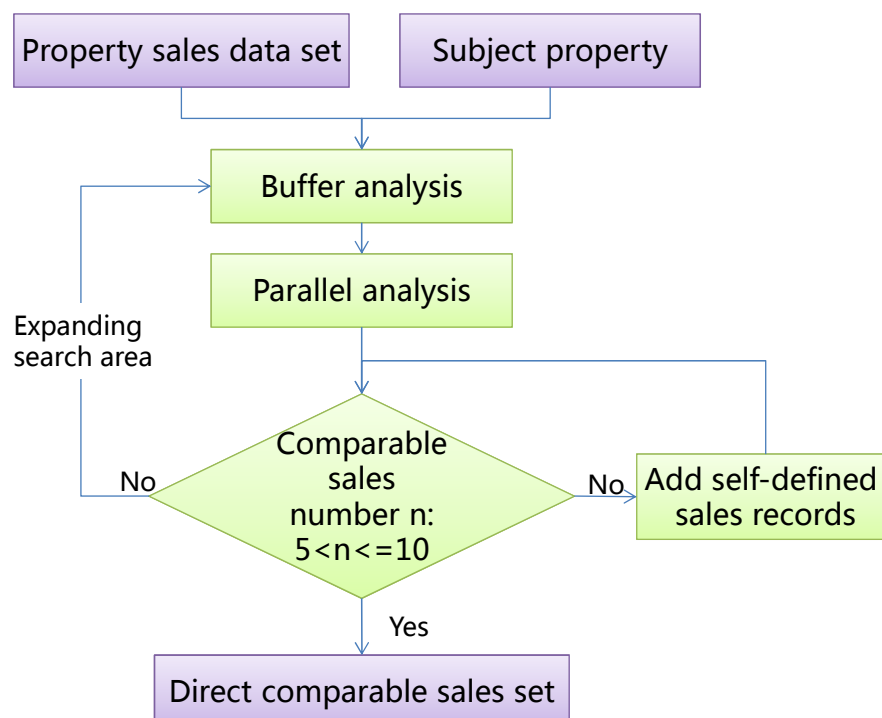


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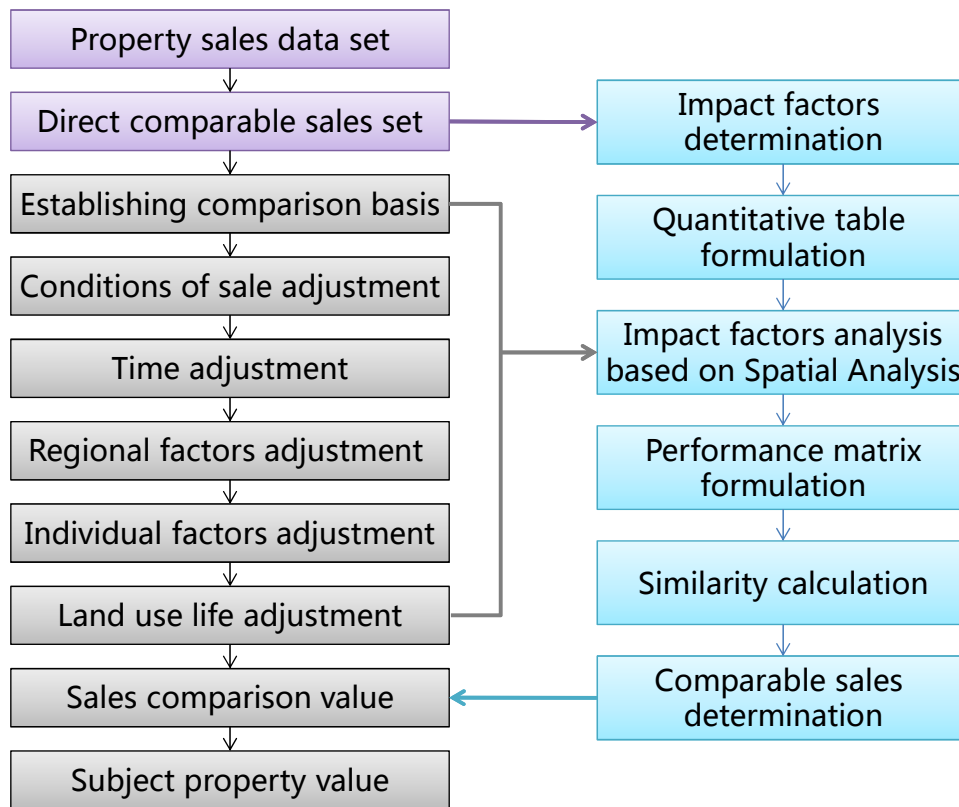


Direct comparable sales selection model



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Modelling

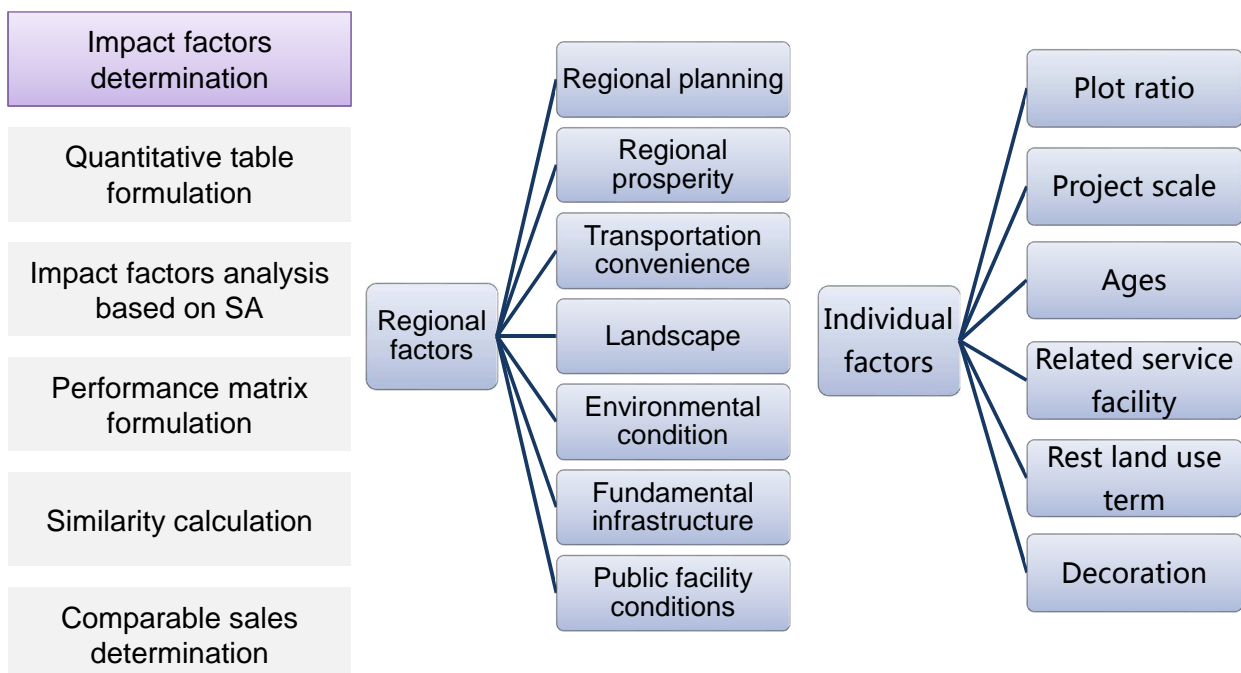


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Modelling



3D GIS valuation model



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3D GIS valuation model

Impact factors determination

Quantitative table formulation

Impact factors analysis based on SA

Performance matrix formulation

Similarity calculation

Comparable sales determination

- Directly adopt analysis results, or through simple transformation;
- Utilize Likert scale;
- Utilize comprehensive measurement index system, and scores the results.

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3D GIS valuation model

Impact factors determination

Quantitative table formulation

Impact factors analysis based on SA

Performance matrix formulation

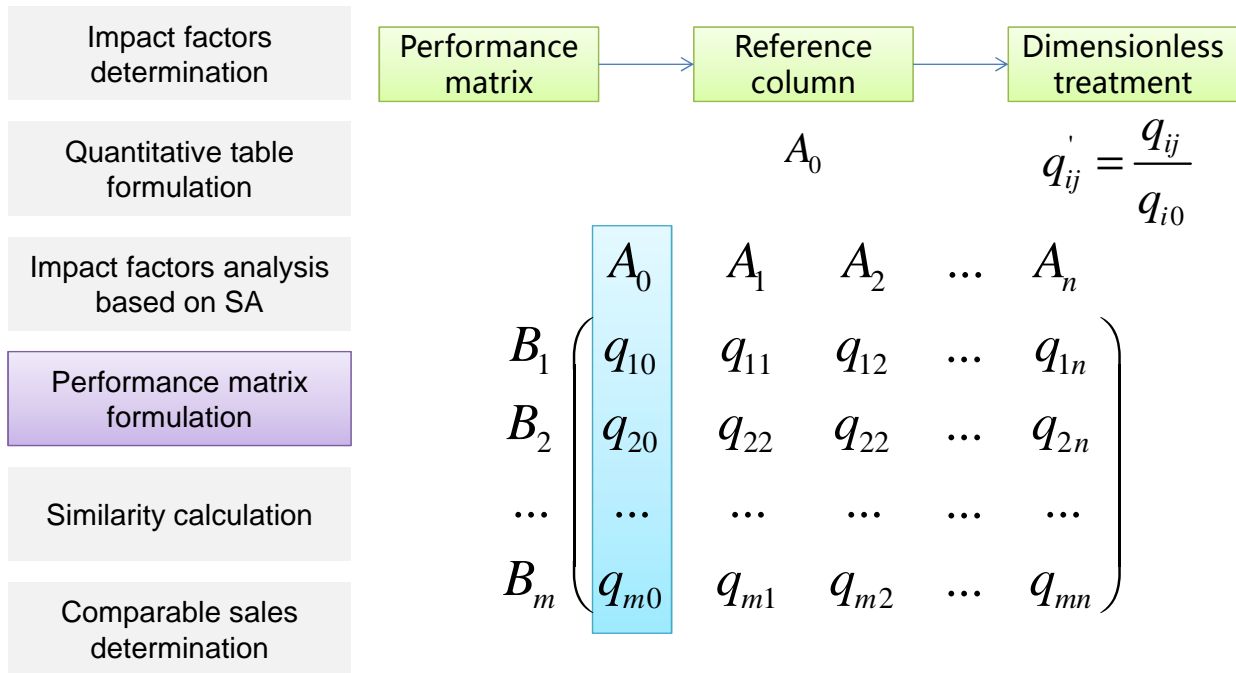
Similarity calculation

Comparable sales determination

	Impact factors	Data involved	Analysis methods
Regional factors	Regional planning	Urban master planning and detailed planning documents, maps, planning data	Spatial query, spatial overlay
	Regional prosperity	Business area data	Spatial measurement, network analysis
	Transportation convenience	Bus stop, subway station, MRT, airport, train station, port and pier, and road network data with carriage information	Spatial measurement, network analysis, road network accessibility analysis, spatial statistics
	Landscape	Ocean, lake, mountain, green, forest park and golf course data	Visibility analysis, spatial measurement, spatial statistics
	Environmental condition	Environmental monitoring data, road network, traffic, pollution monitoring data, waste yard, incineration plant, power station, high-voltage power lines, and 3D buildings and so on	Spatial query, noise propagation analysis, pollutants diffusion analysis, visibility analysis, solar shadow analysis, spatial statistics
	Fundamental infrastructure	Under ground water pipe, electricity line, gas pipe, communications, cable, internet, wireless local area network and so on	Spatial query, spatial statistics
	Public facility conditions	Point of interests in all category	Spatial query, spatial statistics

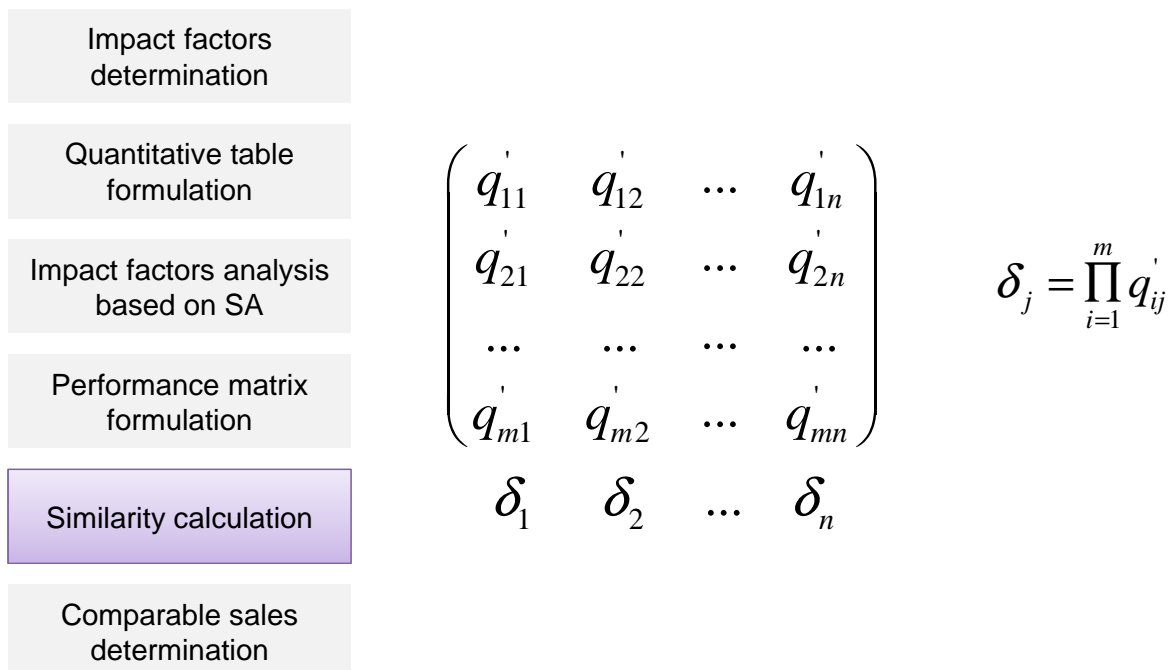
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3D GIS valuation model



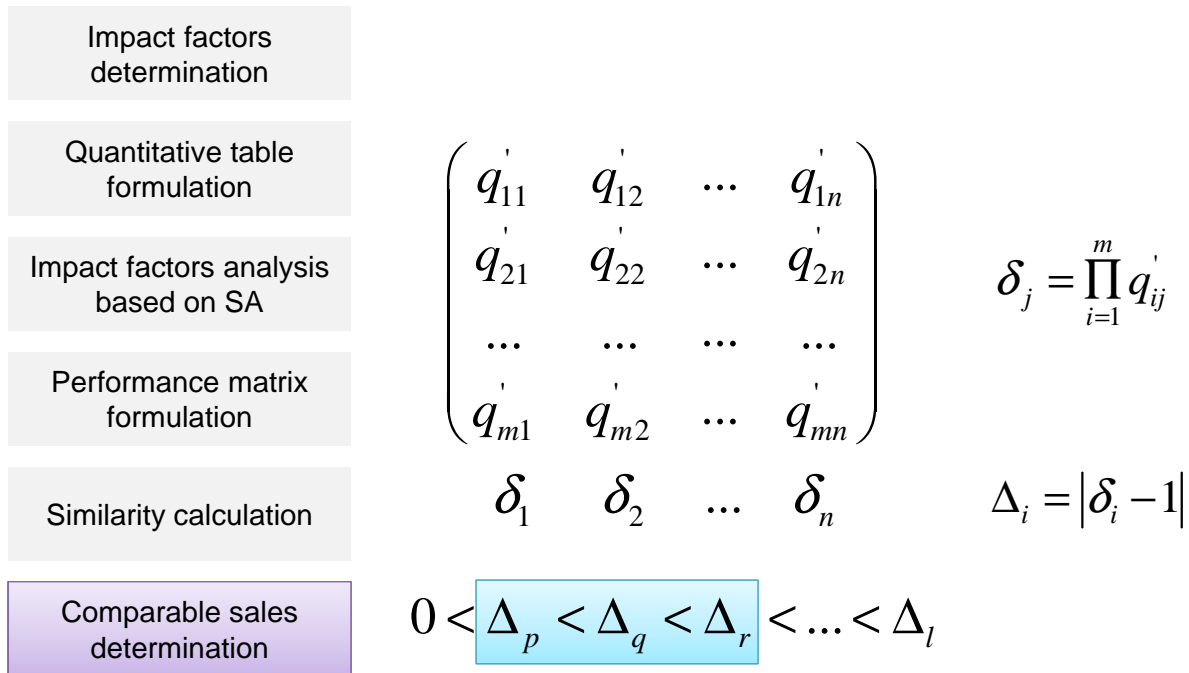
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3D GIS valuation model



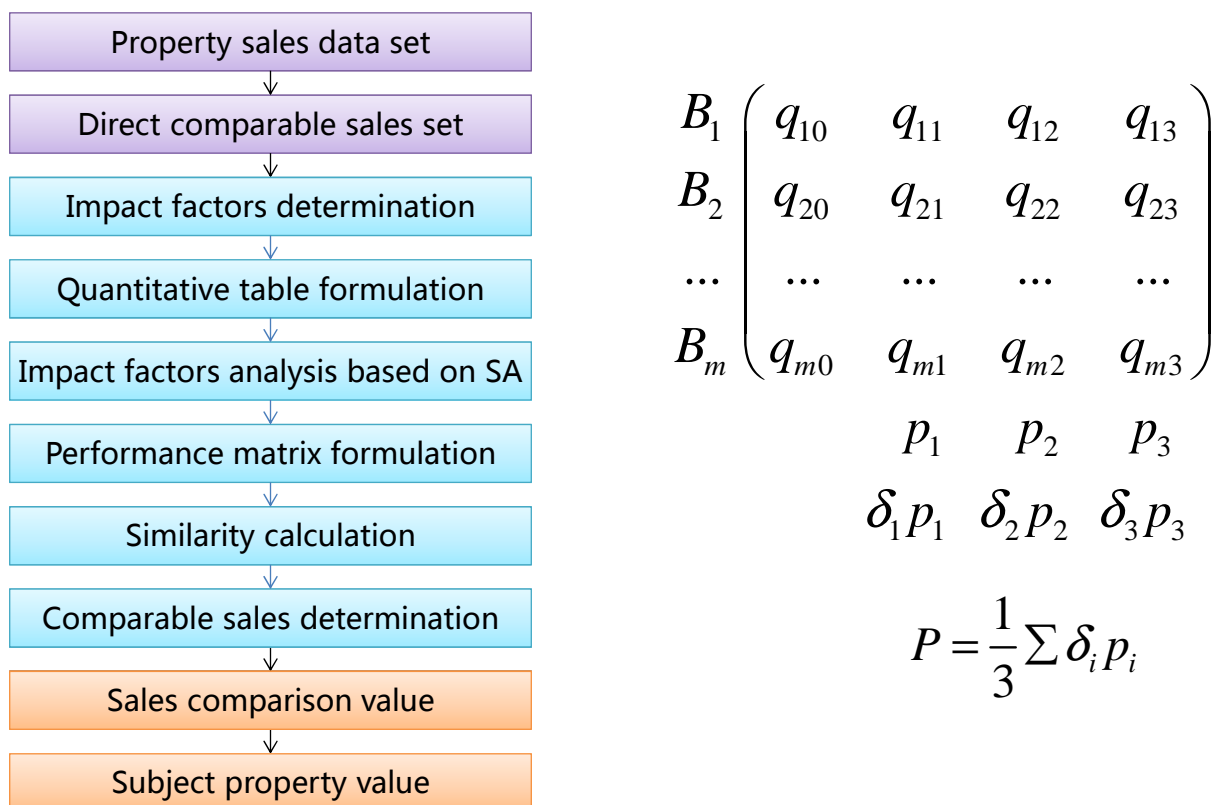
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3D GIS valuation model



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Modelling



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Valuation essential data

- Real estate sales records data
 - real estate attribute data & real estate price data
- Valuation parameters data
 - parameters, coefficients, indices and interest rates

Spatial data

- Land data
- Building data
- Road data
- Multilevel administration zone
- Remote sensing image
- Topographic map
- Land benchmark price
- Point of interests



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Valuation thematic data

- Building attribute: stores name, structure, corresponding cost and pictures
- Structures & fixtures attribute: stores name, type, engineering calculation rules, corresponding price and pictures
- Plants & trees: records different species, name, pricing and pictures
- Decoration: stores name, engineering calculation rules, and corresponding prices and pictures
- Construction cost: records construction cost and related technical and economic indicators

名称	类别	单位	规格 (m)	参考价格 (元)	图片	
核心木	乔木类	棵	高 (m) 300~350 350~450 350~450	胸径 (cm) 4~6 6~8 8~10	参考价格 (元) 60 150 190	
樟木	乔木类	棵	高 (m) 300~350 350~450 350~450	胸径 (cm) 4~6 6~8 8~10	参考价格 (元) 70 140 190	
银杏	乔木类	棵	高 (m) 300~350 350~450 350~450	胸径 (cm) 4~6 6~8 8~10	参考价格 (元) 60 140 190	
樟木	乔木类	棵	高 (m) 300~350 350~450 350~450	胸径 (cm) 4~6 6~8 8~10	参考价格 (元) 60 80 130	

项目名称	材料名称	材料规格	工程单位	参考价格	图片
楼地面	地面	水泥砂浆	无	直接单价: 16.54	
楼地面	地面	普通水磨石	无	直接单价: 65.81	
楼地面	地面	大理石	平方米	当周长 $\le 200\text{m}$ 时 主材料公式: $35 + (150/0.87) \times 0.07$ 当周长: 200m 时 主材料公式: $35 + (240/0.87) \times 0.07$	
楼地面	地面	花岗岩	平方米	当周长 $\le 200\text{m}$ 时 主材料公式: $35 + (240/0.87) \times 0.07$	
楼地面	地面	陶瓷地砖	无	当周长 $\le 200\text{m}$ 时 主材料公式: $42 + (50/0.87) \times 0.07$ 当周长: 240m 时 主材料公式: $43 + (50/0.87) \times 0.07$ 当周长: 280m 时 主材料公式: $43 + (100/0.87) \times 0.07$	

名称	特征	参考价 (元/m²)	图片
砖混框架屋顶第一类	砖混, 钢屋架, 屋顶结构复杂, 混凝土地坪	595	
砖混框架屋顶第二类	无承重柱, 柱径, 在两层之间设置, $\langle \text{角} \rangle$ 钢屋架, 混凝土地板 $\langle \text{厚} \rangle$ 10厘米	200	
砖混框架屋顶第三类	$\langle \text{角} \rangle$ 钢屋架, 异形钢屋架, 混凝土地板 $\langle \text{厚} \rangle$ 10厘米	425	
砖混框架屋顶第四类	房中房, 无独立基础, 砖墙, 房屋里屋, 铝合金门窗, 钢筋混凝土, 具有办公室功能	480	

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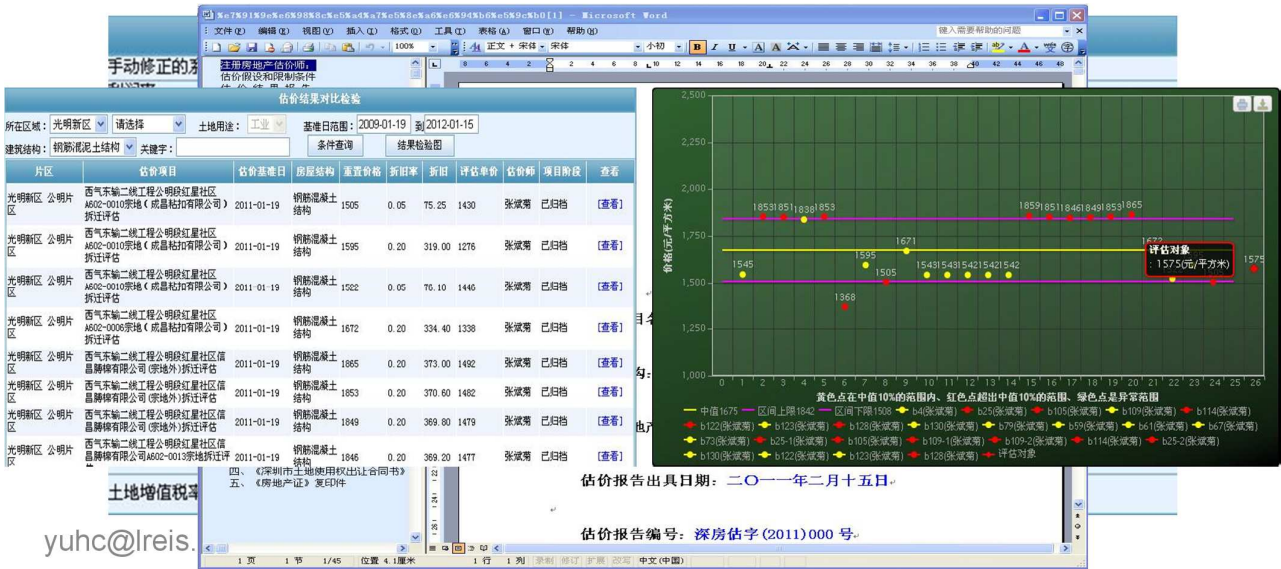
Valuation Functions

1. Comparable sales selection

2. Parameters Setting

3. Valuation Report Generation

4. Valuation Results Comparison



Spatial Analysis

1. Project Locate

2. Query

3. Sales Display

4. Factor Analysis

5. Sales Comparison



- Real estate relevant spatial and non-spatial data can be well collected and managed for valuation through GIS database
- A 3D GIS sales comparison approach improved the traditional sales comparison approach in many ways
- The application of 3DGISSPV system improves the working efficiency and the valuation accuracy

Thank you!



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