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金澤大学環境設計学類
～培育地區營造專家學程

新技術支持下的空間戦略規劃与都市設計框架体系
～以日本金澤市規劃決策支持実践為例～

日本国立金澤大学

沈　振江　教授

規劃支援研究與實踐

総体規劃的部門戦略規劃研究

- 投資総量的分配・資源利用（GA＋GIS）
- 中心区居住促進戦略（MAS）
- 高齢者養護施設建設戦略（MAS）
- 商業環境形成戦略・相関公共交通政策（MAS）
- 都市開発・土地重劃・環境影響（CA＋MAS）

都市設計（VR）

- 公共空間・公園
- 重点地区・街道景観
- 歴史街區・保護区

規劃支持的将来

- CA+MAS+GIS＋VR＋Internet

政策＋計画＋設計

都市設計方針

規劃支援研究與實踐

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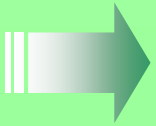


政策＋計画＋設計

規劃策略研究—Planning Support

規　劃　設　計　支　持　之　架　構

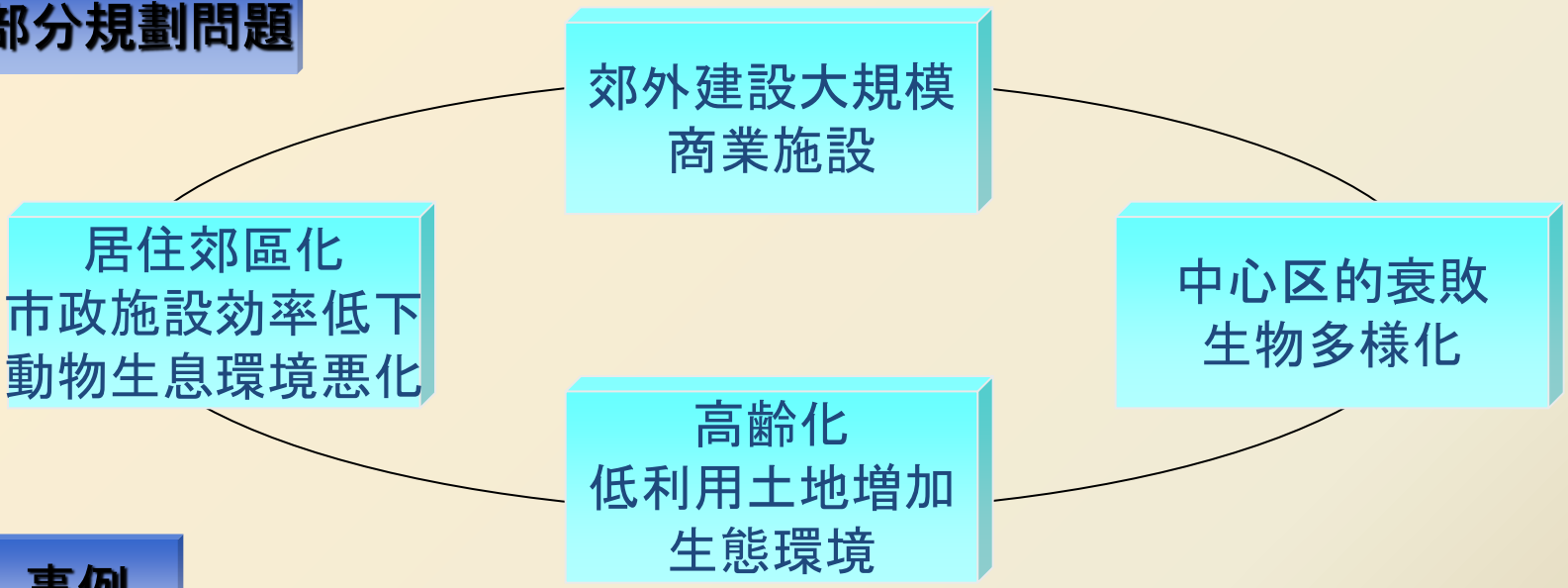
	Research target 1	Research target 2	Research target 3	Research target 4
	Urban boundary change	**Household mobility and location choices**	**Location choice of tertiary sector**	**Environmental influences**
Investigation contents	**Spatial data,** from statistic books, GIS and remote sensing data in Beijing and Kanazawa	**Housing data**, housing prices, household mobility in Beijing and Kanazawa within past 10-20 years	**Tertiary data**, industry and commercial locations in Beijing and Kanazawa within past 10-20 years	**Water consumption**, industry inventory and the volume of their water consumption
	Policy, land use policy, land use control, urban plan, land use suitability, social economic development plan, etc.	**Housing policy**, residential promoting policy in Kanazawa, affordable housing policy in Beijing, etc	**Policy**, development strategies	**Water supply capacity, waste water disposal capacity**, charge price of water supply, charge price of waste water disposal
Model development approach	Constraint Cellular Automata (CCA) approach	Multi-Agent System approach	Multi-Agent System approach	Multi-Agent System approach
Simulation model development	**Urban boundary growth module**	**Household lifecycle stage module and household location choice module**	**Industry and commercial location choice module**	**Inventory based urban agents' water consumption module**

課　題

経済/土地開発/人口･居住/設施区位/交通/環境影響

規劃策略研究—Planning Support

部分規劃問題



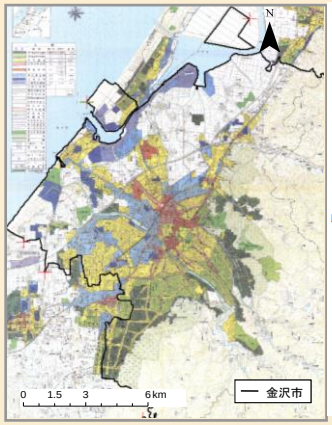
事例

中心建成区的居住促進
高齡者的養護施設的需要和建設
誘導新的大規模商業施設之設置區位及場所
郊外的土地区画整理開発事業
水資源・水価格和生態網絡的規劃

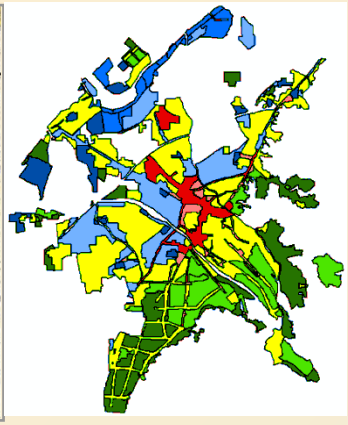
金沢市都市計画的課題

規劃策略研究—Planning Support

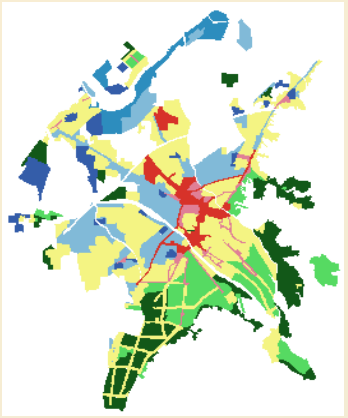
都市総体規劃？



11a



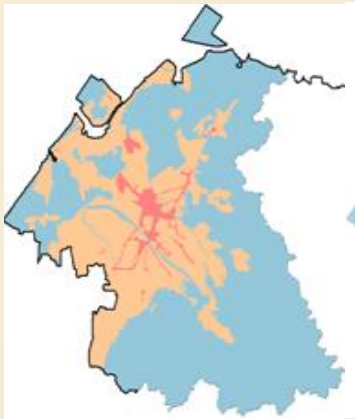
11b



11c

1. Category I Exclusively residential zone
2. Category II Exclusively residential zone
3. Residential zone
4. Neighborhood commercial zone
5. Commercial zone
6. Quasi-industrial zone
7. Industrial zone
8. Exclusively industrial zone

圖. 1985之土地使用管制.
a) 紙本地圖, b) GIS資料, c) Netlogo資料



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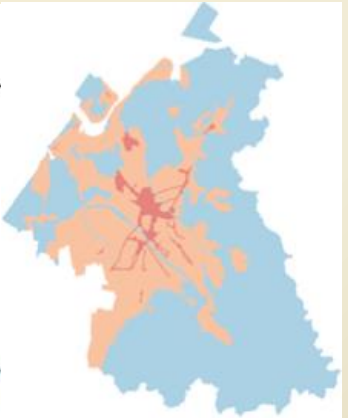
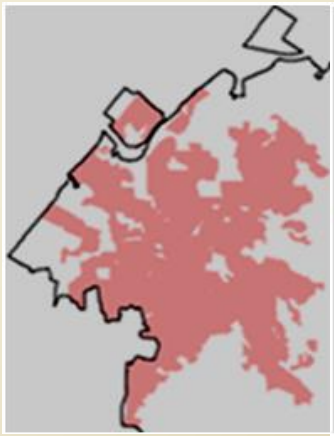


12b

City Center Area (CCA)
Urbanization Promotion Area (UPA)
Urbanization Control Area (UCA)

圖. 1985之都市地區.
a) GIS資料, b) Netlogo資料

圖. 家戶分布.
a) 金澤市家戶分布, b) 以三種不同收入呈現6825個家戶分布



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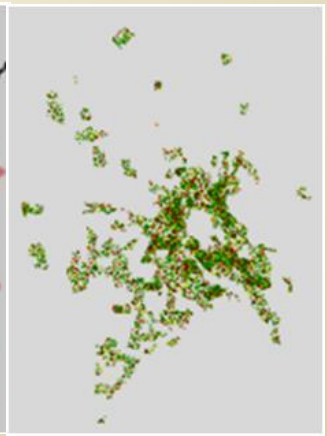
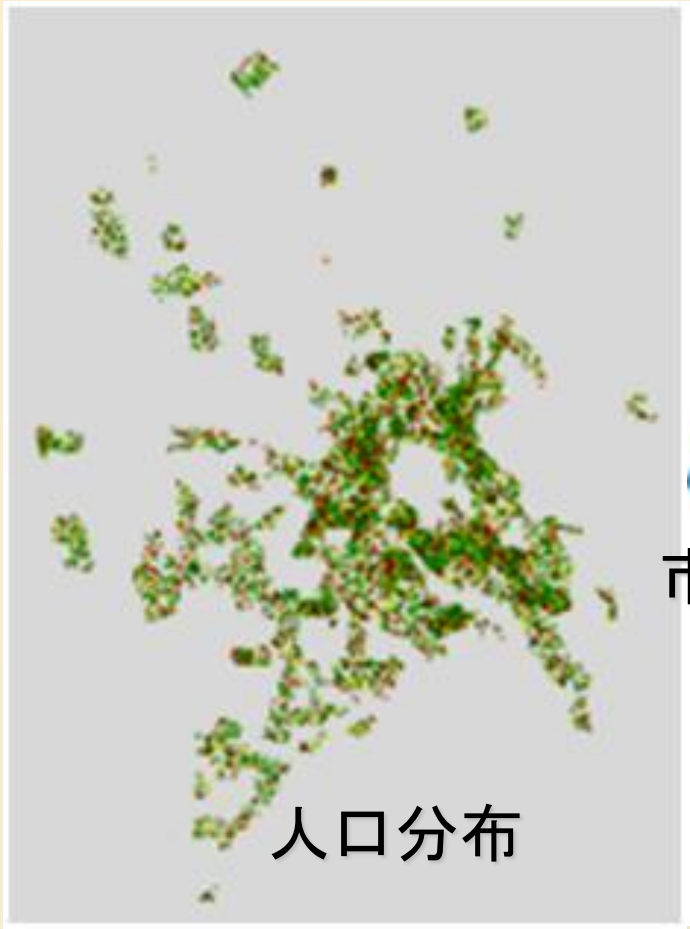
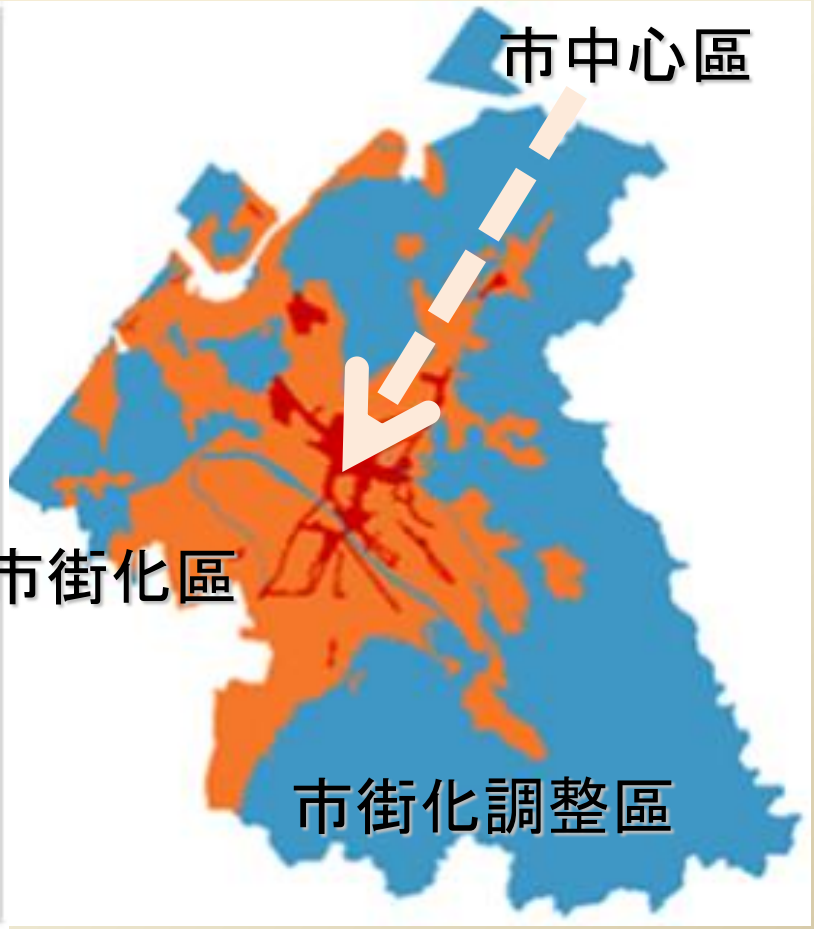


13b

規劃策略研究—Planning Support

・市中心區, 市街化區,市街化調整區





歷史都市·觀光·郊外開發·中心地衰退·災害

規劃策略研究—Planning Support

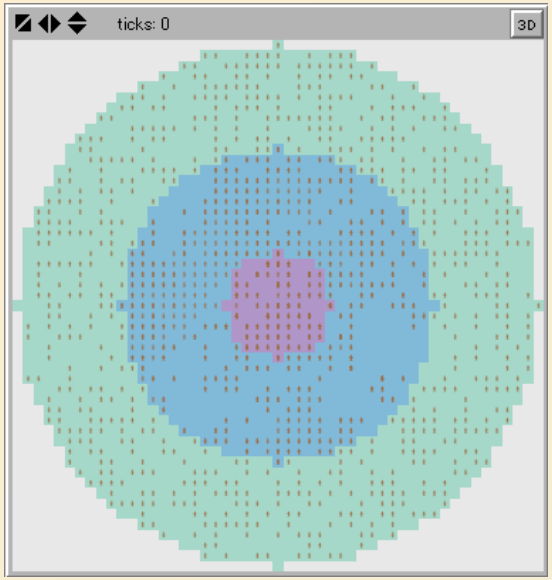


Fig. 4- Urban area in virtual city

2*2 Neumann is used as neighborhood with four cells orthogonally

Table 1- Comparing virtual city with real city

	Urban space	
	Virtual data	Real data
Households	1500	6825 (0.38% of real data)
Shape	Round	Administrative areas
Cell size (m)	500	50
Grid	50 * 50	468 * 752

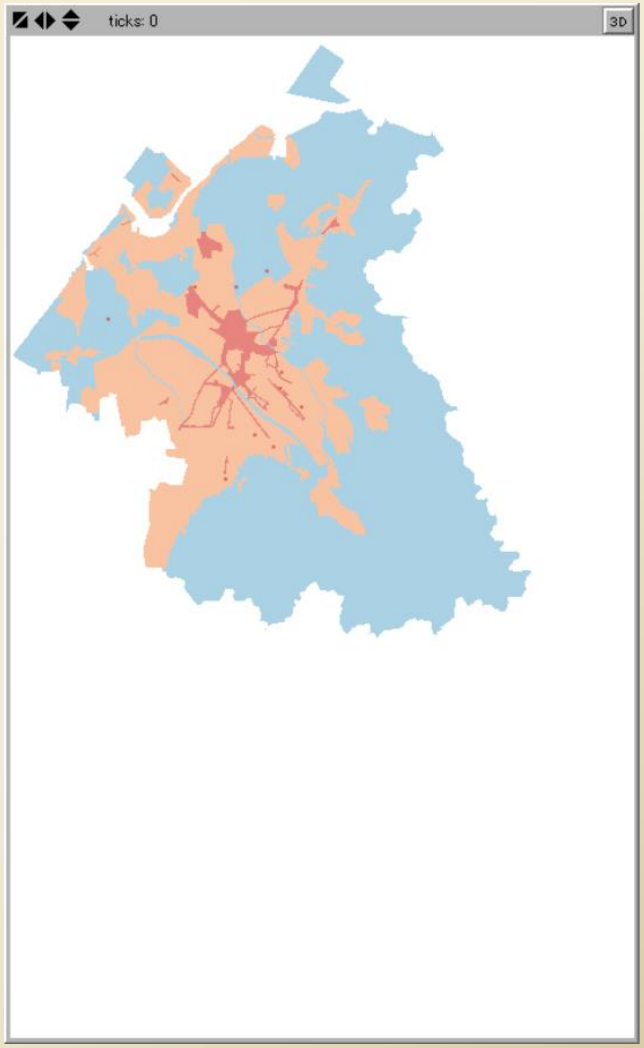
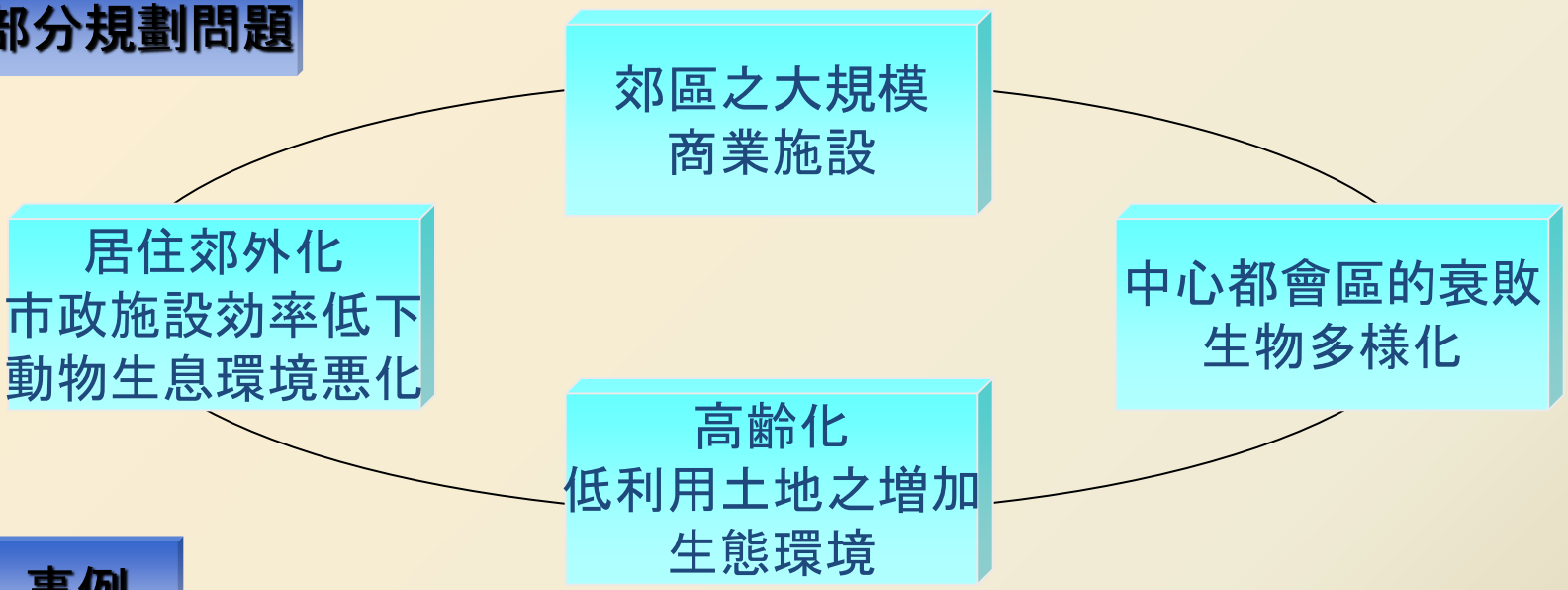


Fig. 5- Urban area in Kanazawa city

規劃策略研究—Planning Support

部分規劃問題



事例

中　心　建　成　区　的　居　住　促　進
高　齡　者　的　養　護　施　設　的　需　要　和　建　設
誘　導　新　的　大　規　模　商　業　施　設　之　設　置　區　位　及　場　所
郊　外　的　土　地　区　画　整　理　開　発　事　業
水　資　源　・　水　価　格　和　生　態　網　絡　的　規　劃

総体規劃条件下的部門規劃・専題

金　沢　市　都　市　計　画　的　課　題

Development of Agent-Based Model for Simulation on Residential Mobility Affected by Downtown Regeneration Policy

1990以来中心区居住促进都市再生的背景

- 中心区人口减少
- 高齢化
- 低利用土地的増加
- 商業衰退

contents

HRRM – household residential relocation model

Introduction

1-1 Agent-based model and household relocation ?

Policy impact on Urban activities – potential of agent-based model

Individual behavior

- Life cycle stage
- Household relocation model

Micro simulation

- Spatial process and individual behavior
- Considering Optimal solution for individuals
- Individual preference and Utility model

Agent-based simulation

- Interaction between individuals
- Integration with all the above conventional models

行為研究—微観模似—多個体智能->BIG DATA

1-1

How to visualize policy impact using agented-based model?

Urban and regional development

Urban sprawl

- Urban development in suburban areas
- More private Car
- Energy consumption and global warming

Urban decline

- Population decrease in downtown
- Decline on Commercial area
- Ineffective use of Public facilities in downtown

Downtown revitalization

- Regulations on Large-scale Shopping mall
- Improvement on Residential environment
- Public policy on transportation

都市拡張ー都市衰退ー都市中心区再生
緊湊都市

1-2 Residence promotion policy

A case study: Residence promotion policy of Kanazawa City

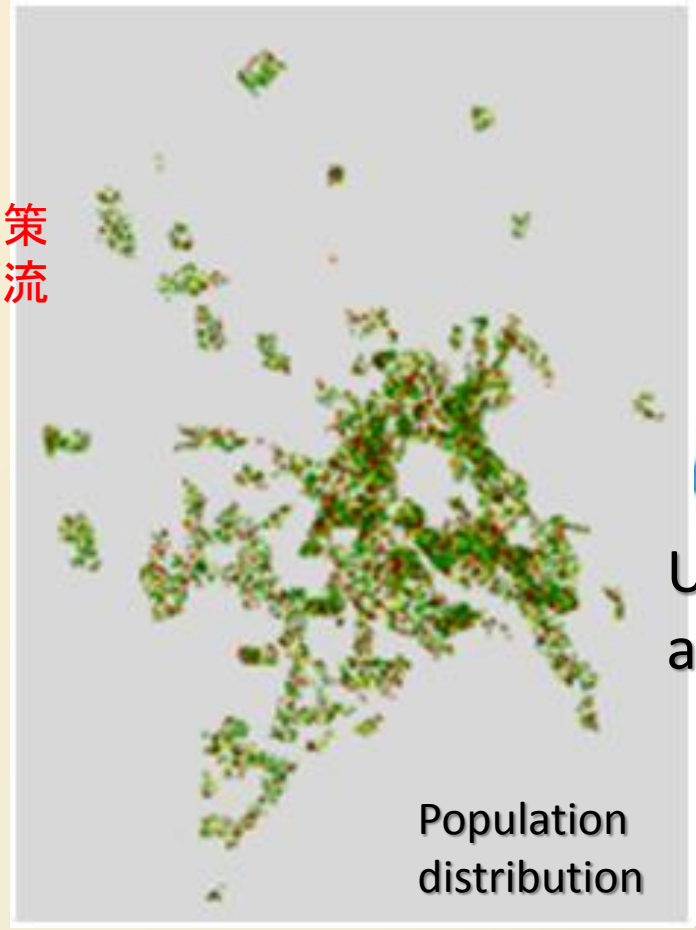
Building Types	Utilization types			Allowances
House	Buy a new house	Single household		10 % payment , 2 million JPY
		Two households		10% payment, less than 3million JPY
	Buy or repair old house			Basic part+ supplementary part, less than 500,000+200,000 JPY
Apartment	Buy new apartment			Basic part (5% of payment) + supplementary part (1%), less than 1 million + 200,000 JPY
	old apartment		Buy	
			Repair	50% of design payment, less than 1 million JPY

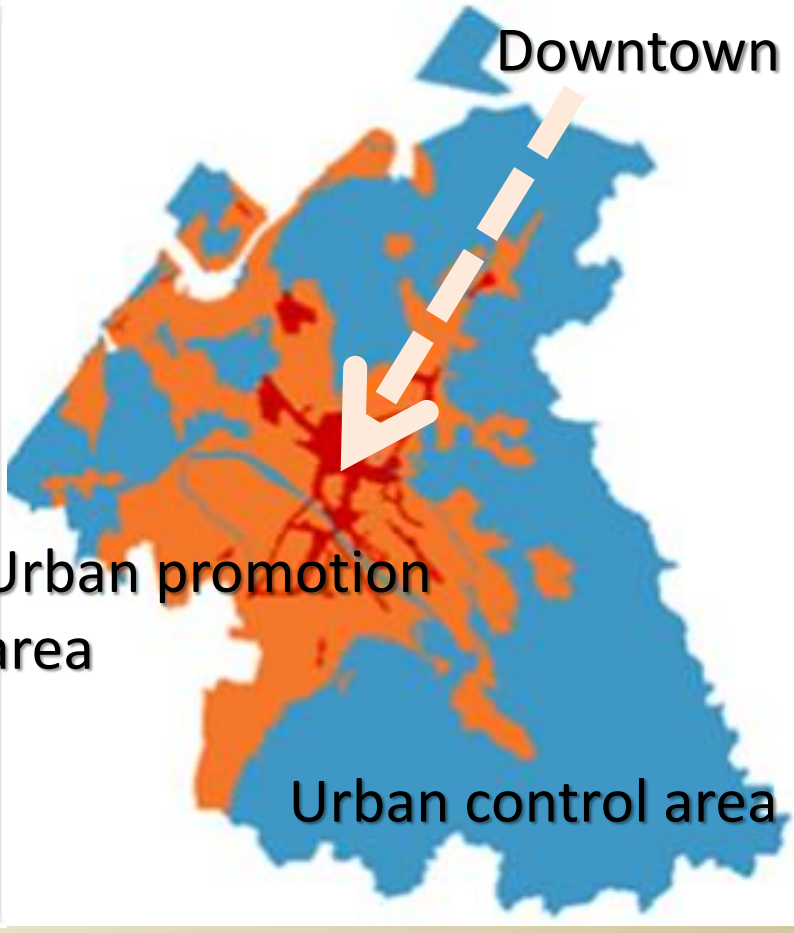
中心区居住促進政策→購買住宅的補助金

1-2 Planning zones in Kanazawa city

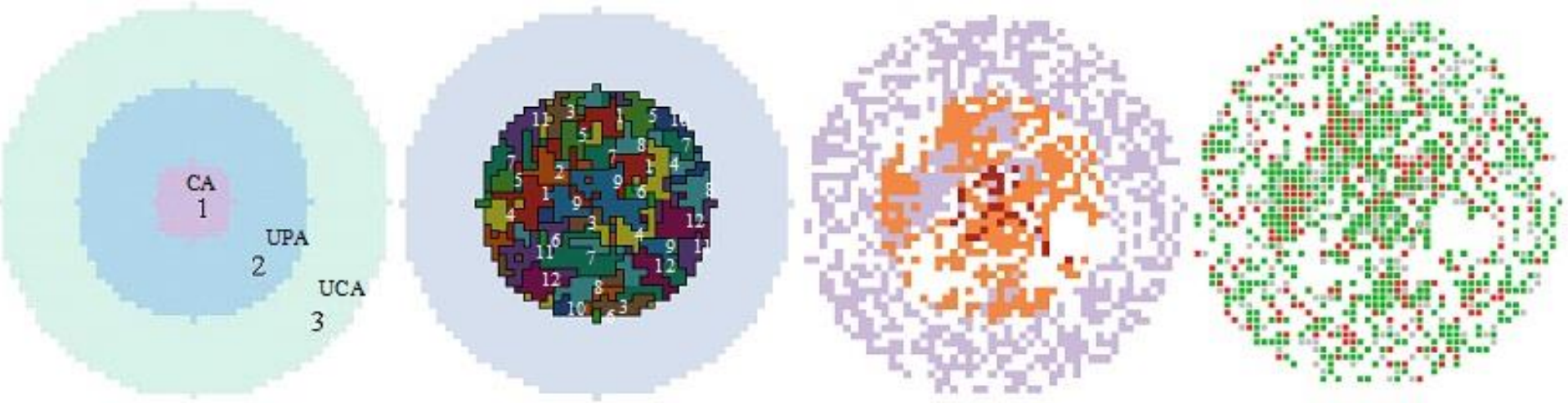
Downtown, Urban promotion area, Urban control area

中心区居住促進政策
促進中心区人口回流





1-2 Virtual city in this work



Zoning type:

1---1st low-rise exclusive residential district

2---2nd low-rise exclusive residential district

3---1st mid-high-rise exclusive residential district

4---2nd mid-high-rise exclusive residential district

5---1st residential district

6---2nd residential district

7----Quasi-residential district

8----Neighborhood commercial district

9----Commercial district

10----Quasi-industrial district

11-----Industrial district

12------Exclusive industrial district

Household density:

Household-num>=4

Household-num>=2

Household-num = 1

Household-num = 0

Income level:

Rich

Middle

Poor

中心区居住促進政策ー仮想都市和理論模型的検証

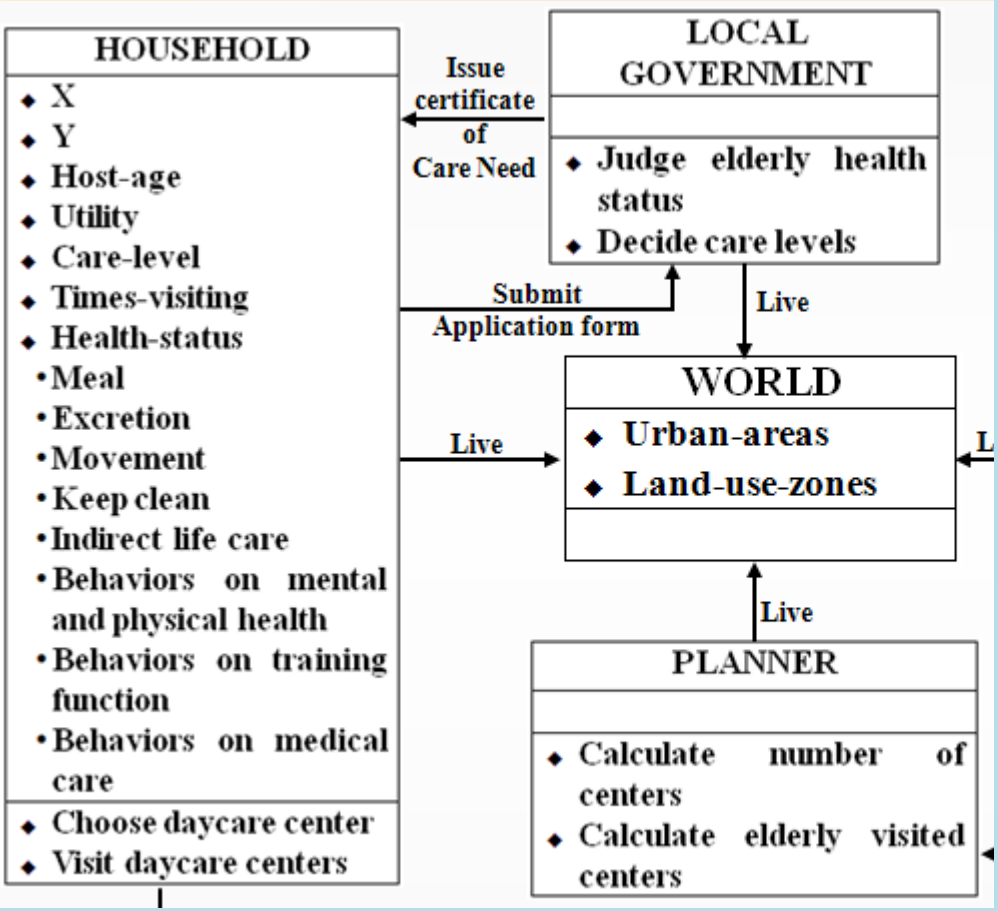
総体規劃、土地利用計画是制約条件

2

HRRM Model Design

Household Residential Relocation Model (HRRM)

2-1 Agent types in HRRM



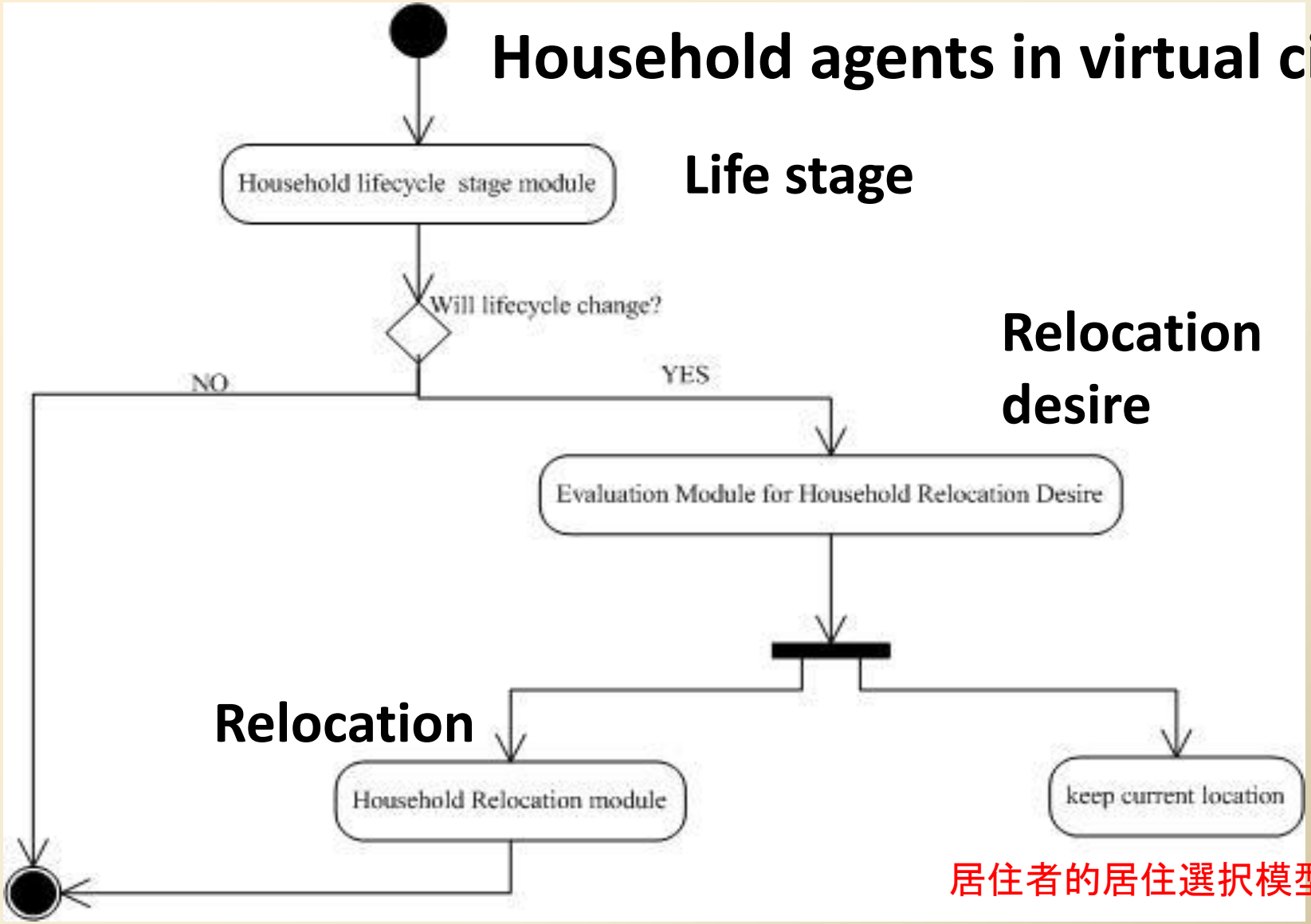
個体的構成和属性

- 地方政府
- 住戸
- 規劃師

2-1

Three steps in HRRM

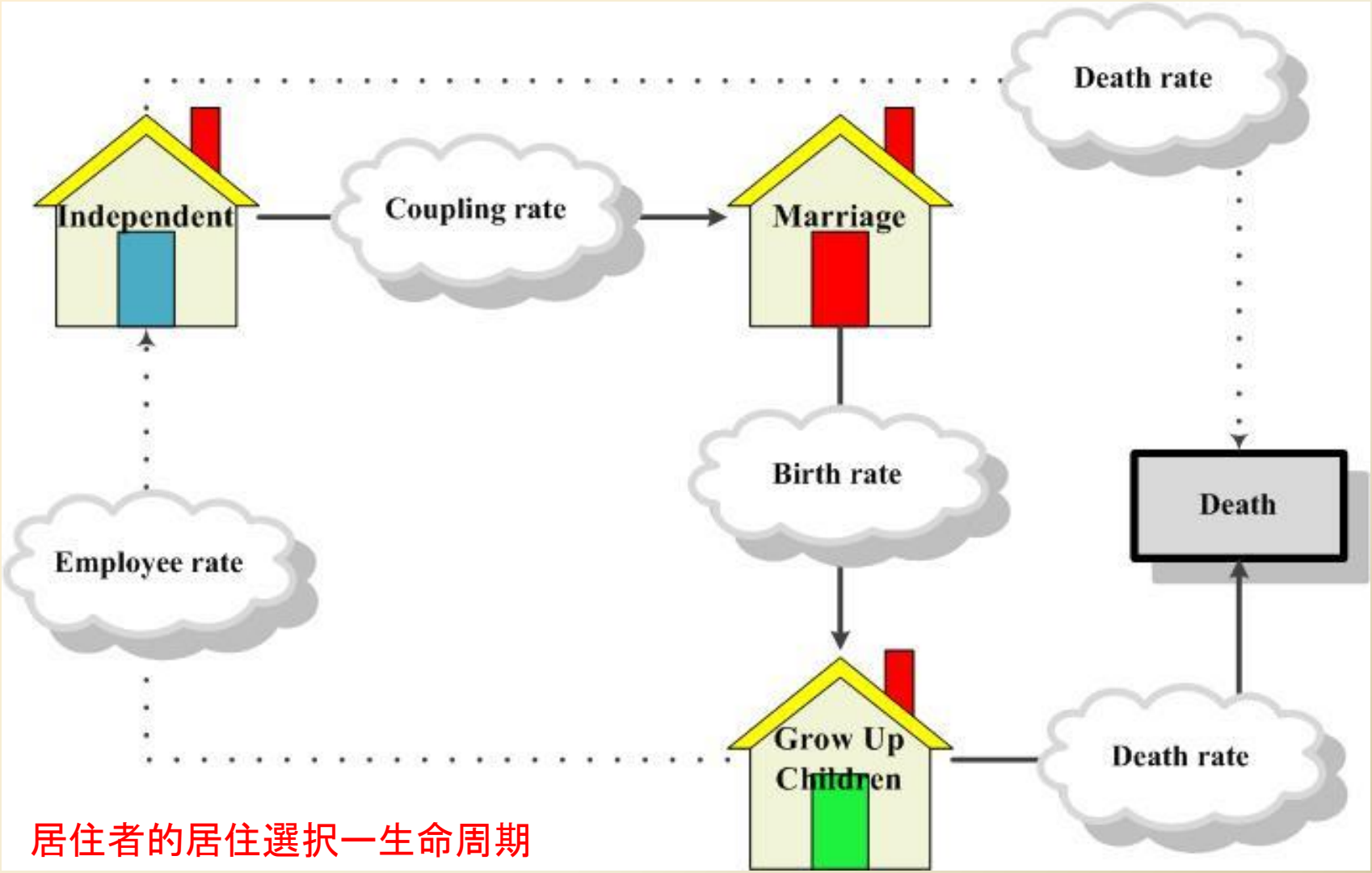
Household Residential Relocation Model (HRRM)



居住者的居住選択模型

2-2 Lifecycle stage

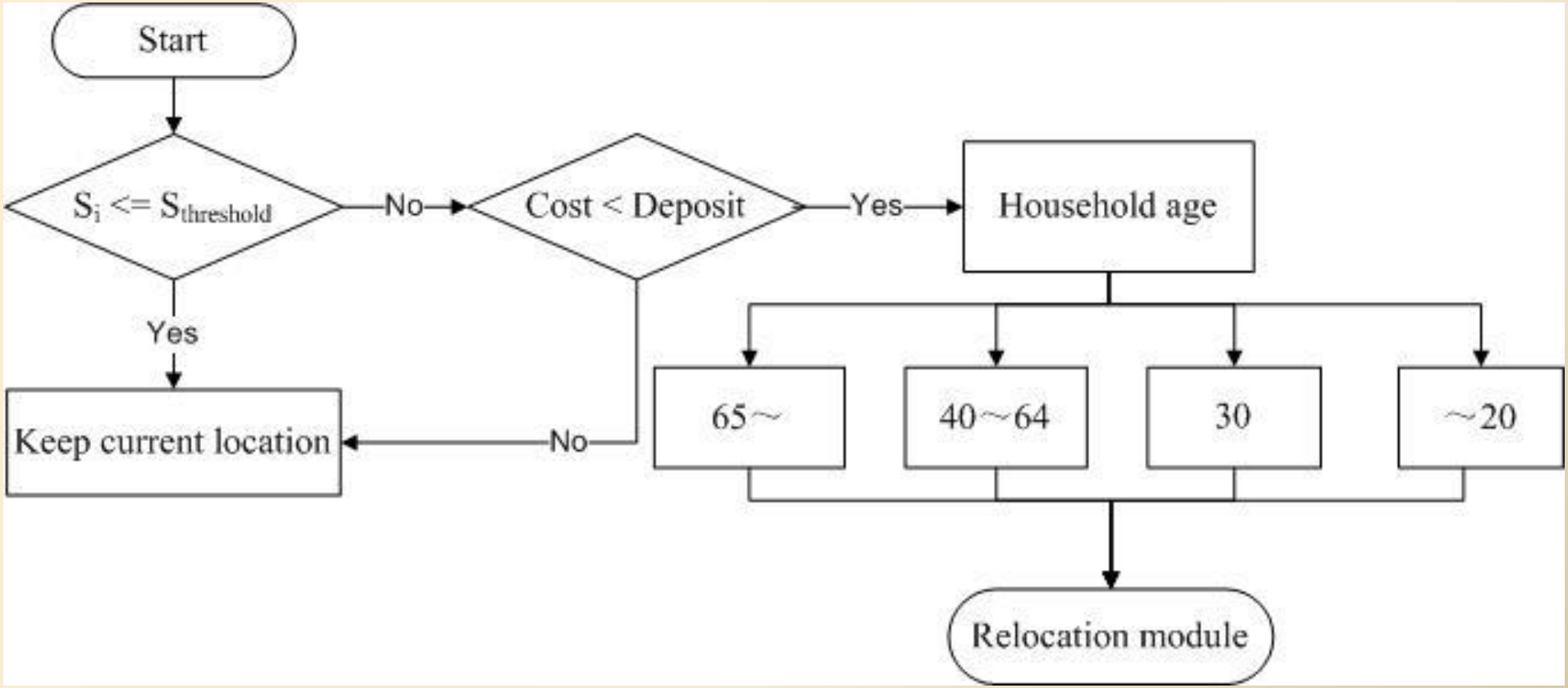
Household Residential Relocation Model (HRRM)



居住者的居住選択ー生命周期

2-3 Satisfaction on current housing

Household Residential Relocation Model (HRRM)



居住者的居住選択的満足度＋費用＋生命周期

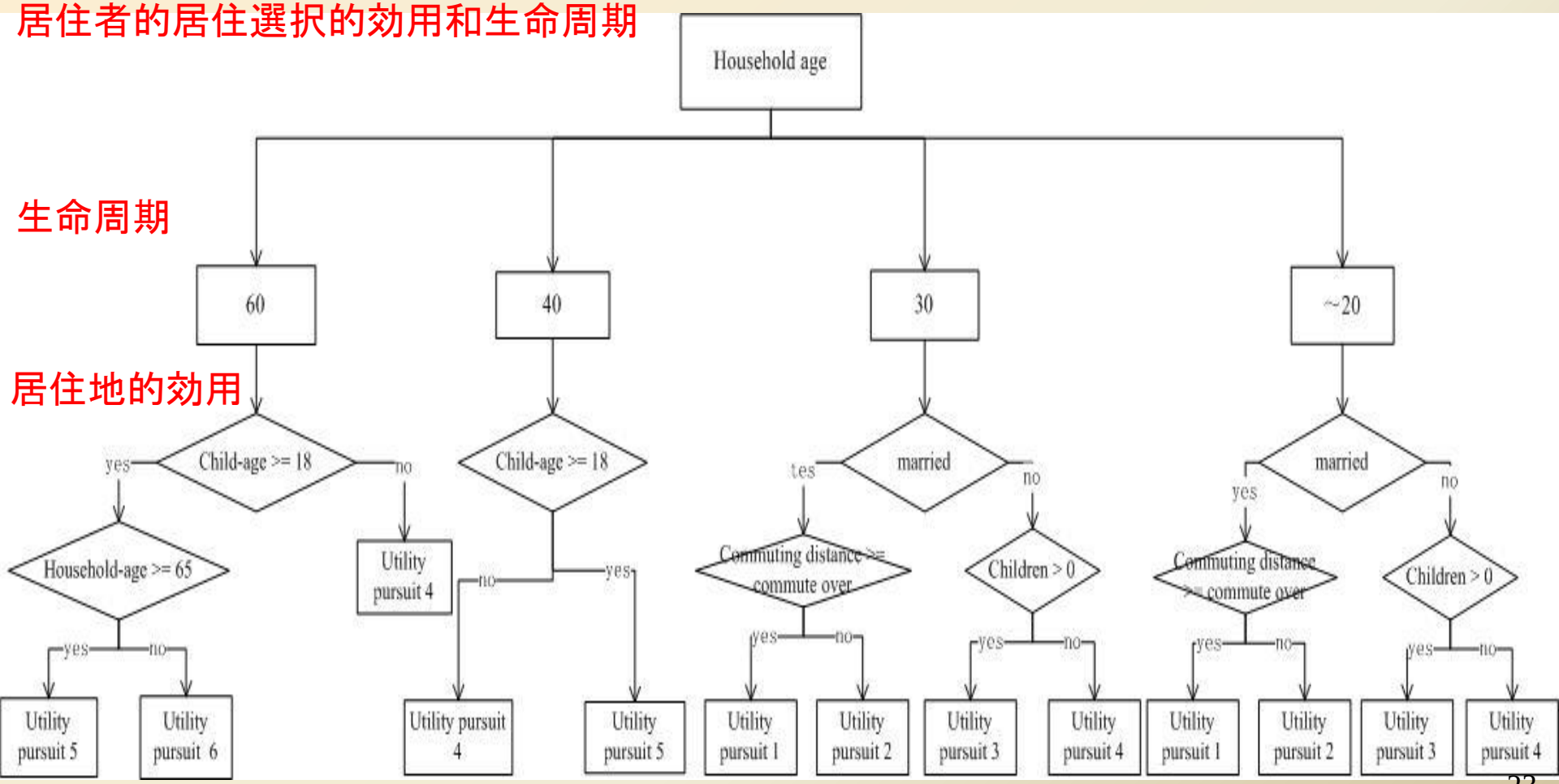
2-4 Relocation utilities in different life stages

Household Residential Relocation Model (HRRM)

居住者的居住選択的効用和生命周期

生命周期

居住地的効用



2-4 Relocation utilities in different life stages

Household Residential Relocation Model (HRRM)

Interaction factors between neighbor and the entire area are integrated in Utility model

$$V_{is} = \sum_{j=1}^{n} b_{uij} \times x_{ij} \quad (n = 1, \ldots, 18)$$

$$b_{uij} = b_j(1 + \beta_{uik})$$

$$U_{is} = V_{is} + \varepsilon_{is}$$

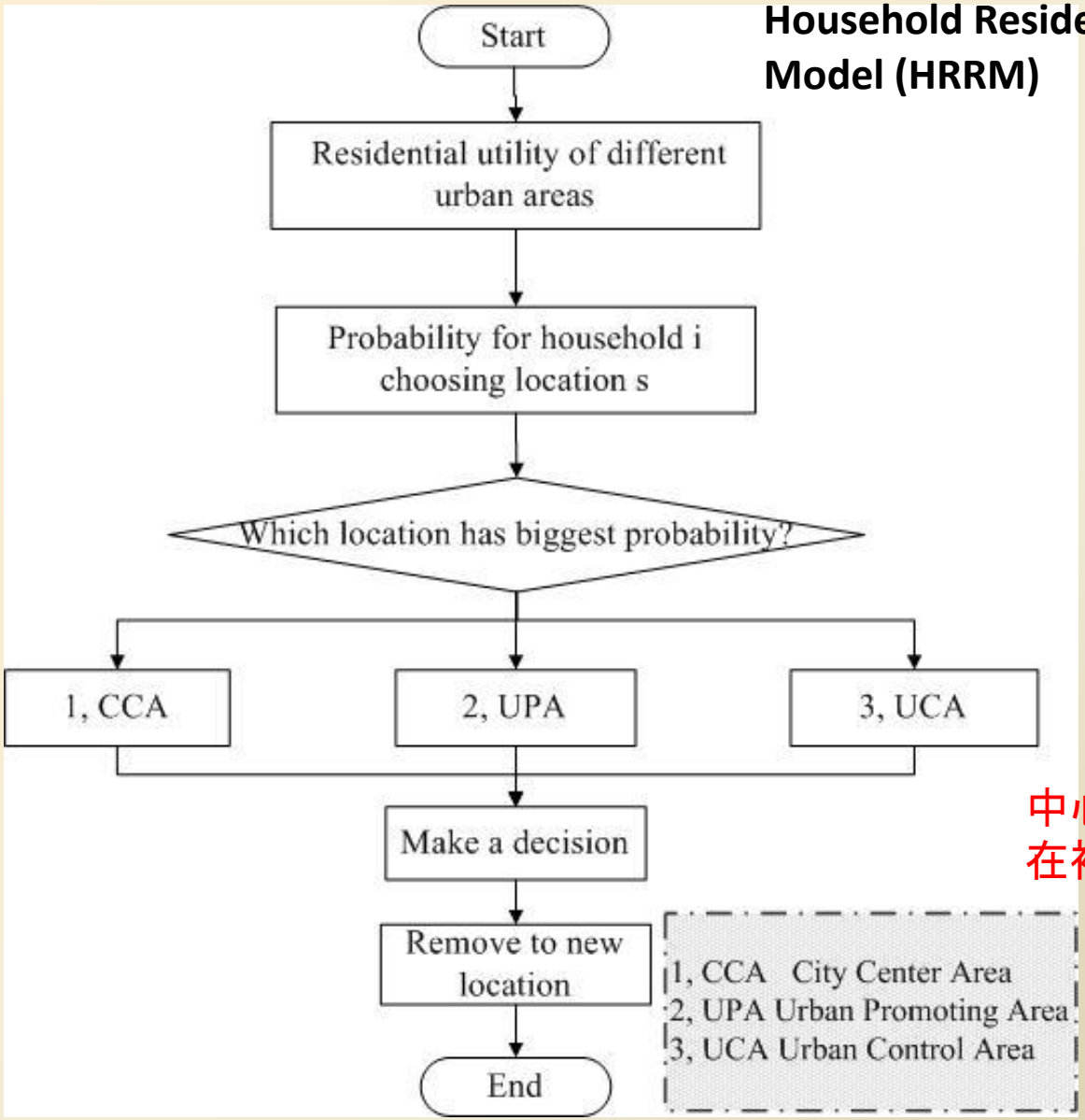
$$\varepsilon_{is} = \mu - \beta \ln(-\ln r) \quad (\beta > 0), (0 < r < 1)$$

$$Q_{is} = \frac{e^{V_{is}}}{\sum_{i=1}^{m} e^{V_{is}}}$$

居住者的効用模型

2-5 Relocation choices - zonings

Household Residential Relocation Model (HRRM)

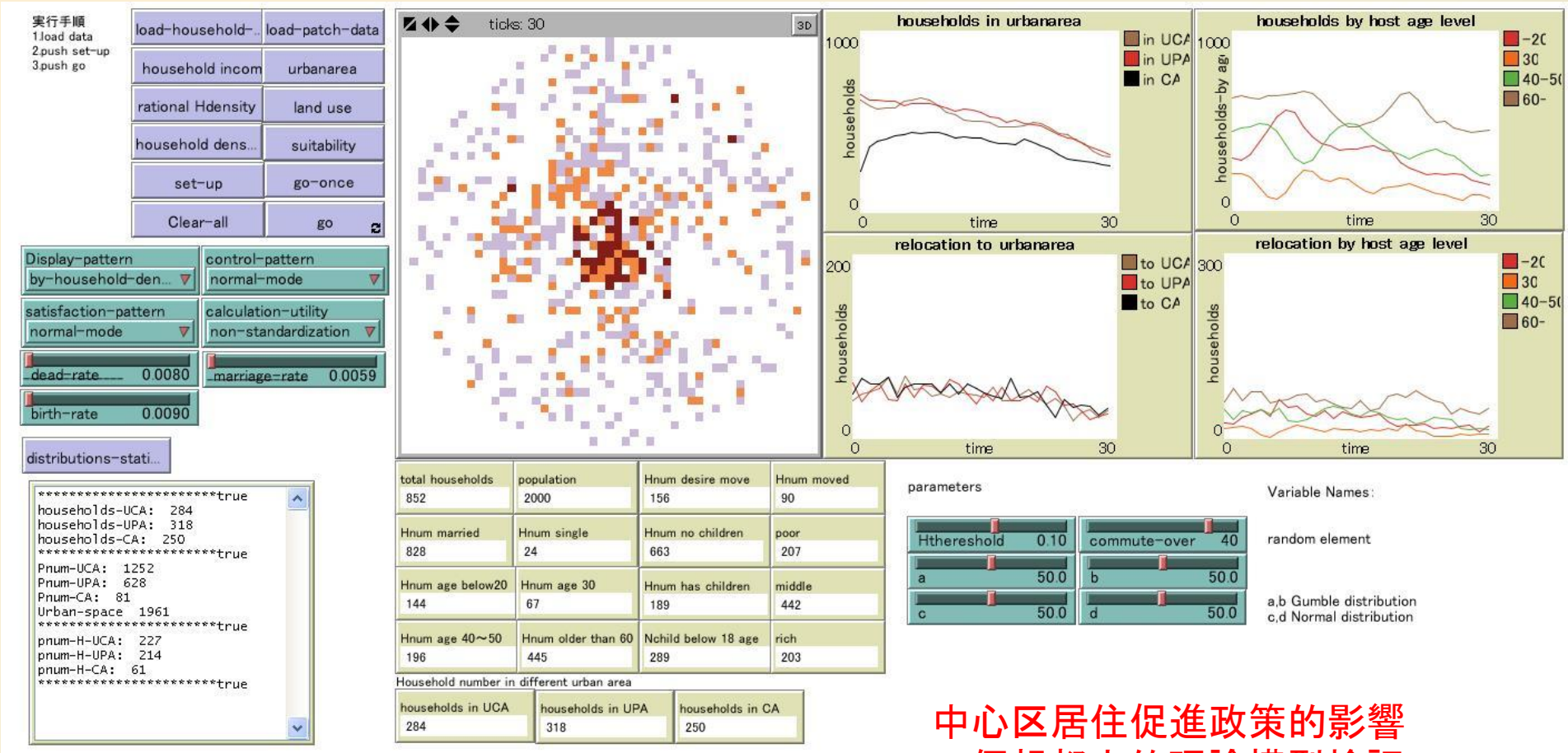


中心区居住者
生命周期
満足度
居住地効用
＋
如何選択、区位

中心区居住促進政策
在補助金的条件下
一選不選中心区？

2-6 Simulation tools

Household Residential Relocation Model (HRRM)



中心区居住促進政策の影響
一仮想都市的理論模型検証

2-7

Parameters based on Kanazawa City

			icient cy	Significant	Coefficients (b'j)	Partial coefficient (with policy interaction)	Significant
x2 typ				****	b'_2	0.153358	***
x3: Building security from fire	b_3	0.045609		.	b'_3	0.085280	*
x4: Building impairment	b_4	0.029561		.	b'_4	0.112268	**
x5: Barrier-free structu							.
x6: Surrounding safety							*
x7: Safety while walki pavement							*
x8: Crime rate							*
x9: Air or noise polluti							*
x10: Accessibility to w							*
x11: Shopping conven							*
x12: Accessibility to c							.
x13: Cultural facilities library)							.
x14: Park or playing gr							*
x15: Green space							**
x16: The areas of out s							.
x17: Street landscape							*
x18: Communication f neighbors							.
Interaction 1: Neighbo							.
Interaction 2: Global in							****

10年以上的中心区居住区位的調查一了解居住地選択的影響要因

Preconditions (assumption)

- Planning conditions
- Population and others
- Policy

Parameters for checking the HRRM model

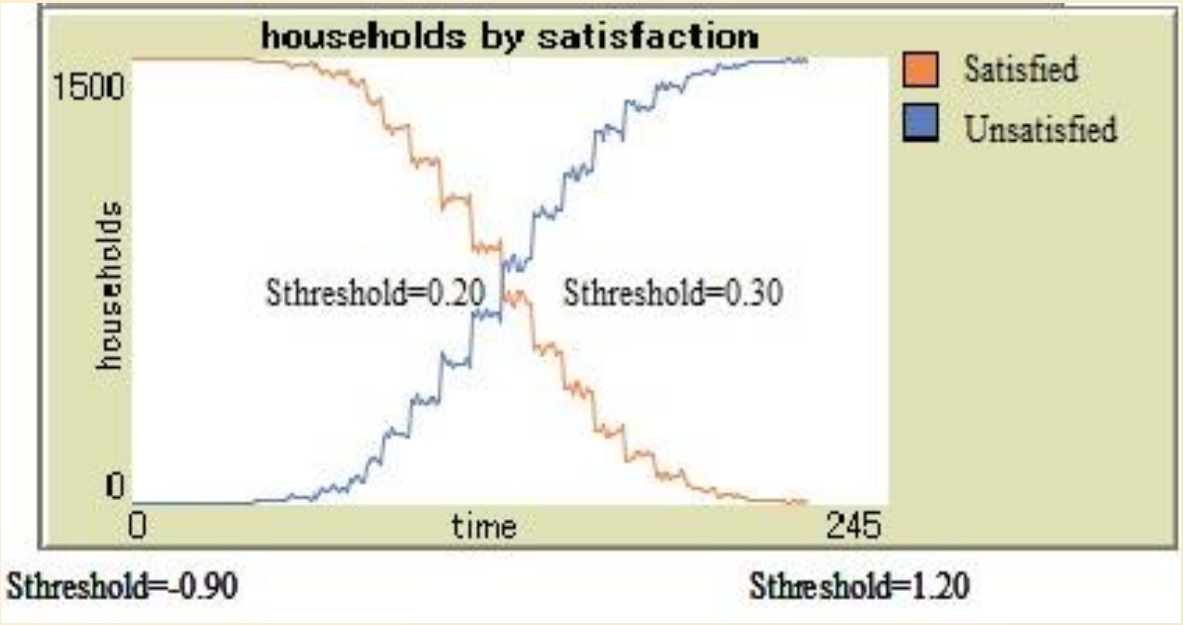
- Satisfaction threshold
- Factors in utility function
- Interaction between agents

3

Sensitive analysis

HRRM

3-1 Satisfaction threshold for relocation desire

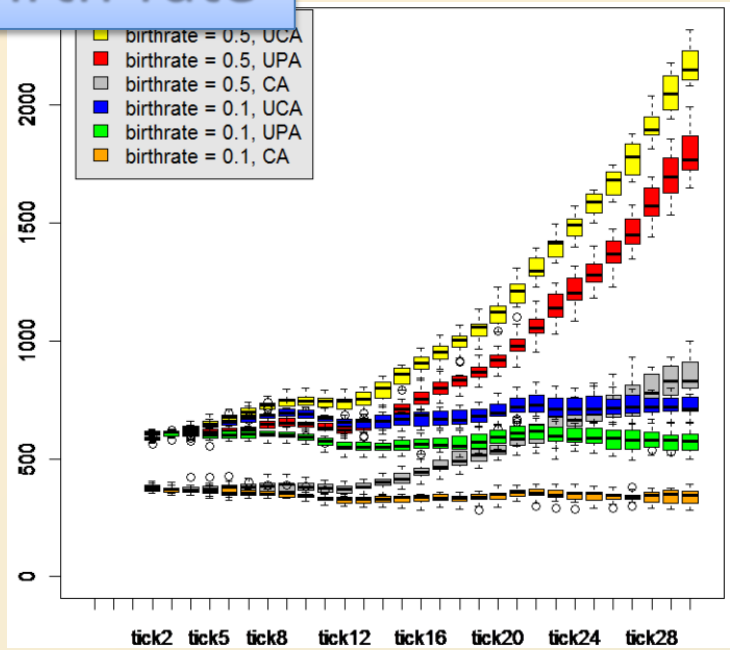


Household Residential Relocatio Model (HRRM)

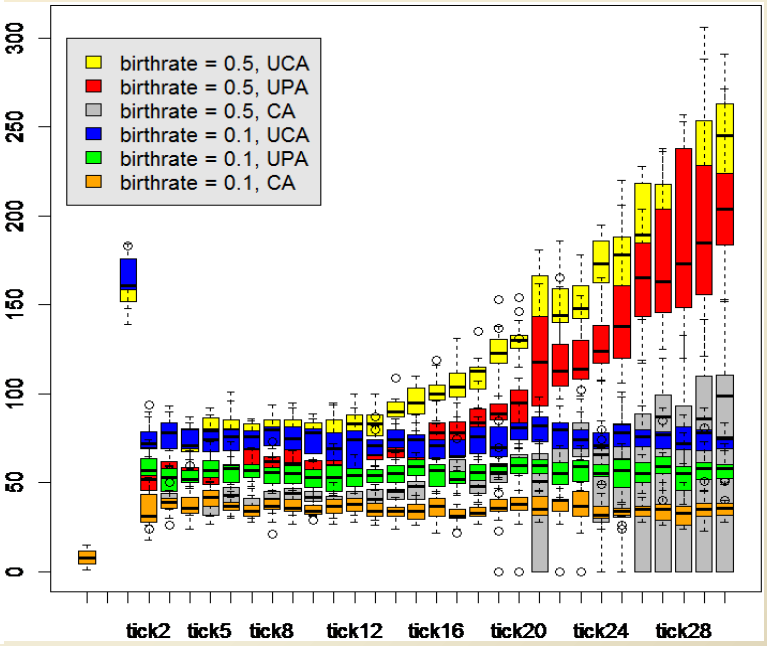
Satisfaction threshold influence on the desire of households to relocate

中心区居住促進政策一理論模型的検証
10年以来、居住地的選択要因安定
人口移動的状況安定一安定値的確定

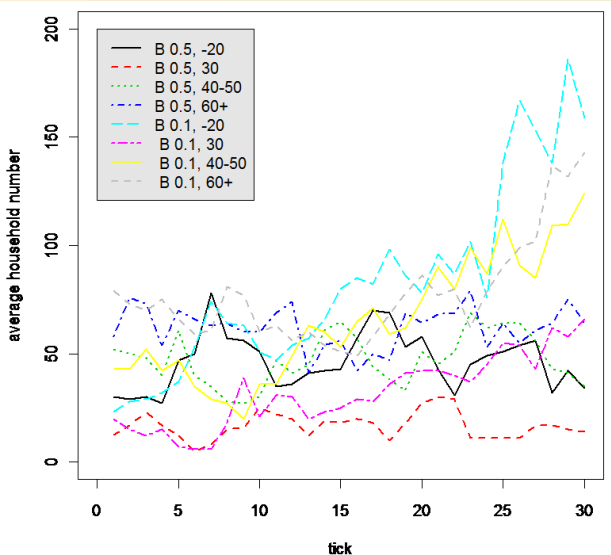
3-2 Birth-rate

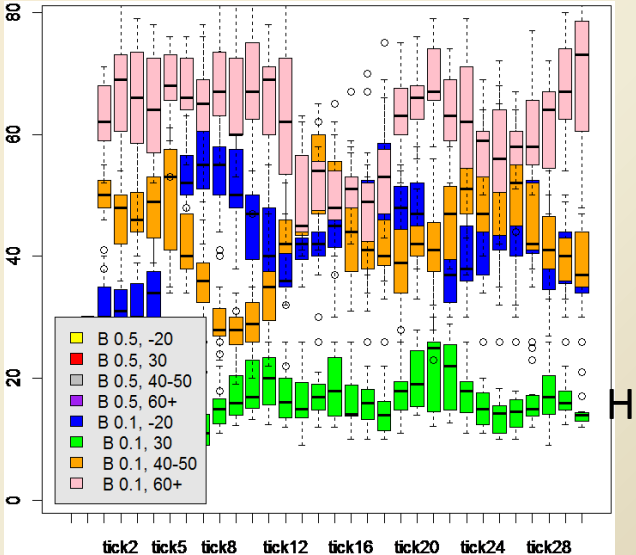


Households in urban area by birthrate



Households relocation to urban zonings





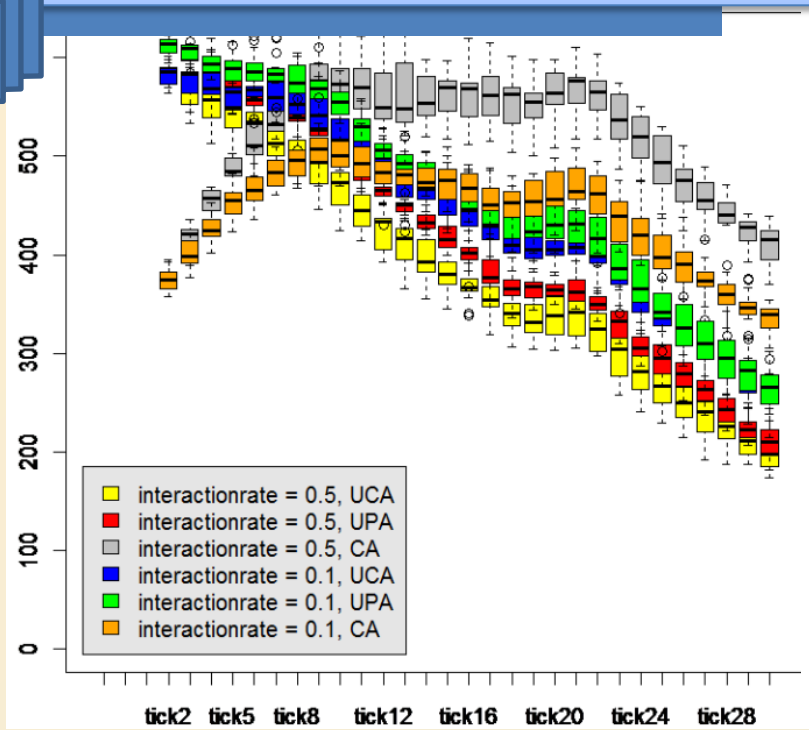
Households relocation by host age

中心区居住促進政策
一反映人口変化
一出生率和出生数

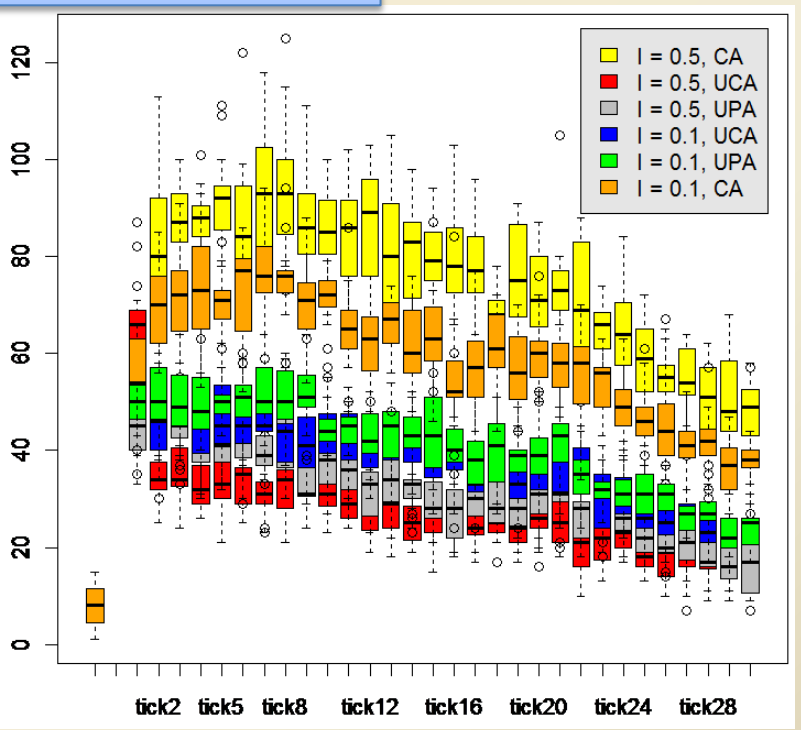
出生率的影響検証

Policy parameters and Policy impact

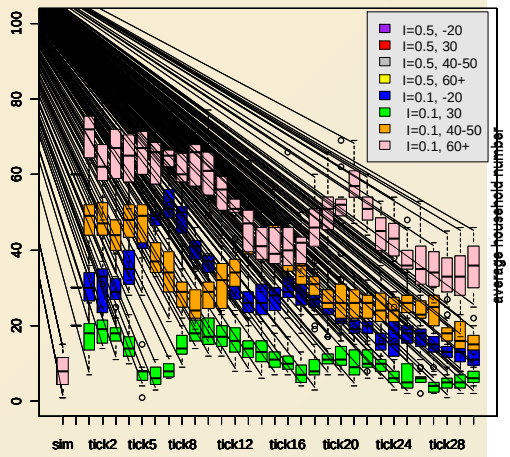
3-4

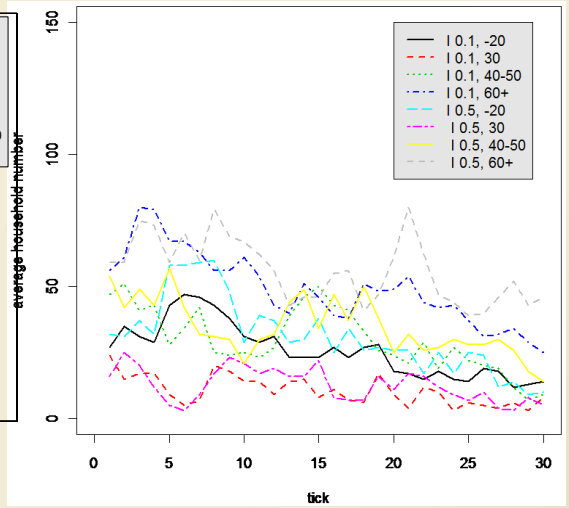


Households in urban areas by policy effects



Household relocation to urban areas





Households by different host age

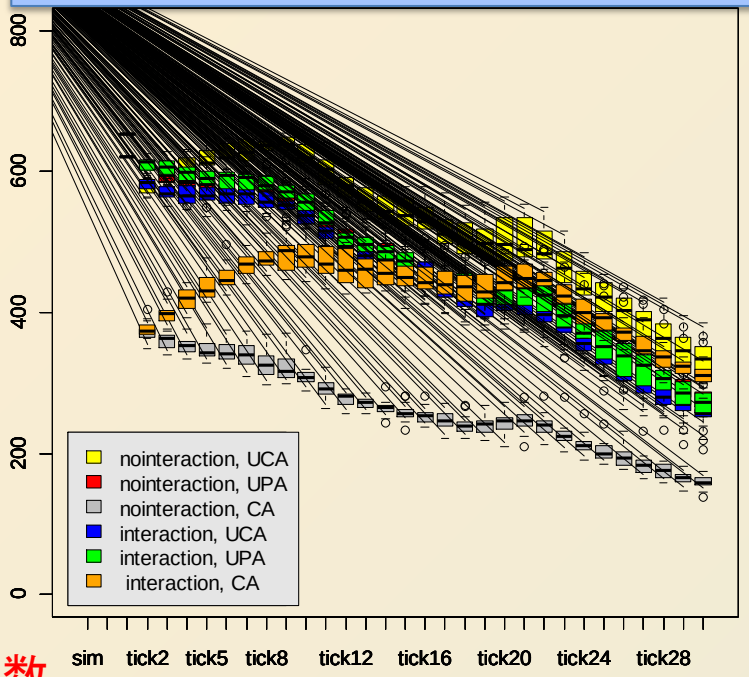
中心区居住促進政策
政策推進力度和効果分析

一居住者的相互影響

3-3

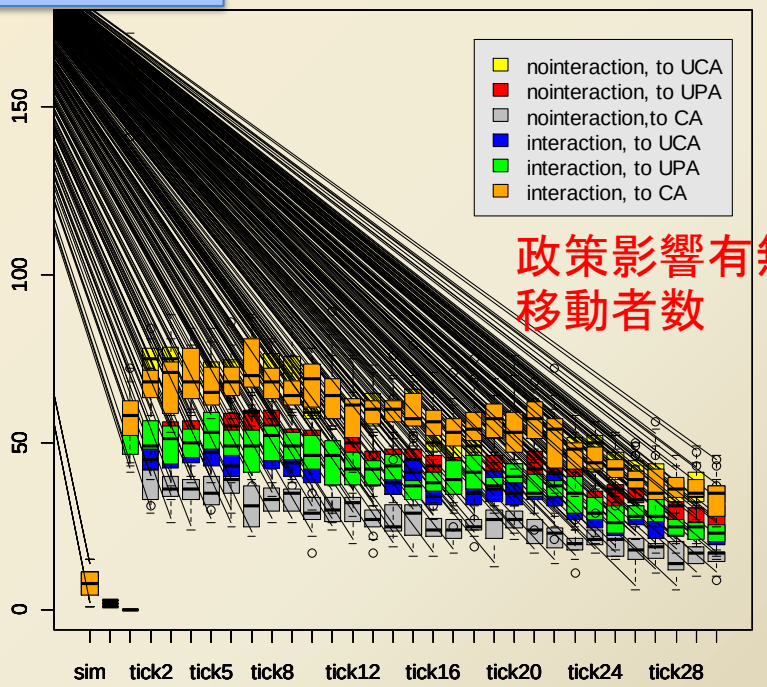
With or without Policy impact

政策影響有無
地区居住者数



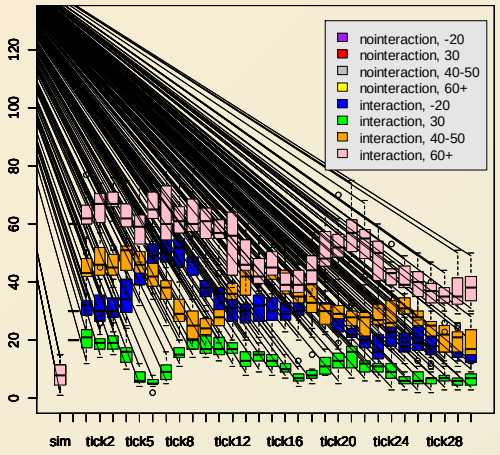
Household number in urban areas

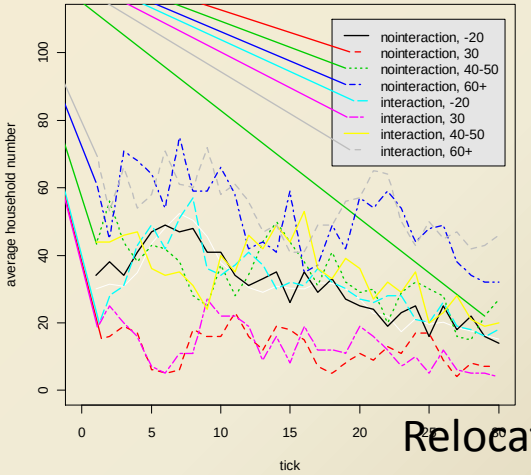
政策影響有無
移動者数



Household number of relocation
to different urban areas

年齢層和移動数

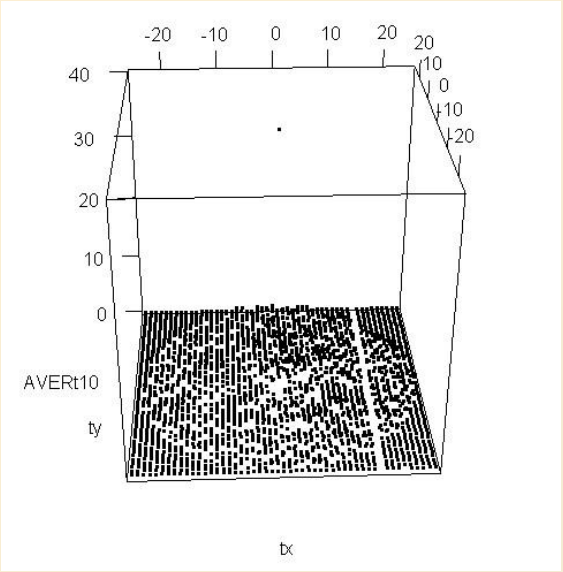




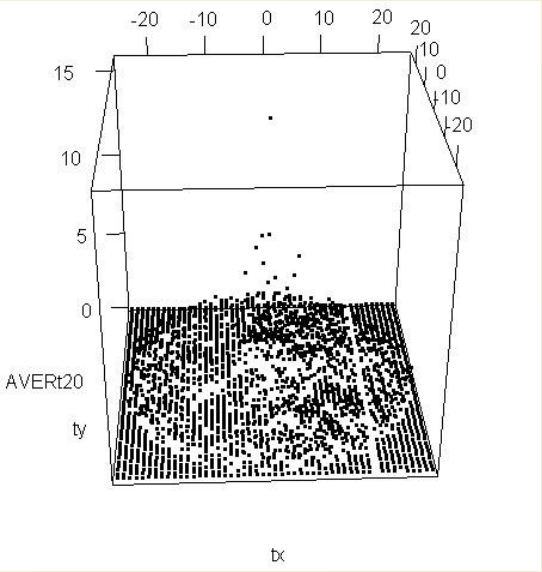
中心区居住促進政策
—補助金是効用的一部分
補助金有無的居住地選択的影響
其実和年収相関
（高齢者人群的影響大
和政策目標矛盾）

Relocated households in different age levels

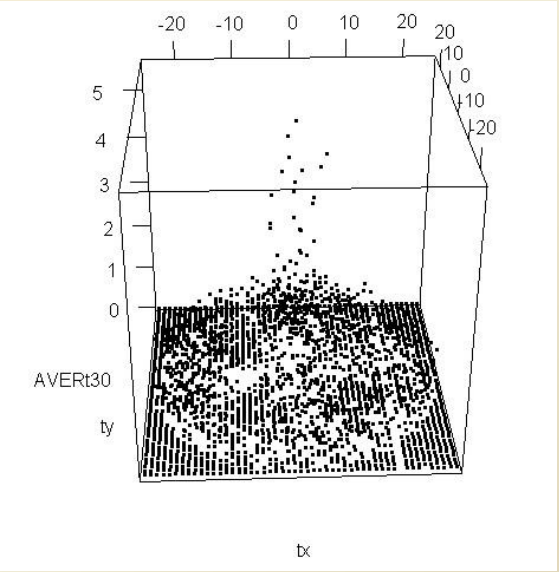
3-5 Spatial autocorrelation



Average agent number in each cell at tick 10



Average agent number in each cell at tick 20



Average agent number in each cell at tick 30

中心区居住促進政策
—仮想都市の居住地の人口分布

3-6 Comparison between simulation and real society

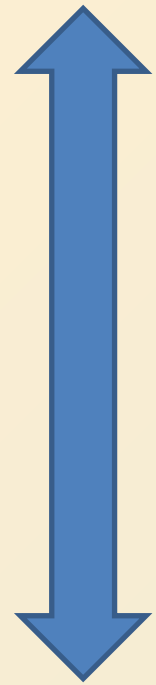
	Years	1985	1990	1995	2000
Real dataset	CA	33.9%	31.9%	29.0%	26.6%
	UPA+UCA	66.1%	68.1%	71.0%	73.4%
Simulated results	CA	32.7%	32.1%	30.4%	33.7%
	UPA+UCA	67.3%	67.9%	69.6%	66.3%

中心区居住促進政策
—実際都市的模擬
—和統計数据的比較

4

Conclusion and discussion

Visualizing the policy impact using Agent-based model



Households

Life cycle stage.

- Seven life cycle stages
- Satisfaction threshold to current location

Relocation utility

- Individual preferences in different zonings
- Policy impact factors and interactions

Downtown revitalization

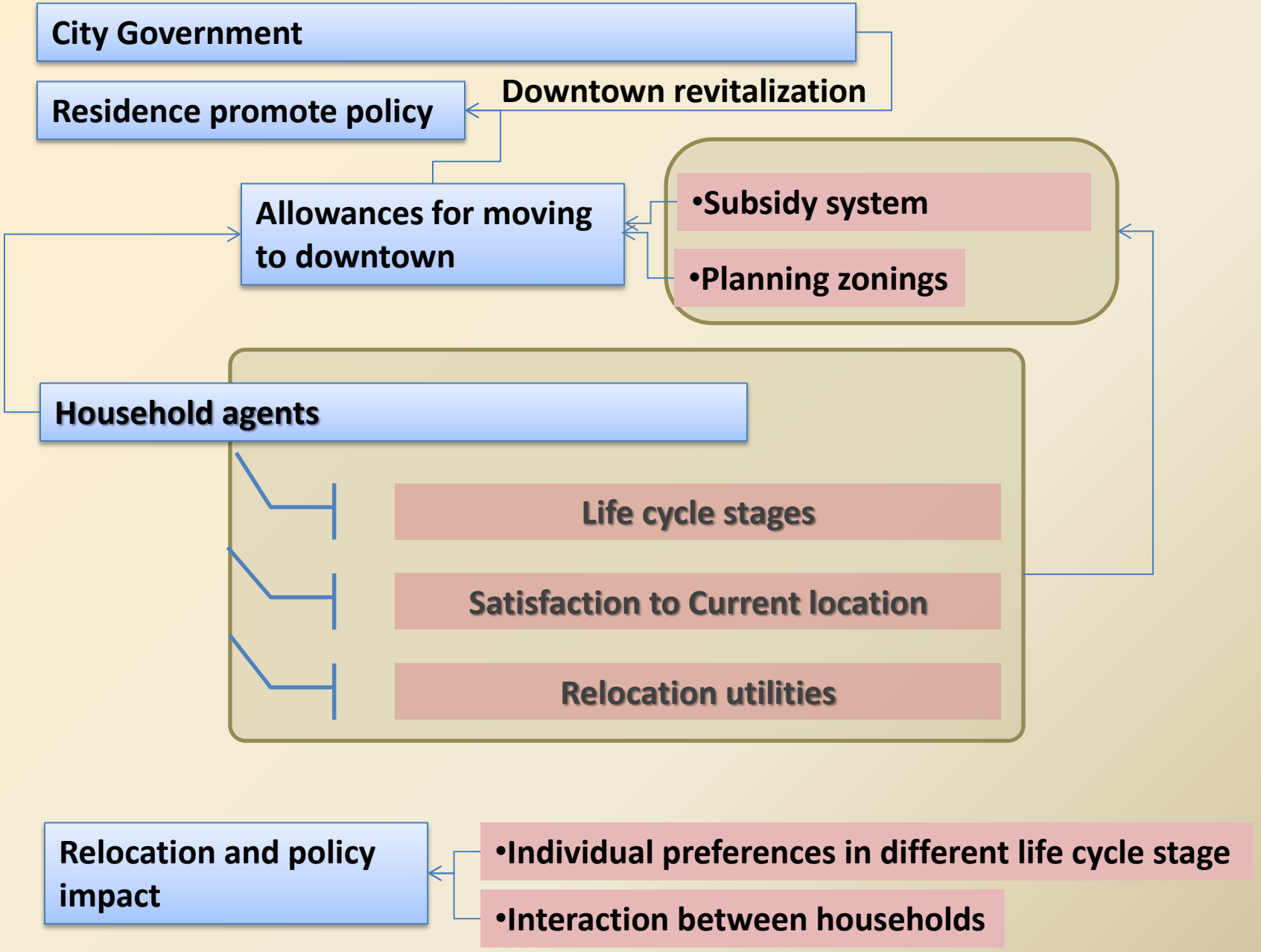
- Allowances for relocation
- Planning zoning and regulations

Government

用MAS模擬
中心区居住促進政策
有効

HRRM is a potential tool to simulate policy impact

HRRM ----- visualizing the policy impact on downtown



中心区居住促進政策評価的全体像

規劃策略研究—Planning Support

部分規劃問題

郊區之大規模
商業施設

居住郊外化
市政施設効率低下
動物生息環境悪化

中心都會區的衰敗
生物多様化

高齢化
低利用土地之増加
生態環境

事例

中心建成区的居住促進
高齢者的養護施設的需要和建設
誘導新的大規模商業施設之設置區位及場所
郊外的土地区画整理開発事業
生態網絡的規劃

金沢市都市計画的課題

An Agent-based Model for Simulating Locations of Day-care Centers

A Case Study of Kanazawa City

2011年金澤市高齢者居住確保計画
—養護設施将来的戦略（日護理設施）

CONTENTS

40

1. Introduction

1.1. Research Background

- In Japan, the number of elderly people aged 65 and older increased from about 12.3 million in 1985 to 29.3 million people in 2010.

- In Kanazawa City:

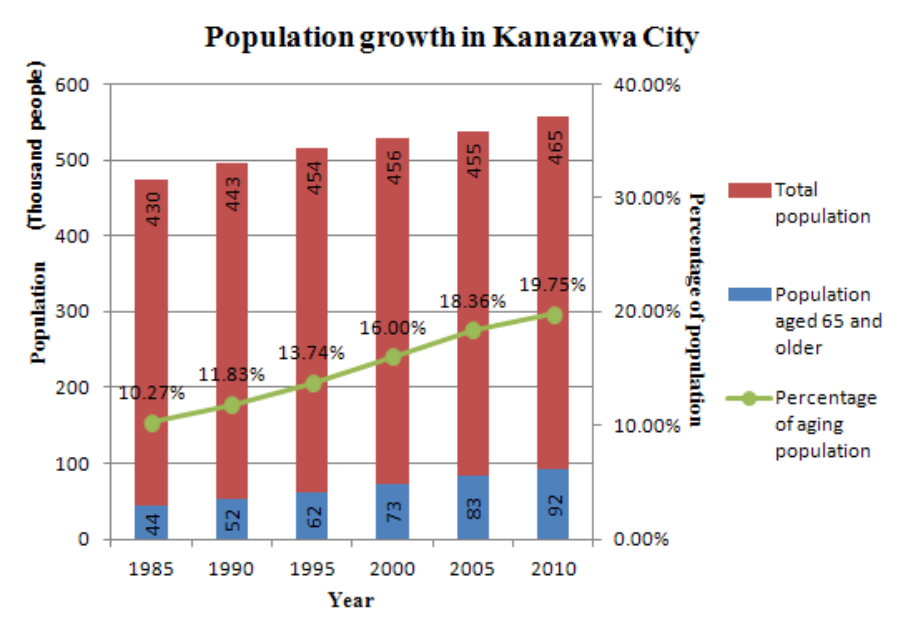


Fig. 1- Population growth in Kanazawa City
http://www.stat.go.jp/english/data/kokusei/index.htm

高齡化傾向

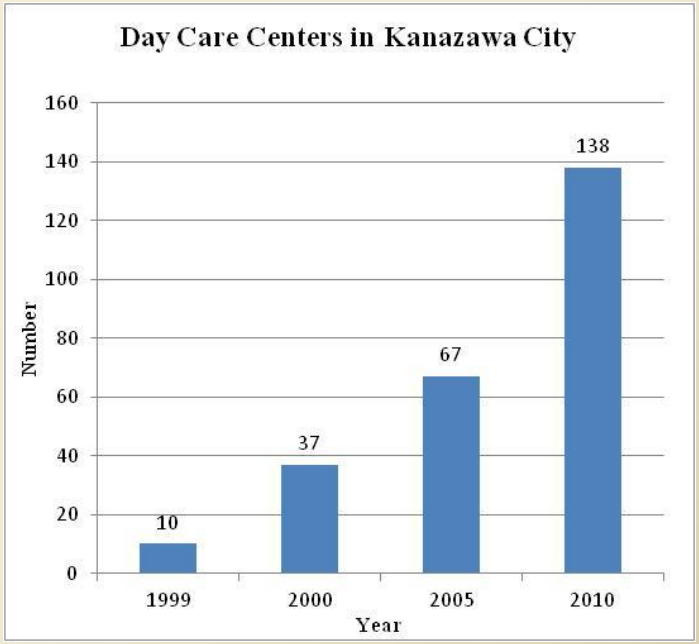


Fig. 2- Day care centers in Kanazawa City
http://www.pref.ishikawa.lg.jp/ansin/list/list.html

日護理設施的数量

1. Introduction

1.1. Research Background

1963:	**Enactment of the Old-age Persons' Welfare Law**
1973:	Free medical care for the elderly
1982:	**Enactment of the Health and Medical Service Law for the Aged** (introduction of co-payment of medical expenses)
1989:	Formulation of the Gold Plan (Ten-year General Strategy for the Promotion of Health and Welfare for the Elderly)
1990:	Revision of the Old-age Persons' Welfare Law
1994:	Formulation of the New Gold Plan (New Ten-year General Strategy for the Promotion of Health and Welfare for the Elderly)
1997:	**Enactment of the Long-term Care Insurance Law**
1999:	Gold Plan 21 (direction of health and welfare measures for the elderly for the next five years)
April 2000:	Enforcement of the long-term care insurance system
April 2003:	Revision of nursing-care benefits / review of long-term care insurance premiums
November 2005:	Enactment of the Elder Abuse Prevention Law
April 2006:	Enforcement of the revised long-term care insurance system/ revision of the nursing-care benefits

高齢化社会的養護政策形成
1997年養護保険法
2000年開始実行

Fig. 3- History of the Development of Nursing-care for elderly people in Japan (*Topic: Welfare policy for the elderly – With a focus on Long-term care insurance system. 2007*)

- The government of Ishikawa prefecture issued a project to investigate current status in aging population, living environment for elderly people, facilities for elderly people's health care, etc.

2011年石川県開始規劃

1. Introduction

1.2. Research Purpose

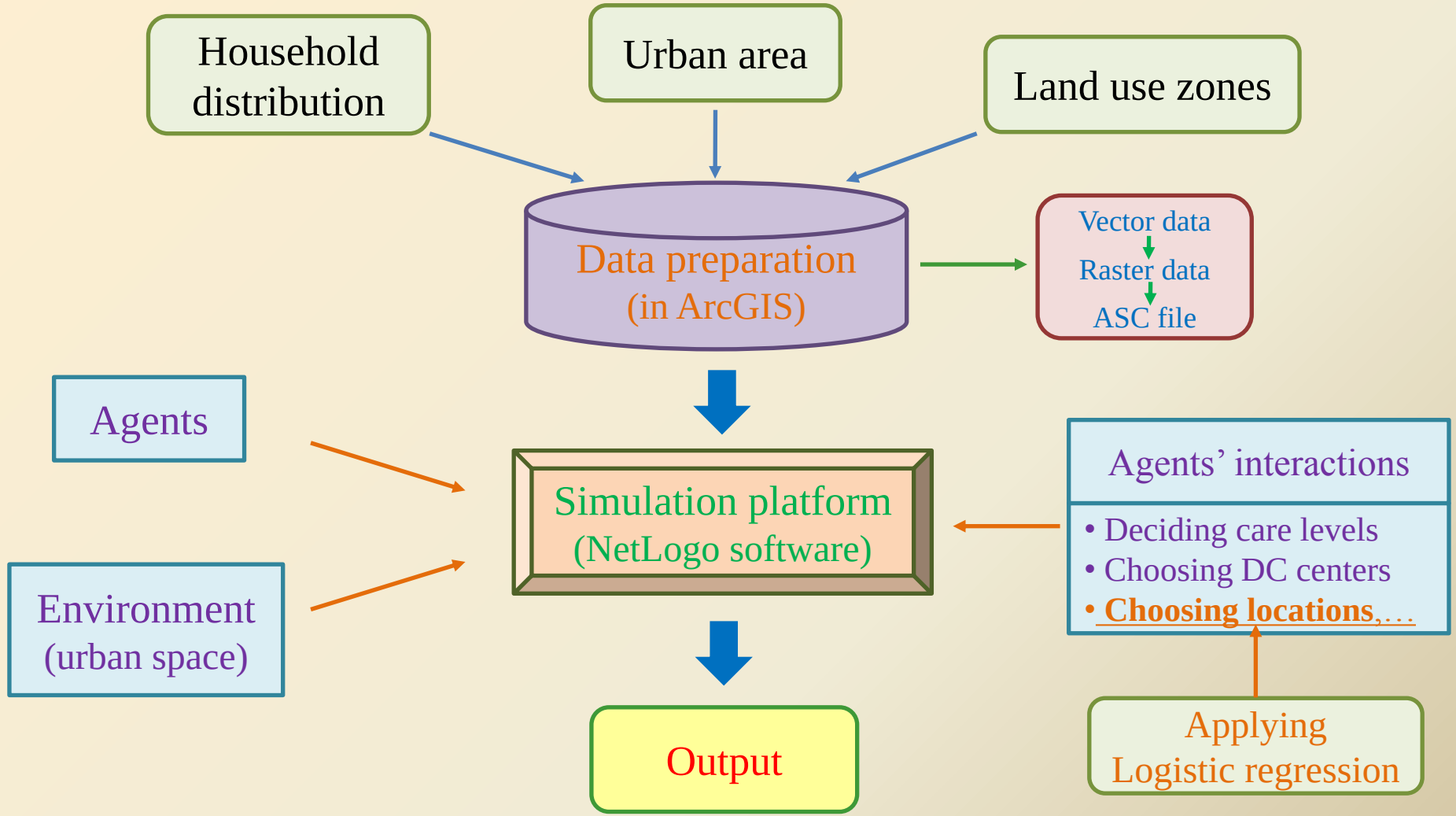
- The purpose of this study is to:
  - develop an agent-based model for planners and policy-makers to consider planning strategies of DC centers before making a plan regarding the locations of DC centers

- Our contribution is that:
  - we considered complex interactions between behaviors and environment and give rise to urban macro patterns in situations where decision-making are made under conditions of deep uncertainty

負責2011年石川県規劃的現状和予測部分

2. Methodology

- We employed Kanazawa City as a case study city.



系統設計一規劃条件、人口土地GIS統計数据、模型設計

3. Model design

3.1. Assumptions

- 6825 households are investigated.
- People will not leave their houses to move to new locations.
- DC centers can be built in all types of land uses.
- One tick equals one year.
- Three kinds of DC centers with different capacities and expenditures

中心区建成区居住促進政策分析的基礎上、
進行仮設
考慮計算時間、導入金沢市一部分的住戸

3. Model design

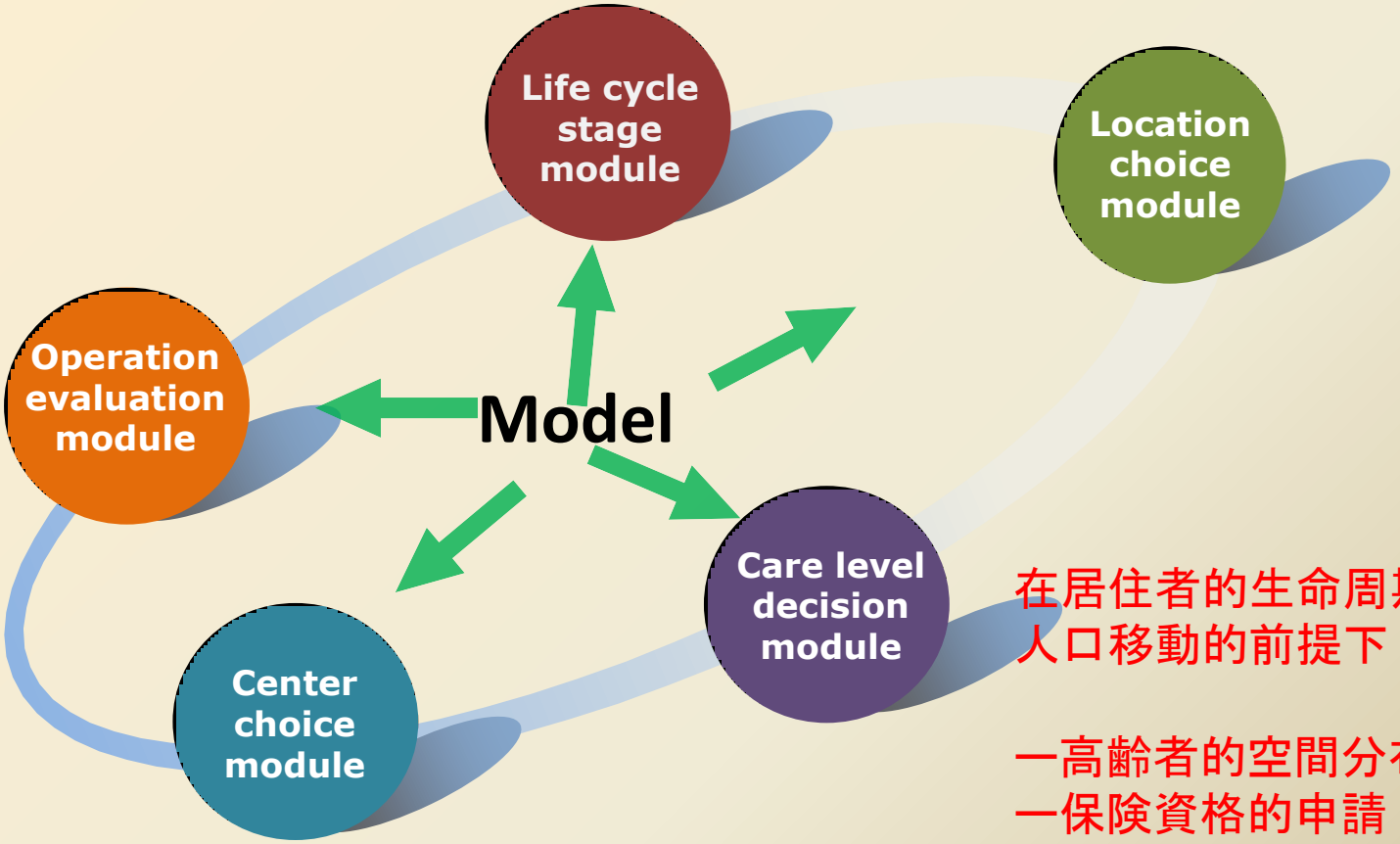
3.2. Agents of the model

主体設置和属性
一地方政府
一住戸
一計画者
一養護設施経営者

総体規劃、土地利用
計画是制約条件

3. Model design

3.4. Model's structure



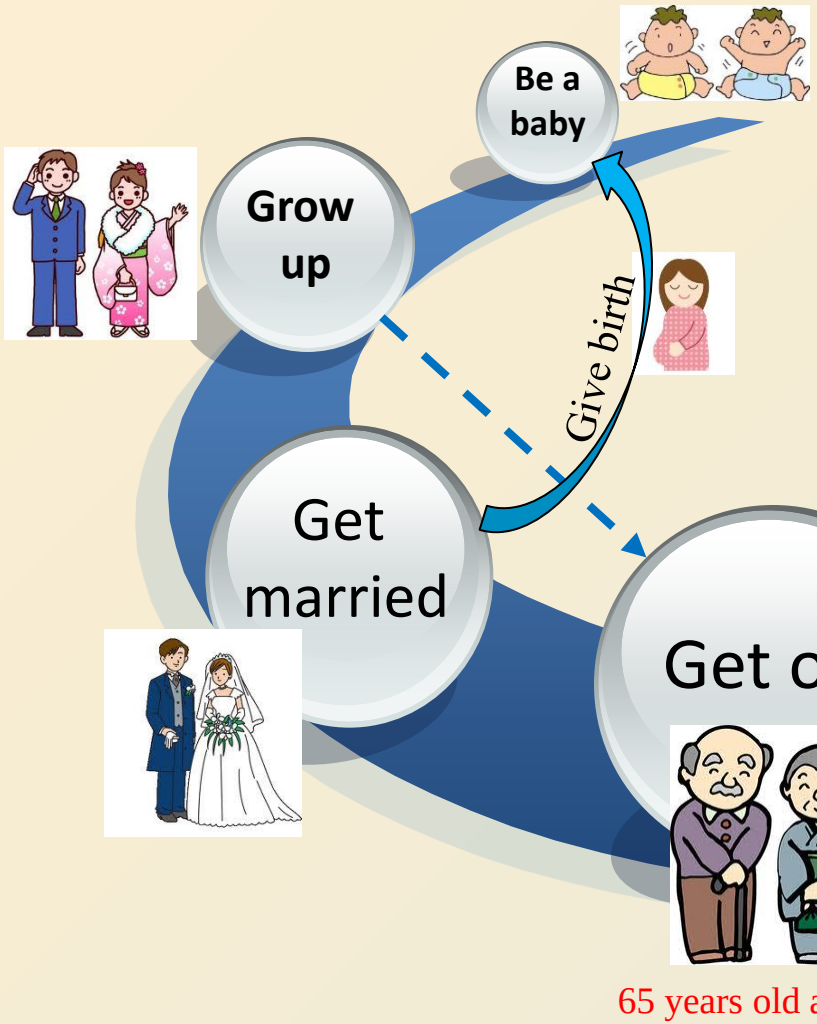
在居住者的生命周期、人口移動的前提下

—高齢者的空間分布
—保険資格的申請
—養護中心的選択
—経営者的経営

3. Model design

3.4. Model structure

3.4.1. Life cycle stage module



❖ Displaying a lifecycle that a person is born, grows up, gets married, gets old and passes away.

生命周期的設定

3. Model design

3.1. Assumptions

- Number of new DC centers that will be built at each tick depends on the number of elderly people wanting to visit DC centers and existing DC centers.

$$N_{newDC} = \frac{N_{Visited-Elderly}}{Ca_{av}} - N_{exDC} \quad (1)$$

N_{newDC} : number of new DC centers

$N_{Visited-Elderly}$: number of elderly agents who want to visit DC centers

Ca_{av} : the average capacity among DC centers

N_{exDC} : number of existing DC centers

計画者主体:養護中心的需要数量的設定
（高齢者数量）

3. Model design

3.2.4. Interactions among agents

3.2.4.3. Operation evaluation module

$$R_j^t = \sum_{m=1}^{7}\sum_{k=1}^{3} N_{imj}^t \times P_{mj} \times F_{imj} \times ra_k \times 52 \qquad (6)$$

R_j^t : revenue of center j for a year at time t

N_{imj}^t : number of elderly i with care level m visited center j.

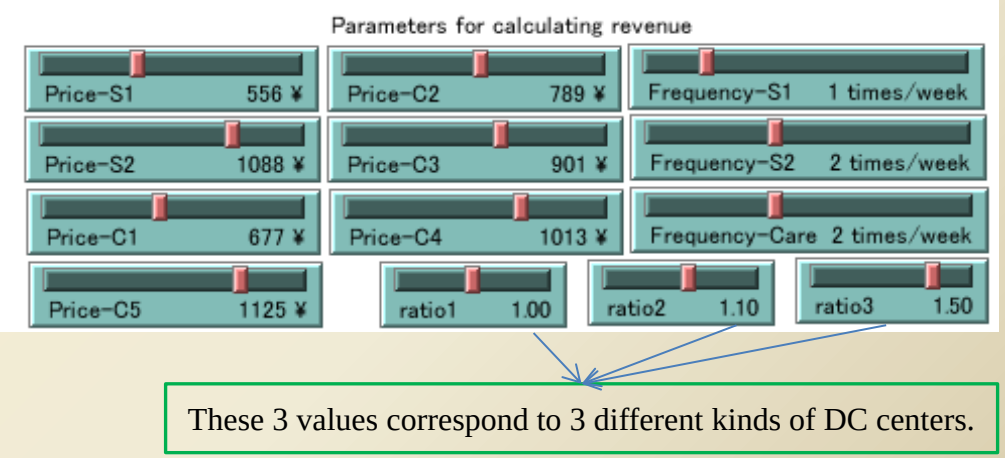
P_{mj} : is the price of care level m at center j.

F_{imj} : is frequency that elderly i with care level m visited center j.

ra_k : is the price ratio among three kinds of DC centers and has 3 different values, such as ra_1 =1; ra_2 =1.1; ra_3 =1.5

52 : number of weeks in a year

m = [1;7] corresponds to 7 care levels that are (S1), (S2), (C1), (C2), (C3), (C4), and (C5).



経営者主体的経営ー高齢者的利用率
利用頻度、価格（政策参数）

3. Model design

3.2.3. Interactions between agents and environment

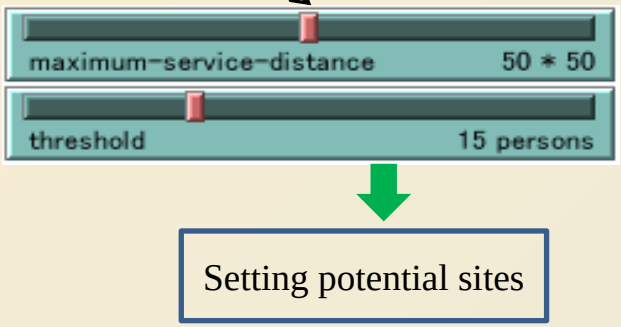
3.2.3.1. DC center agents choose locations to build DC centers in the environment

$$Dj = \sum_{i=1}^{n} a_i \times y_i \quad ;j=[1;n] \qquad (2)$$

Subject to $y_i = 0$ if $d_{ij} > S_{max}$

$y_i = 1$ if $d_{ij} < S_{max}$

- Dj : demand at cell j.
- a_i : number of the elderly who want to visit day-care center at cell i.
- d_{ij} : distance between cell i and cell j
- S_{max}: maximum service distance



経営者確定建設地点参数ー距離、利用人口、最大距離

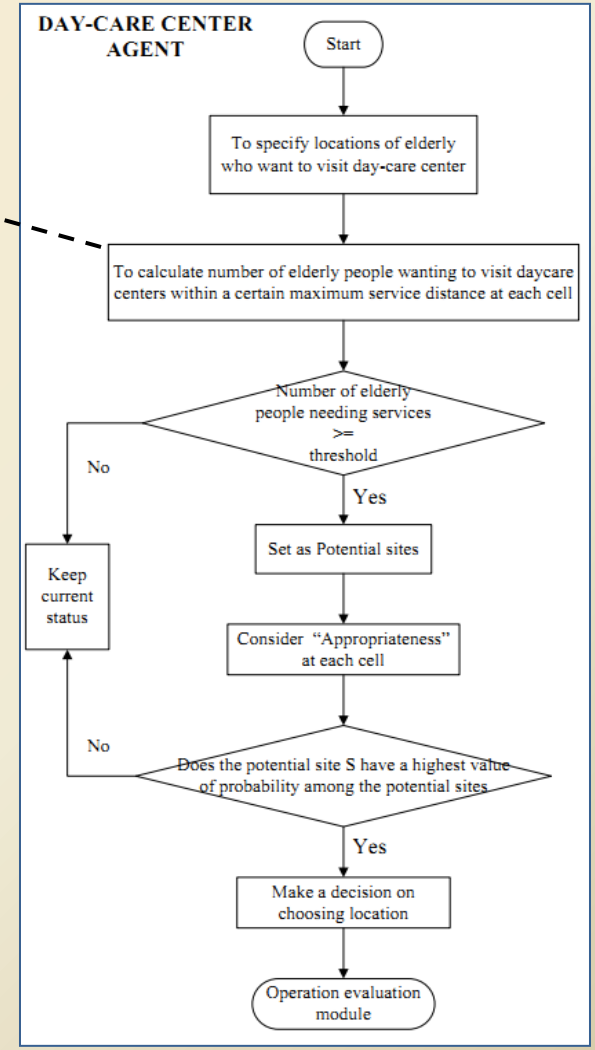


Fig. 6- Decision tree for choosing DC center locations by DC center agents

III.3. Model description (10)

IV.3.4. Center choice module (1)

Using Fee	Meal	bathing	Travel cost	others	Total	Ratio
677	650	50	0	27	1394	1.04
790	60	50	0	27	1467	1.1
677	580	50	0	27	1334	1
677	600	50	0	27	1354	1.01
677	600	50	470	27	1797 / / 2267	1.35 / 1.7
677	630	50	0	27	1384	1.04
790	500	50	0	27	1367	1.02

```
to build-center
  ask daycare-center-owners
[
  ask max-n-of number patches with [EPnum >= threshold ] [ probability]

 [sprout-centers 1  [
     set capacity one-of [ 15 20 25 ]
     set price one-of [ 500 550 750]
     set size 15
     ;set c-xpcor xcor
     ;set c-ypcor ycor
     set order (count centers)

     ask patch-here [
       set pcenter 1;(count centers)
       ;set center-x pxcor
   ;set center-y pycor
    ]
 ]]]


end
```

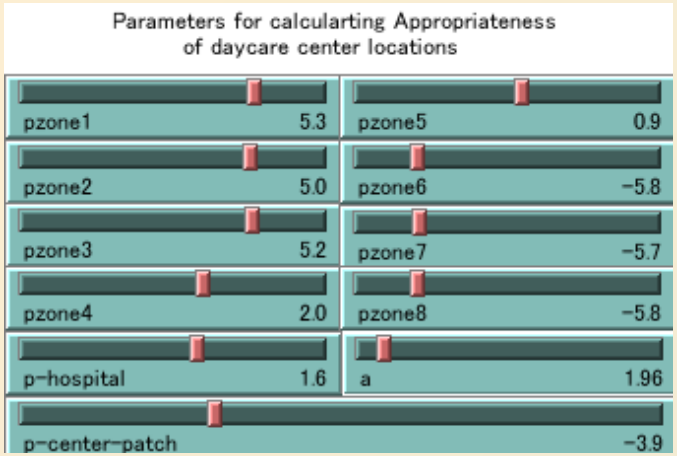
```
to set-price-weight

ask centers with [ price = 500 ] [ set price-weight 50
                                   set price-ratio ratio1]
ask centers with [ price = 550 ] [ set price-weight 45
                                   set price-ratio ratio2 ]
ask centers with [ price = 750 ] [ set price-weight 40
                                   set price-ratio ratio3 ]
end
```

経営者主体:設定服務価格
（随機過程）

3. Model design

3.2.3. Interactions between agents and environment

3.2.3.1. DC center agents choose locations to build DC centers in the environment



Logistic regression

$$S_{ij}^{t} = S_0 + \beta_1 \times f\_zone1 + \beta_2 \times f\_zone2 + \beta_3 \times f\_zone3$$
$$+ \beta_4 \times f\_zone4 + \beta_5 \times f\_zone5 + \beta_6 \times f\_zone6 + \beta_7 \times f\_zone7$$
$$+ \beta_8 \times f\_zone8 + \beta_9 \times f\_center + \beta_{10} \times f\_hospital \quad (3)$$

$$p_g^t = \frac{1}{1 + e^{(-S_{ij}^t - p_{gav}^{t-1} \pm 1)}} \quad (4)$$

$$p_f^t = e^{a \times [-1 + (p_g^t / p_{g\max}^t)]} \quad (5)$$

A potential site having the highest value of p_f will be chosen as a location for DC center

S_{ij}^t : Suitability of cell (i ; j) at time t

S_0 : is constant that is one of [-3 ; 3]

p_g^t : is initial probability at time t

$p_{g\max}^t$: is maximum value of p_g during each step

$\beta_1, \beta_2, ..., \beta_{10}$: are coefficients in logistic regression that correspond to pzone1,…,p-center-patch respectively

$f\_zone1,..$: are spatial features of cell (i;j) that indicate which land use zone that cell belongs to. These parameters were set as values of 1

f_center : spatial feature of cell (i,j) indicating whether there is a DC center at that cell or not

$f\_hospital$: spatial feature of cell (i,j) indicating whether there is a hospital at that cell or not

p_{gav}^{t-1} : the average value of p_g at time t-1 of each cell and its four-cell neighbor

a : is diffusion coefficient which is in the range of (1 – 10)

p_f^t : is the final probability at time t

総体規劃、土地利用計画是制約条件
一用途地域的潜力設定（適応度）

3. Model design

3.2.3. Model structure

3.4.2. Location choice module

- Factors for choosing location:
  - Accessibility
    - The demand from potential elderly people.
    - Distance to hospitals.
  - Land use zones
  - Agglomeration effect: Distance to existing DC centers

Logistic regression

経営者主体:養護中心的区位選択模型

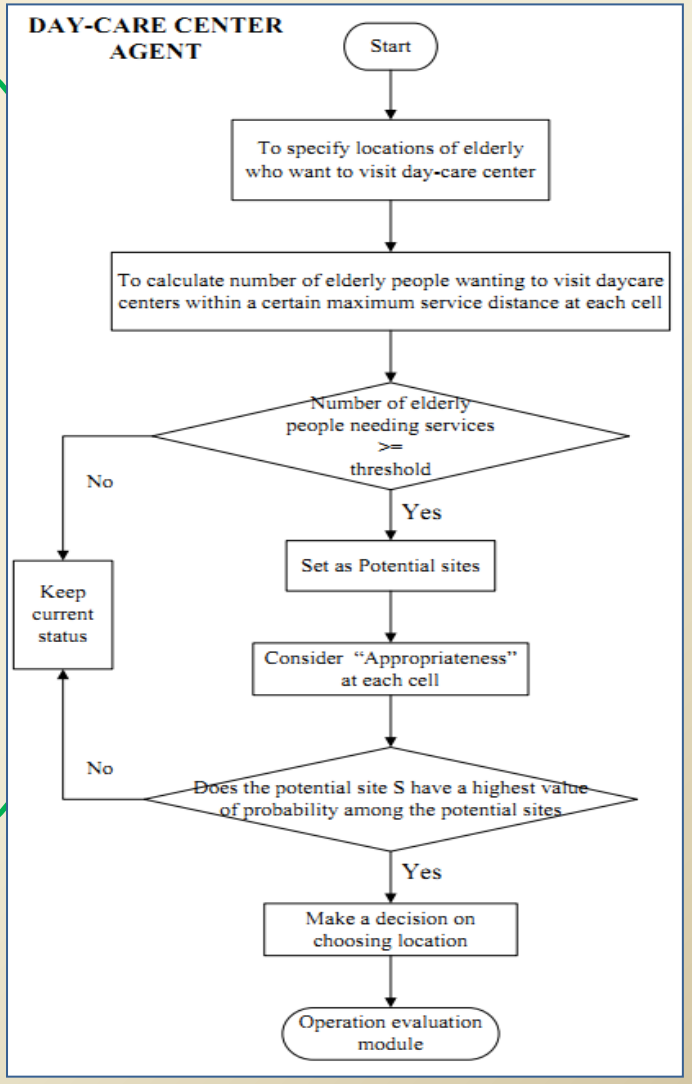


Fig. 6- Decision tree for choosing DC center locations by DC center agents

3. Model design

3.2.3. Model structure

3.4.4. DC centers choice module

Distance from an elderly person's house to a DC center is a single criterion for choosing a DC center to visit.

Interaction between elderly agents for asking other elderly people to visit DC centers

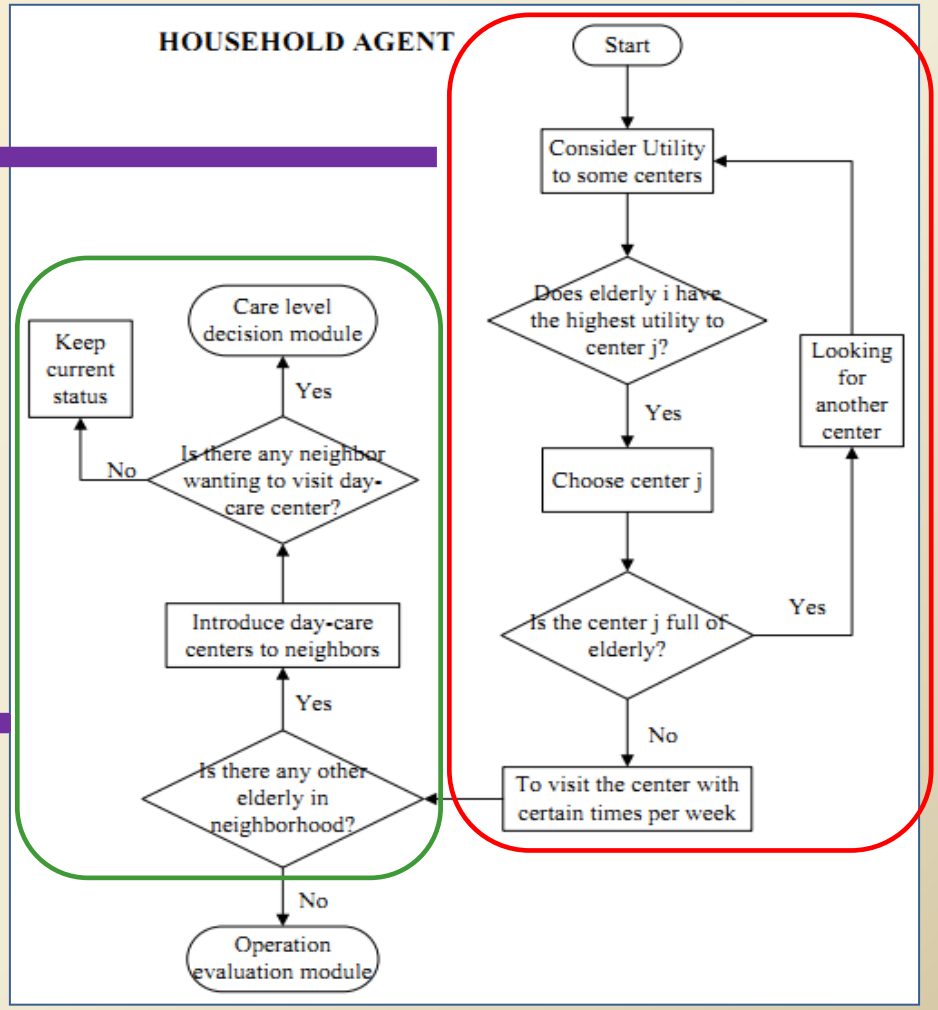


Fig. 9- Decision tree for choosing DC center

経営者主体:高齢者利用人口的計算

3. Model design

3.2.4. Interactions among agents

3.4.5. Operation evaluation module

Showing the behaviors of DC center agents on comparing the revenue and expenditure in a year in order to make sure they could keep on their operation or not

経営者主体:都市空間上高齢者的利用人口和保険費用的推計

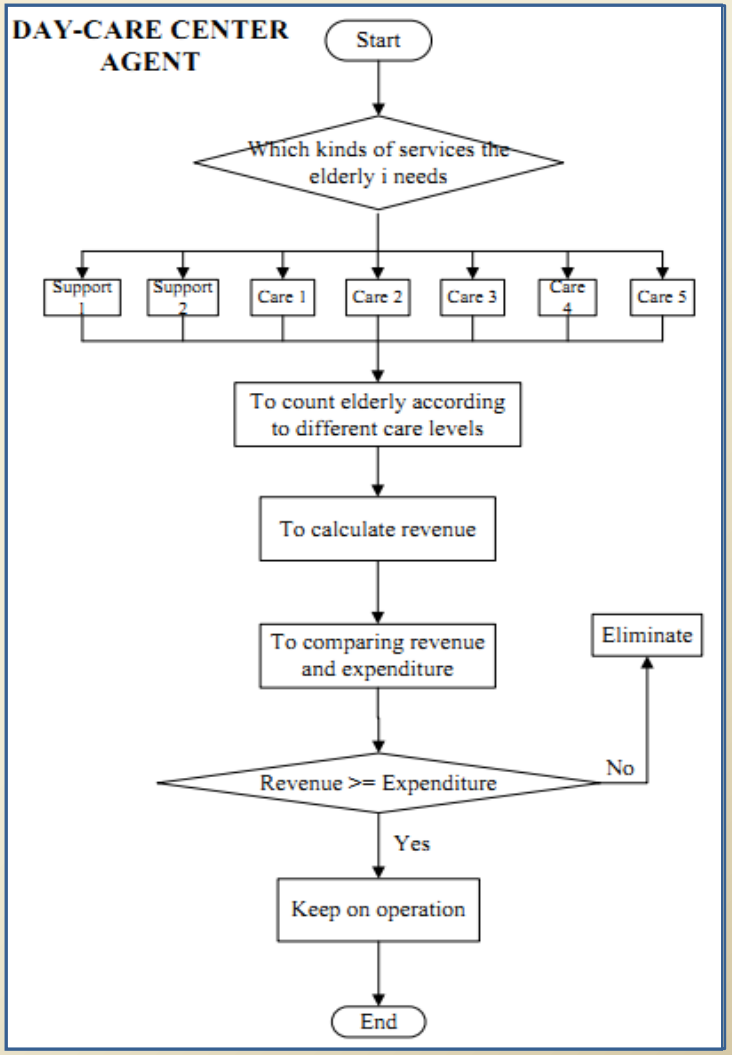


Fig. 10- Decision tree for evaluating DC centers' operation

V. Simulation process for DC center location choice

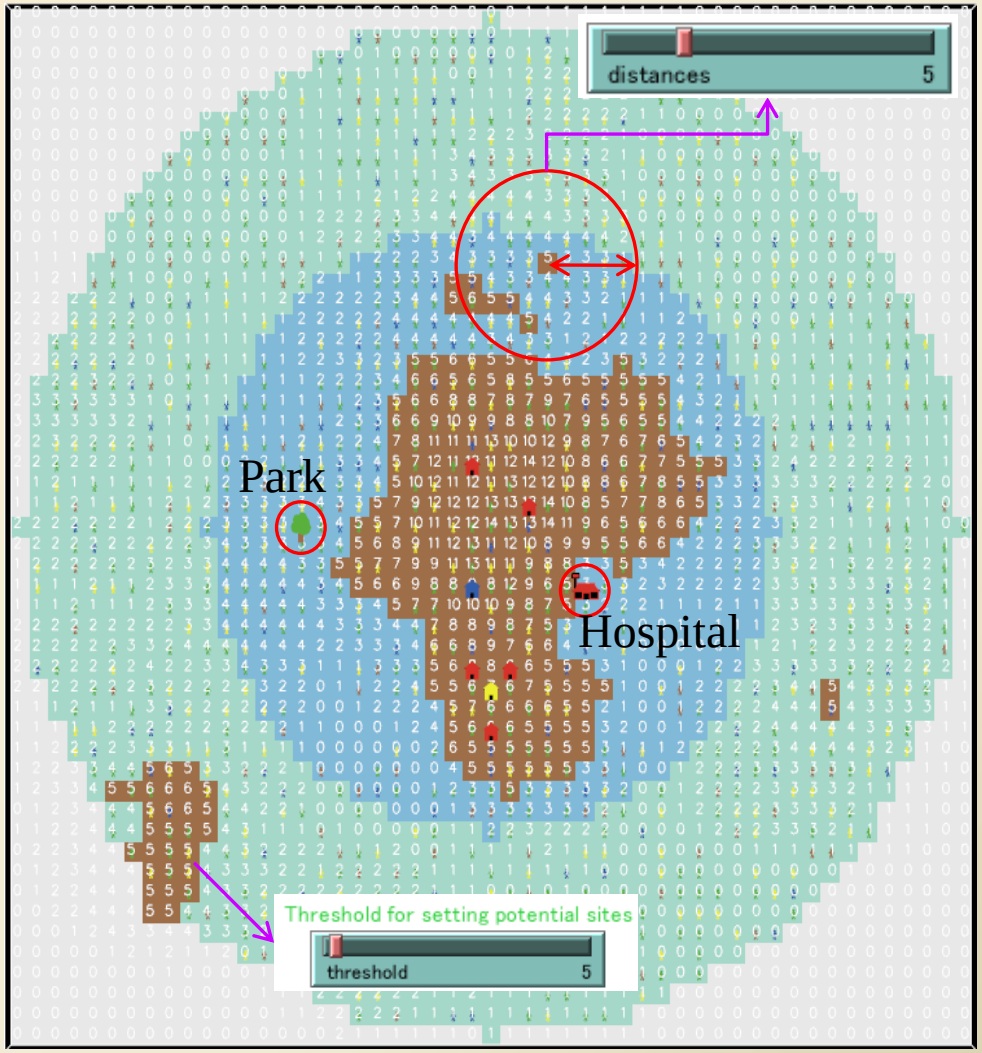


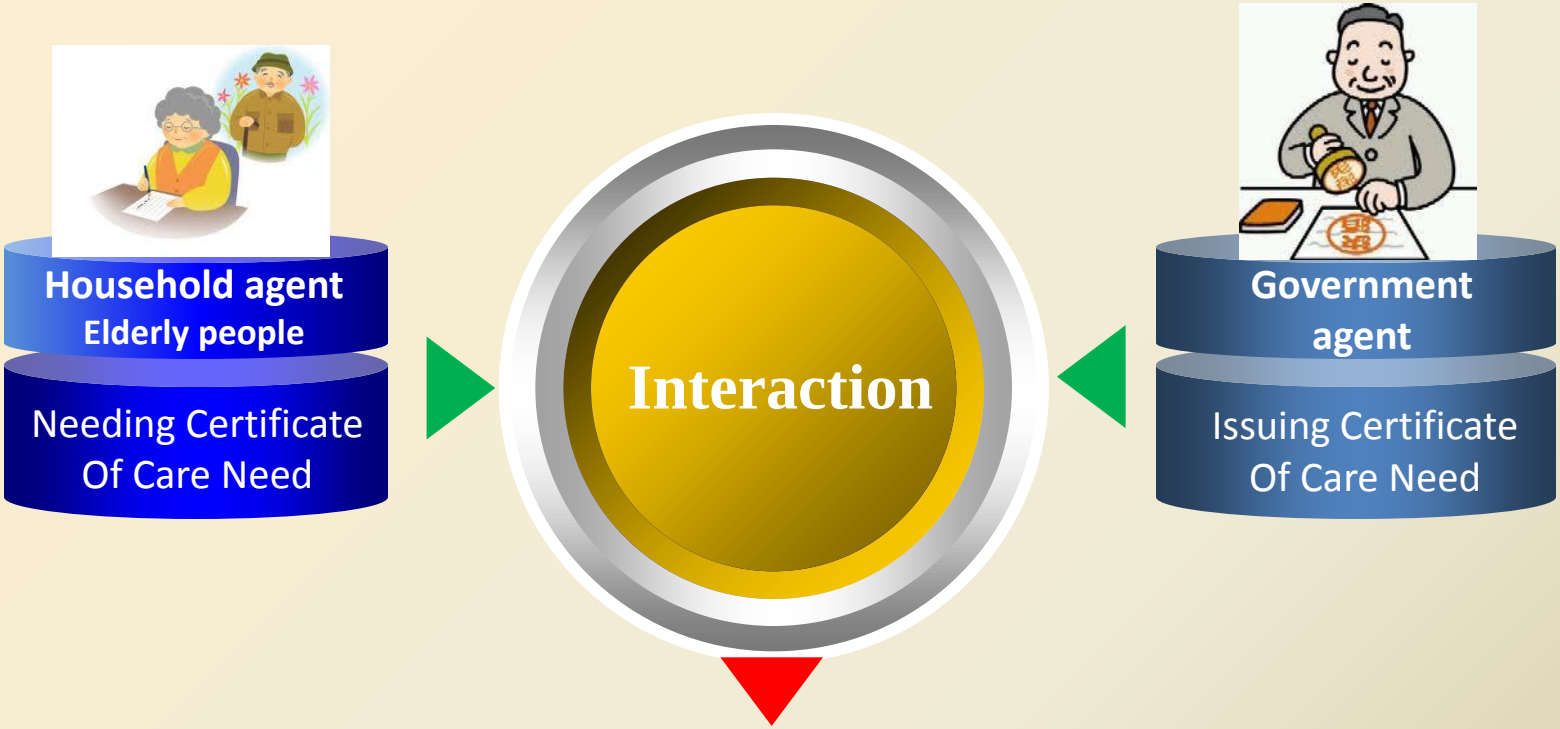
Fig. 2. The way to calculate the demand and to set the potential sites.

経営者主体:仮想都市的模擬効果的検証

3. Model design

3.2.4. Interactions among agents

3.2.4.1. Government agent decides care levels for Elderly agents



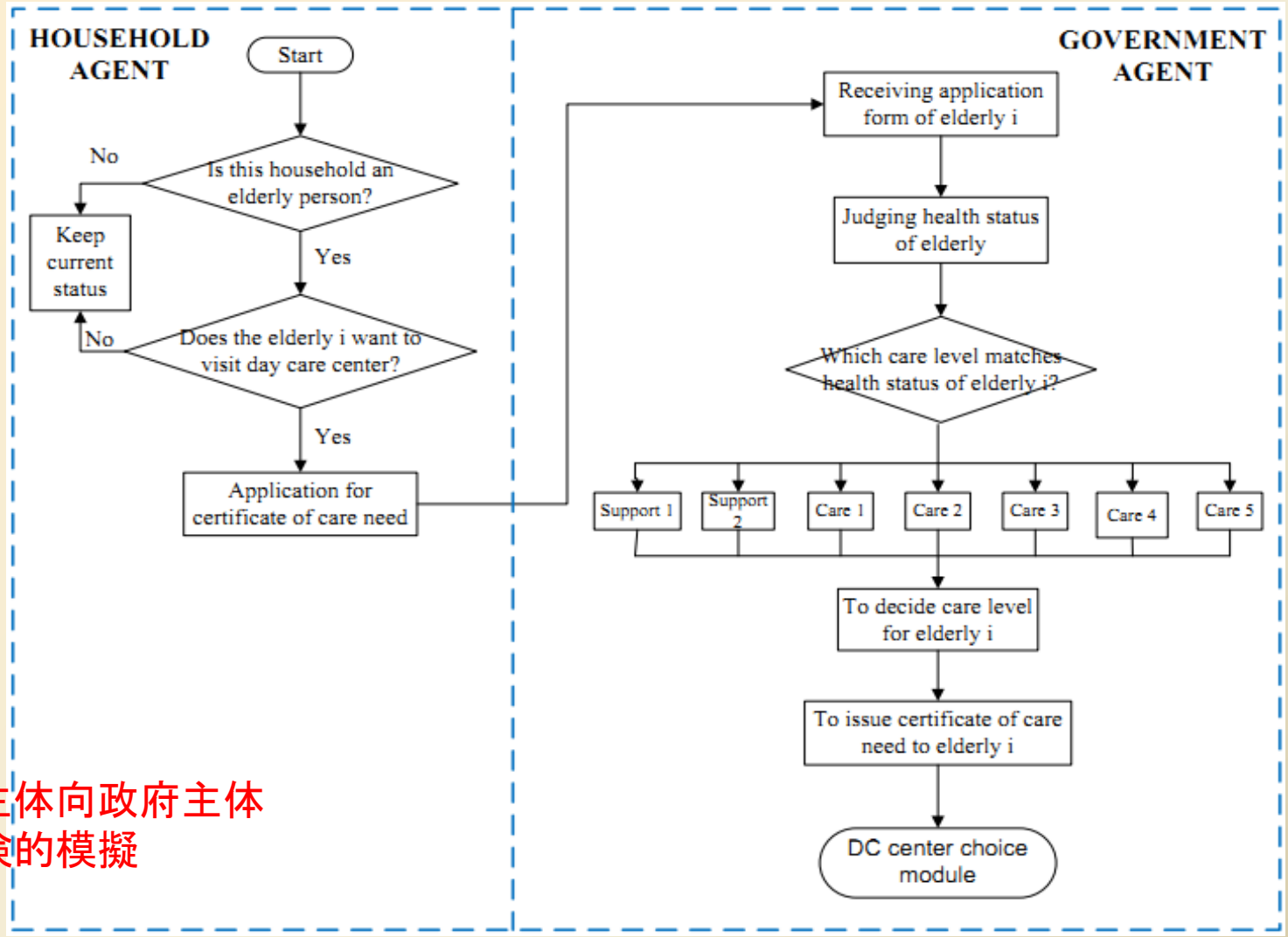
Deciding care levels for elderly people who want to visit DC centers

高齢者主体＋政府主体:用保険的健康条件＋政府判定

3. Model design

3.2.4. Interactions among agents

3.4.3. Care levels decision module



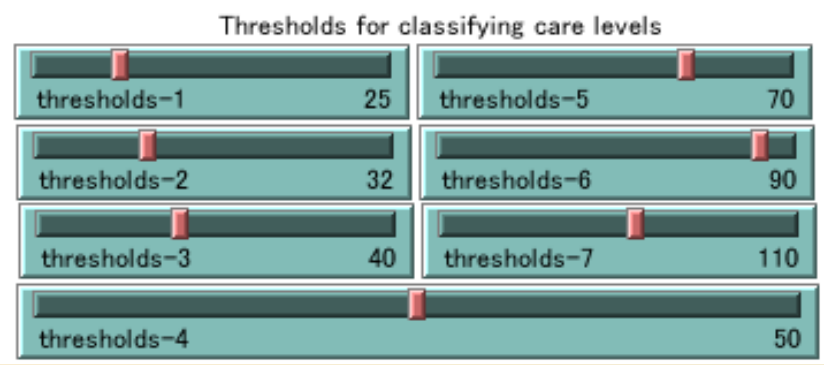
高齢者主体向政府主体
申請保険的模擬

Fig. 7- Decision tree for deciding care levels by government agent

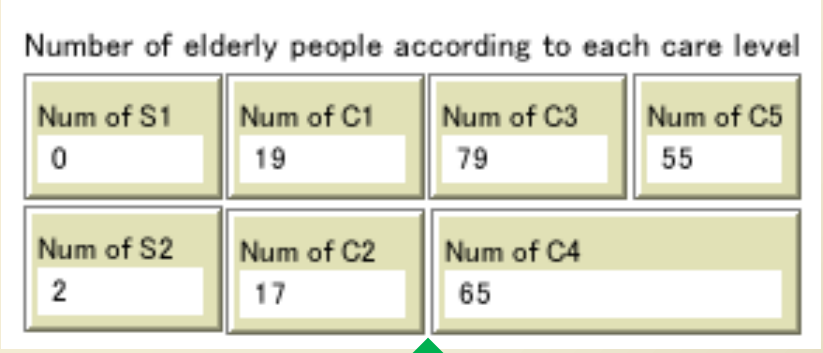
3. Model design

3.2.4. Interactions among agents

3.2.4.1. Government agent decides care levels for Elderly agents



Setting thresholds for classifying care levels



Result on number of elderly according to each care level after each tick

高齡者的保険判定申請
一保険得点的基準
一政府判定的結果

III.3. Model description (4)

IV.3.3. Care levels decision module (3)

図表 23　中間評価項目得点

HC1	1 身体機能・起居動作	麻痺の種類	ない	6.5	いずれか一肢のみ	5.5	両下肢のみ	3.9	右上下肢あるいは左上下肢	3.3	その他の四肢の麻痺	0
HC2		拘縮(肩関節)	ない	2.3	ある	0						
HC3		拘縮(股関節)	ない	2.7	ある	0						
HC4		拘縮(膝関節)	ない	1.1	ある	0						
HC5		寝返り	できる	9.0	つかまれば可	6.5	できない	0				
HC6		起き上がり	できる	8.8	つかまれば可	6.7	できない	0				
HC7		座位保持	できる	10.0	肘が支えれば可	8.4	支えが必要	4.7	できない	0		
HC8		両足での立位	できる	8.7	支えが必要	6.2	できない	0				
HC9		歩行	できる	7.6	つかまれば可	5.5	できない	0				
HC10		立ち上がり	できる	9.7	つかまれば可	7.1	できない	0				
HC11		片足での立位	できる	7.3	支えが必要	5.4	できない	0				
HC12		洗身	介助されていない	6.2	一部介助	4.4	全介助	0	行っていない	0		
HC13		つめ切り	介助されていない	4.1	一部介助	2.8	全介助	0				
HC14		視力	普通	5.2	1m 先が見える	4.0	目の前が見える	2.9	ほとんど見えず	0	判断不能	0
HC15		聴力	普通	10.8	やっと聞こえる	10.6	大声が聞こえる	9.8	ほとんど聞こえず	9.0	判断不能	0
HA1	2 生活機能	移乗	介助されていない	9.1	見守り等	6.9	一部介助	3.5	全介助	0		
HA2		移動	介助されていない	8.1	見守り等	6.4	一部介助	3.7	全介助	0		
HA3		えん下	できる	10.2	見守り等	7.2	できない	0				
HA4		食事摂取	介助されていない	9.8	見守り等	6.8	一部介助	4.6	全介助	0		
HA5		排尿	介助されていない	7.2	見守り等	5.9	一部介助	5.1	全介助	0		
HA6		排便	介助されていない	7.2	見守り等	5.7	一部介助	4.9	全介助	0		
HA7		口腔清潔	介助されていない	9.3	一部介助	5.2	全介助	0				
HA8		洗顔	介助されていない	9.0	一部介助	5.1	全介助	0				
HA9		整髪	介助されていない	7.9	一部介助	4.1	全介助	0				
HA10		上衣の着脱	介助されていない	9.4	見守り等	8.0	一部介助	5.7	全介助	0		
HA11		ズボン等の着脱	介助されていない	8.7	見守り等	7.3	一部介助	5.4	全介助	0		
HA12		外出頻度	週 1 回以上	4.1	月 1 回以上	3.4	月 1 回未満	0				
BT1	3 認知機能	意思の伝達	できる	17.7	ときどきできる	12.5	ほとんど不可	4.2	できない	0		
BT2		毎日の日課を理解	できる	7.6	できない	0						
BT3		生年月日をいう	できる	11.3	できない	0						
BT4		短期記憶	できる	7.0	できない	0						
BT5		自分の名前をいう	できる	16.3	できない	0						
BT6		今の季節を理解	できる	9.1	できない	0						
BT7		場所の理解	できる	11.6	できない	0						
BT8		徘徊	ない	9.5	ときどきある	2.7	ある	0				
BT9		外出して戻れない	ない	9.9	ときどきある	4.7	ある	0				
QI1	4 精神・行動障害	被害的	ない	7.0	ときどきある	3.2	ある	0				
QI2		作話	ない	8.2	ときどきある	3.4	ある	0				
QI3		感情が不安定	ない	5.0	ときどきある	2.5	ある	0				
QI4		昼夜逆転	ない	4.2	ときどきある	1.9	ある	0				
QI5		同じ話をする	ない	4.9	ときどきある	3.0	ある	0				
QI6		大声をだす	ない	7.0	ときどきある	2.8	ある	0				
QI7		介護に抵抗	ない	6.1	ときどきある	2.4	ある	0				
QI8		落ち着きなし	ない	7.8	ときどきある	2.1	ある	0				
QI9		一人で出たがる	ない	8.7	ときどきある	2.3	ある	0				
QI10		収集癖	ない	8.3	ときどきある	1.6	ある	0				
QI11		物や衣類を壊す	ない	10.7	ときどきある	2.3	ある	0				
QI12		ひどい物忘れ	ない	4.0	ときどきある	3.3	ある	0				
QI13		独り言・独り笑い	ない	6.5	ときどきある	2.3	ある	0				
QI14		自分勝手に行動する	ない	6.3	ときどきある	3.0	ある	0				
QI15		話がまとまらない	ない	5.3	ときどきある	1.9	ある	0				
MN1	5 社会生活への適応	薬の内服	介助されていない	21.2	一部介助	9.9	全介助	0				
MN2		金銭の管理	介助されていない	18.2	一部介助	9.5	全介助	0				
MN3		日常の意思決定	できる	22.5	特別な場合を除いてできる	13.7	日常的に困難	5.5	できない	0		
MN4		集団への不適応	ない	6.1	ときどきある	1.8	ある	0				
MN5		買い物	介助されていない	16.6	見守り等	9.2	一部介助	7.4	全介助	0		
MN6		簡単な調理	介助されていない	15.4	見守り等	9.0	一部介助	8.6	全介助	0		

TH1

```
to set-TH1
  ask households with [ elderly = 1]
  [
    set HC1 one-of [ 6.5 5.5 3.9 3.3 0 ]
    set HC2 one-of [ 2.3 0 ]
    set HC3 one-of [ 2.7 0 ]
    set HC4 one-of [ 1.1 0 ]
    set HC5 one-of [ 9.0 6.5 0 ]
    set HC6 one-of [ 8.8 6.7 0 ]
    set HC7 one-of [ 10 8.4 4.7 0 ]
    set HC8 one-of [ 8.7 6.2 0 ]
    set HC9 one-of [ 7.6 5.5 0 ]
    set HC10 one-of [ 9.7 7.1 0 ]
    set HC11 one-of [ 7.3 5.4 0 ]
    set HC12 one-of [ 6.2 4.4 0 0 ]
    set HC13 one-of [ 4.1 2.8 0 ]
    set HC14 one-of [ 5.2 4.0 2.9 0 0 ]
    set HC15 one-of [ 10.8 10.6 9.8 9 0 ]

    set TH1 (HC1 + HC2 + HC3 + HC4 + HC5 + HC6 + HC7 + HC8 + HC9 + HC10 + HC11 + HC12 + HC13 + HC14 + HC15)
  ]
end
```

TH2

TH3

```
to set-TH3
  ask households with [ elderly = 1]
  [
    set BT1 one-of [ 17.7 12.5 4.2 0 ]
    set BT2 one-of [ 7.6 0 ]
    set BT3 one-of [ 11.3 0 ]
    set BT4 one-of [ 7 0 ]
    set BT5 one-of [ 16.3 0 ]
    set BT6 one-of [ 9.1 0 ]
    set BT7 one-of [ 11.6 0 ]
    set BT8 one-of [ 9.5 2.7 0 ]
    set BT9 one-of [ 9.9 4.7 0 ]

    set TH3 (BT1 + BT2 + BT3 + BT4 + BT5 + BT6 + BT7 + BT8 + BT9  )
  ]
end
```

TH4

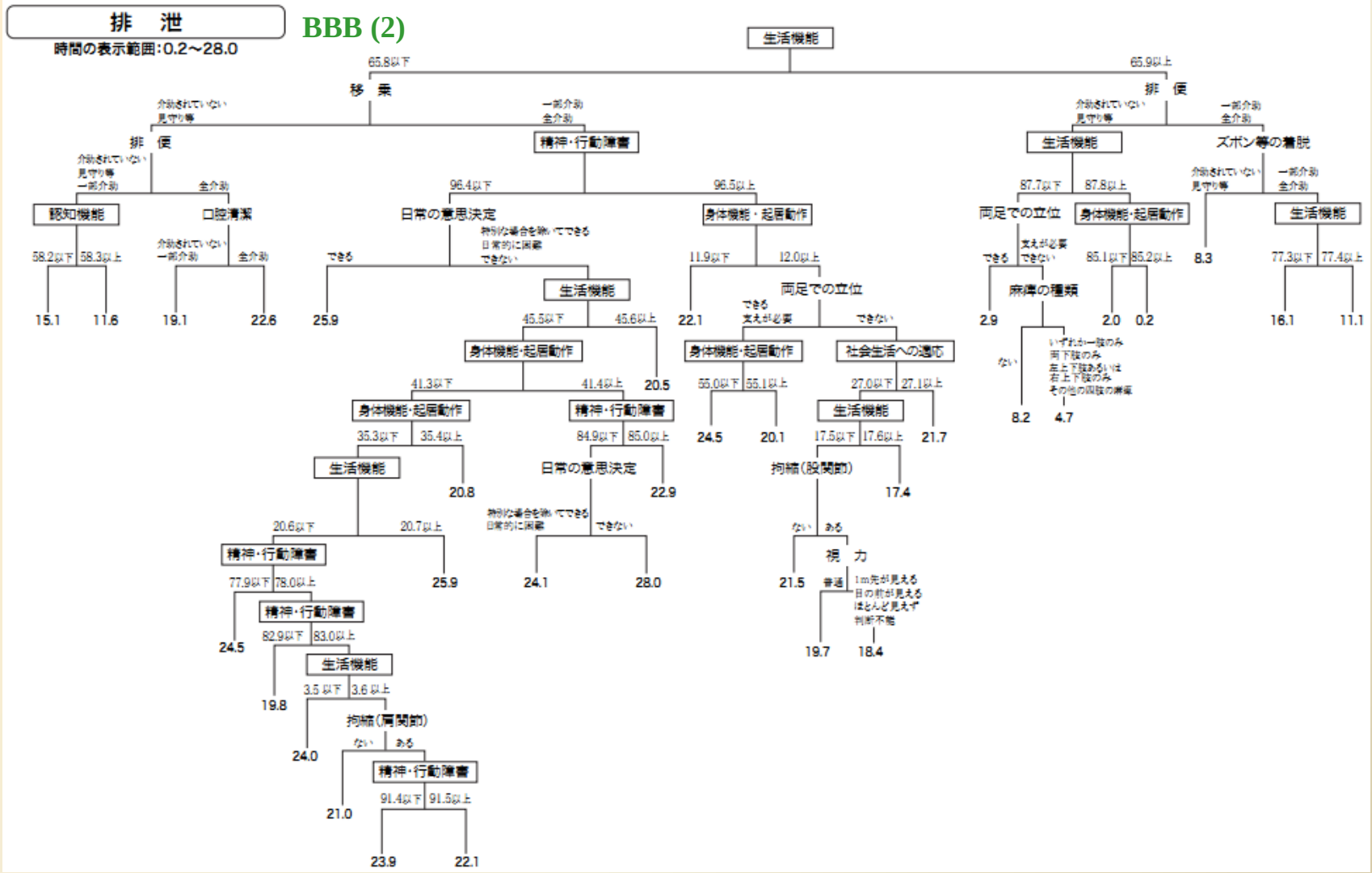
TH5

```
to set-TH5
  ask households with [ elderly = 1]
  [
    set MN1 one-of [ 21.2 9.9 0 ]
    set MN2 one-of [ 18.2 9.5 0 ]
    set MN3 one-of [ 22.5 13.7 5.5 0 ]
    set MN4 one-of [ 6.1 1.8 0 ]
    set MN5 one-of [ 16.6 9.2 7.4 0 ]
    set MN6 one-of [ 15.4 9 8.6 0 ]

    set TH5 (MN1 + MN2 + MN3 + MN4 + MN5 + MN6    )
  ]
end
```

政府主体:高齢者的保険申請的得分判定

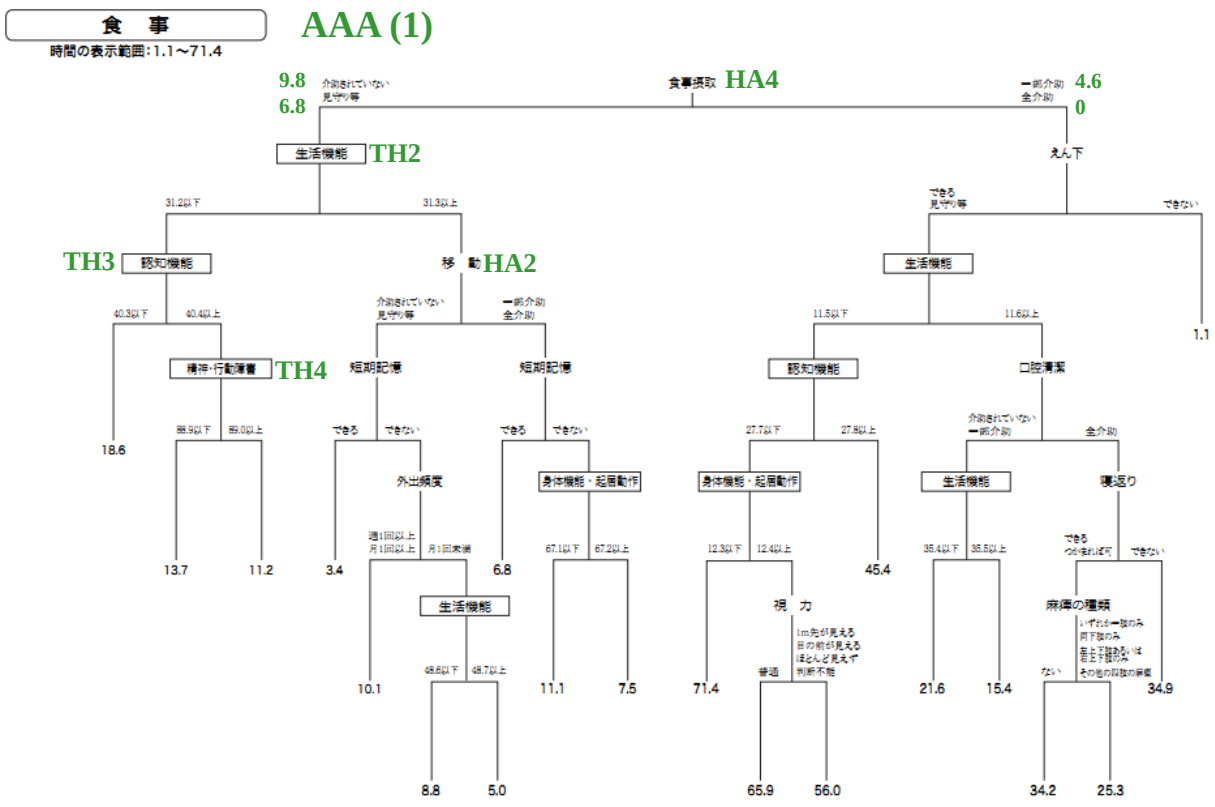
III.3. Model description (4)

IV.3.3. Care levels decision module (3)



III.3. Model description (4)

IV.3.3. Care levels decision module (3)




```
to specify-AAA
  ask households with [ elderly = 1]
  [
    ifelse HA4 = 9.8 or HA4 = 6.8
    [ifelse TH2 <= 31.2
      [ifelse TH3 <= 40.3
        [set AAA 18.6 ]
        [ifelse TH4 <= 88.9
          [ set AAA  13.7]
          [ set AAA  11.2]]]
      [ifelse HA2 = 8.1 or HA2 = 6.4
        [ifelse BT4 = 7
          [set AAA 3.4]
          [ifelse HA12 = 4.1 or HA12 = 3.4
            [set AAA 10.1]
            [ifelse TH2 <= 48.6
              [set AAA 8.8]
              [set AAA 5.0]]]]
        [ifelse BT4 = 7
          [set AAA 6.8]
          [ifelse TH1 <= 67.1
            [set AAA 11.1]
            [set AAA 7.5]]]]]
    [ifelse HA3 = 10.2 or HA3 = 7.2
      [ifelse TH2 <= 11.5
        [ifelse TH3 <= 27.7
          [ifelse TH1 <= 12.3
            [set AAA 71.4]
            [ifelse HC14 = 5.2
              [set AAA 65.9]
              [set AAA 56.0]]]
          [set AAA 45.4]]
        [ifelse HA7 = 9.3 or HA7 = 5.2
          [ifelse TH2 <= 35.4
            [set AAA 21.6]
            [set AAA 15.4]]
          [ifelse HC5 = 9.0 or HC5 = 6.5
            [ifelse HC1 = 6.5
              [set AAA 34.2]
              [set AAA 25.3]]
            [set AAA 34.9]]]]
      [set AAA 1.1]]]

end
```

政府主体:高齢者的保険申請得分的構成和程序設計

3. Model design

3.2.4. Interactions among agents

3.4.3. Care levels decision module

Meal (1)
1.1; 3.4; 5.0; 6.8; 7.5; 8.8; 10.1; 11.1; 11.2; 13.7; 15.4; 18.6; 21.6; 25.3; 34.2; 34.9; 45.4; 56.0; 65.9; 71.4
Excretion (2)
0.2; 2.0; 2.9; 4.7; 8.2; 8.3；11.1; 11.6；15.1；16.1; 17.4; 18.4; 19.1; 19.7; 19.8; 20.1; 20.5; 20.8; 21.0; 21.5; 21.7; 22.1; 22.6; 22.9; 23.9; 24.0; 24.1; 24.5; 25.9; 28.0
Movement (3)
0.4; 2.0; 3.8; 4.1; 4.6; 4.7; 7.3; 7.6; 7.8; 8.2; 8.8; 10.2; 10.4; 11.1; 11.4; 12.6; 14.2; 14.6; 15.2; 16.3; 17.2; 17.6; 17.8; 19.0; 19.1; 19.2; 19.3; 20.5; 20.8; 21.4;
Keep clean (4)
1.2; 3.0; 3.9; 5.8; 6.0; 6.7; 7.6; 8.0; 9.8; 10.5; 10.8; 11.4; 11.6; 13.0; 13.6; 14.8; 15.1; 15.4; 15.5; 15.6; 15.8; 16.4; 17.1; 17.3; 17.5; 17.6; 17.7; 18.1; 18.5; 20.4; 20.5; 21.0; 23.1; 23.3; 24.3;
Indirect life care (5)
0.4；1.3; 1.7; 2.2; 2.7; 2.8; 3.0; 3.2; 3.6; 4.2; 4.5; 4.6; 4.7; 4.9; 5.1; 5.4；5.7; 5.8; 6.3; 6.4; 6.5; 6.7; 7.1; 7.2; 7.7; 7.8; 8.0; 8.2; 9.4; 10.9; 11.3;
Behaviors on mental and physical health (6)
5.8; 6.1; 6.2; 6.3; 6.4; 6.7; 7.5; 7.6; 8.1; 8.7; 9.0; 10.1; 10.5; 10.6; 10.8; 16.1; 21.2;
Behaviors on training function (7)
0.5; 1.1; 1.6; 1.9; 2.0; 2.2; 2.5; 3.2; 3.3; 3.9; 4.0; 4.1; 4.5; 4.6; 5.5; 5.7; 6.0; 6.1; 6.5; 7.0; 7.1; 7.6; 7.8; 8.9; 10.4; 10.5; 11.6; 15.4;
Behaviors on medical care (8)
1.0; 2.0; 2.6; 2.9; 3.0; 3.2; 3.3; 3.9; 5.3; 4.2; 4.4; 4.5; 5.1; 5.9; 6.0; 6.1; 6.5; 7.0; 7.4; 8.3; 9.2; 10.1; 14.8; 28.0; 29.0; 32.0; 33.7; 37.2;

Fig.8- Determinants governing elderly people's health status

Table 2 – Care levels classified by government

	Support 1	Support 2	Care 1	Care 2	Care 3	Care 4	Care 5
TT=1+…+8	$25 \le TT < 32$	$32 \le TT < 40$	$40 \le TT < 50$	$50 \le TT < 70$	$70 \le TT < 90$	$90 \le TT < 110$	$TT \ge 110$

高齢者的健康状態的評価和政府的判定基準

3. Model design

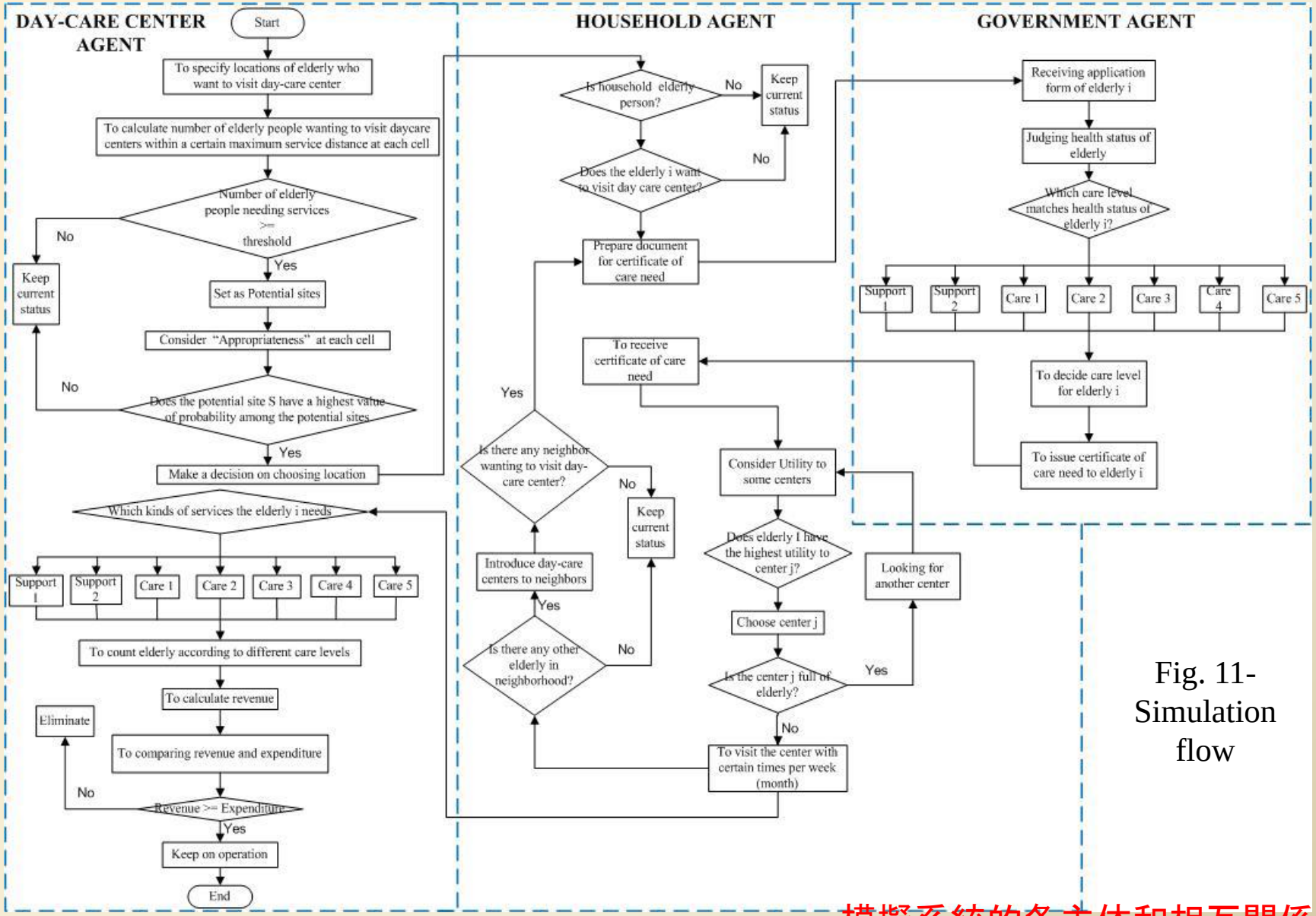
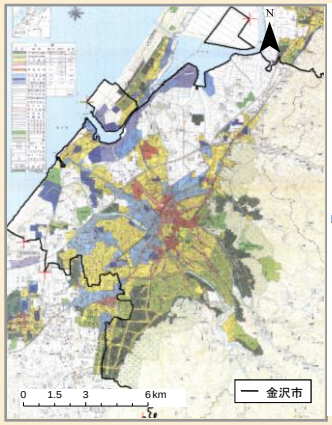


Fig. 11- Simulation flow

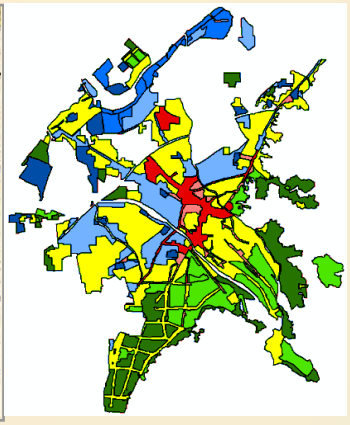
模擬系統的各主体和相互関係

4. Simulation results

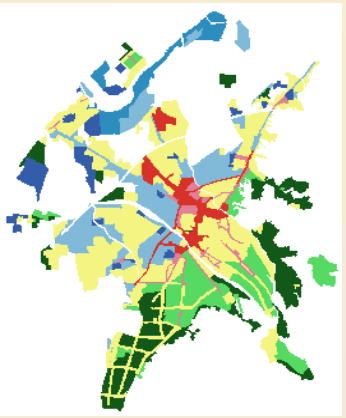
4.1. Case study: Kanazawa City



11a



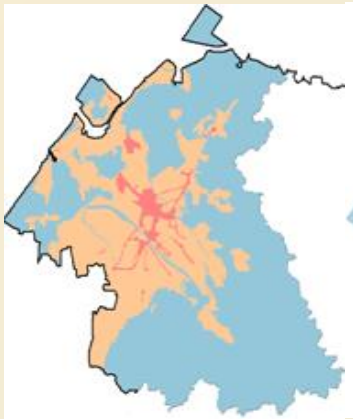
11b



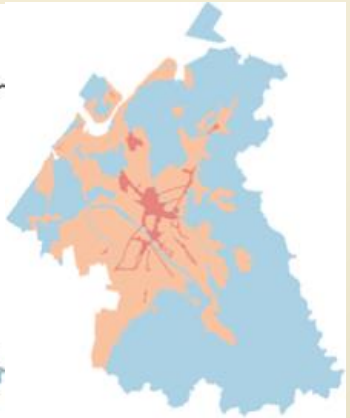
11c

1. Category I Exclusively residential zone
2. Category II Exclusively residential zone
3. Residential zone
4. Neighborhood commercial zone
5. Commercial zone
6. Quasi-industrial zone
7. Industrial zone
8. Exclusively industrial zone

Fig.11- Land use zoning in 1985.
a) paper map, b) Data in GIS, c) Data in Netlogo



12a

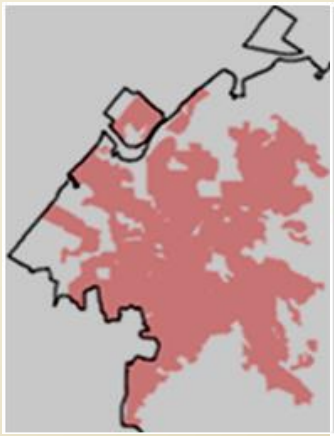


12b

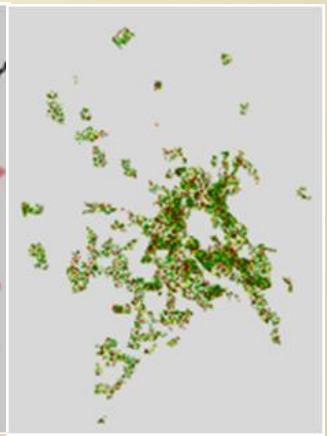
City Center Area (CCA)
Urbanization Promotion Area (UPA)
Urbanization Control Area (UCA)

Fig.12- Urban areas in 1985.
a) Data in GIS, b) Data in Netlogo

Fig.13- Household distribution.
a) Household distribution in Kanazawa City,
b) Distribution of 6825 households with 3 different kinds of income



13a



13b

総体規劃、土地利用計画是制約条件

4. Simulation results

4.2. Initial parameters

6825 households
(3.8% of total households in 2000)

1098 elderly households
(16% of total population)

117 elderly households
visiting DC centers
(10.07 % of elderly households)

+ **6 Existing DC centers**

Running the simulation

一次模擬24小時
系統測試:減少人口数量進行測試

4. Simulation results

4.3. Model interface

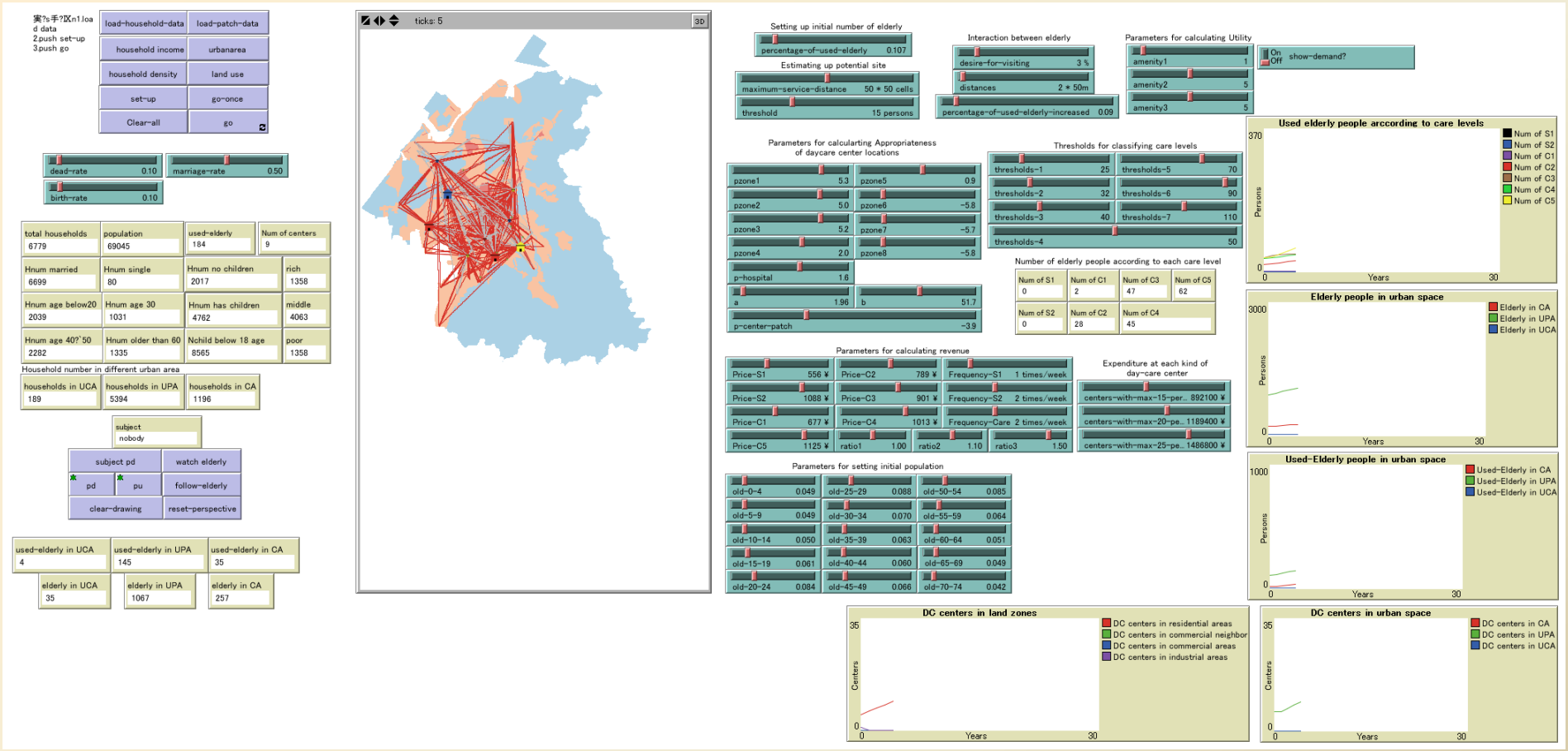


Fig. 14- The interface of the model

4. Simulation results

4.4. Simulated results

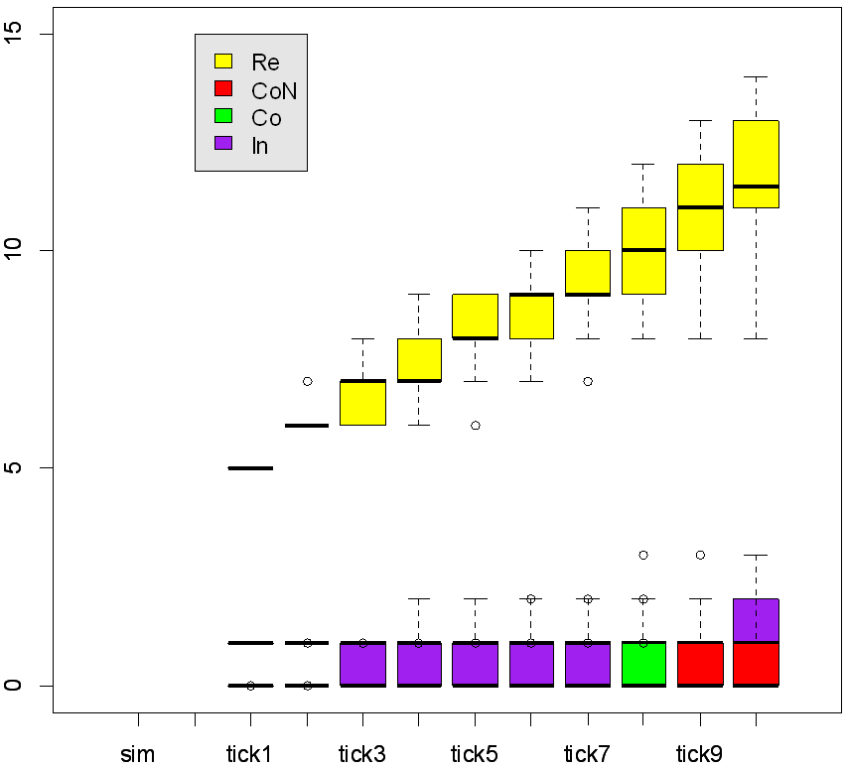


Fig. 16- Number of DC centers from 30 times of simulation

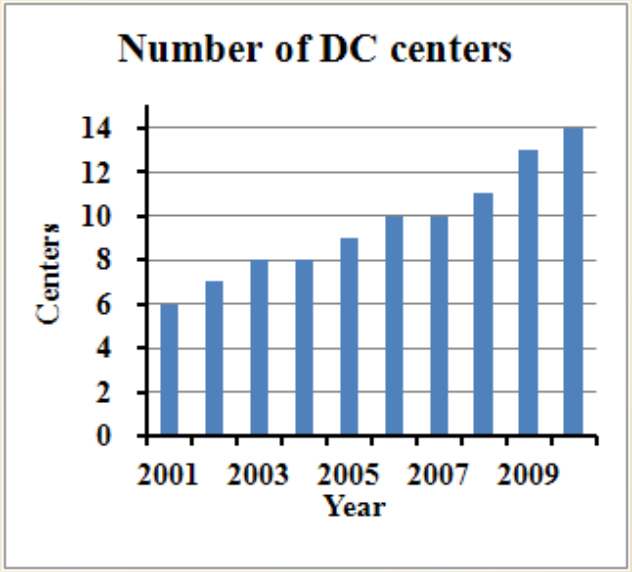


Fig. 17- Number of DC centers in 2010

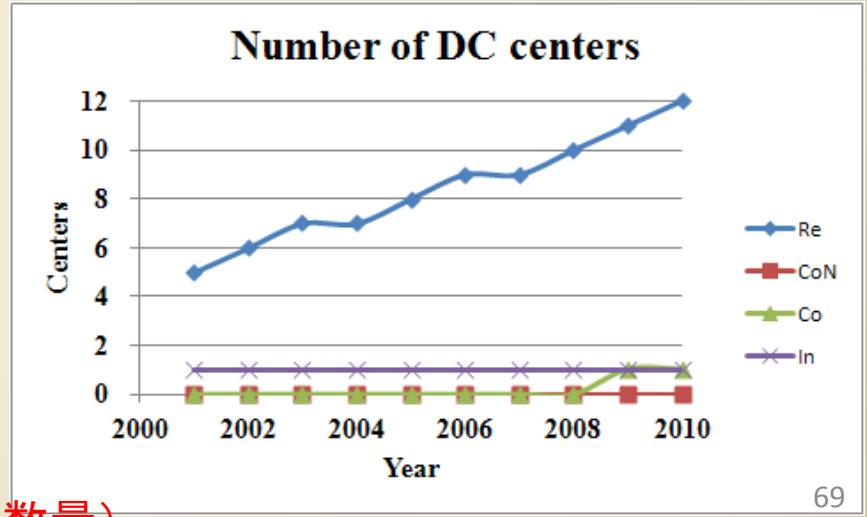


Fig. 18- Number of DC centers in different land use zones

系統計算結果的安定性和結果(養護中心的数量)

4. Simulation results

4.4. Simulated results

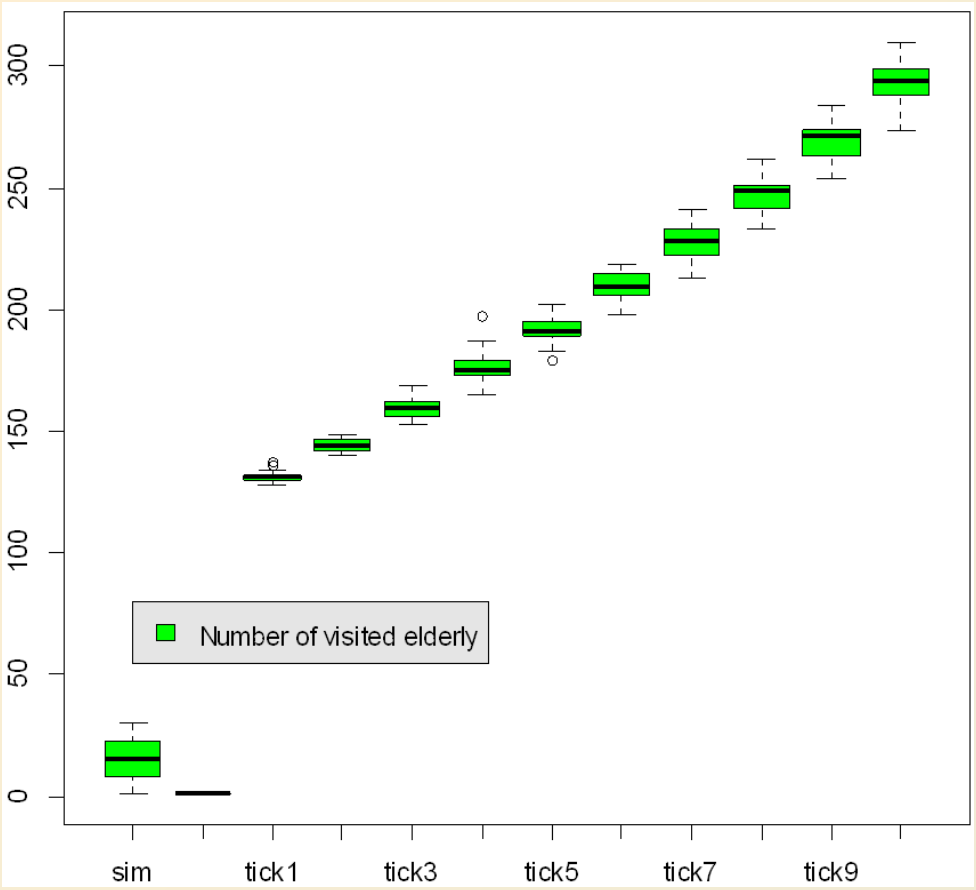


Fig. 19- Number of elderly people who visited DC centers from 30 times of simulation

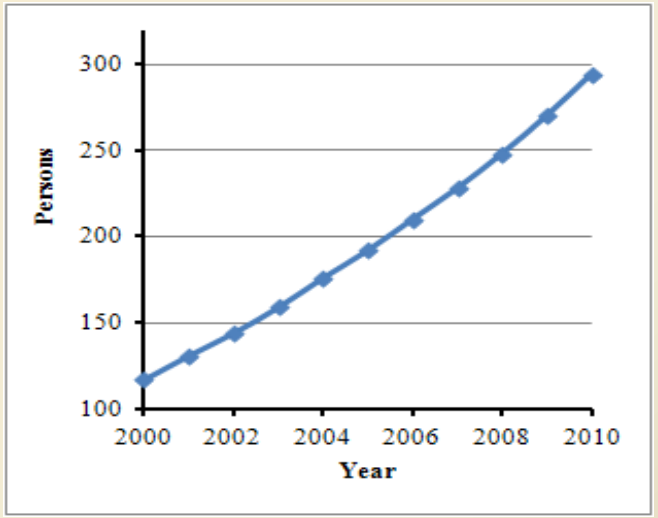


Fig. 20- Number of elderly people who visited DC centers

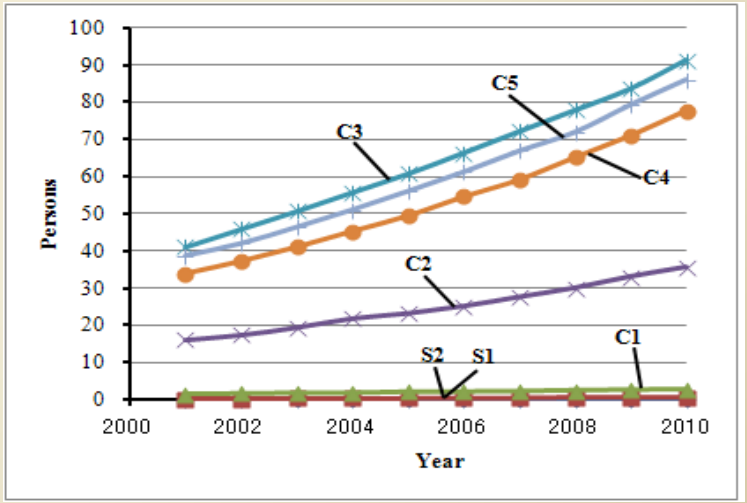
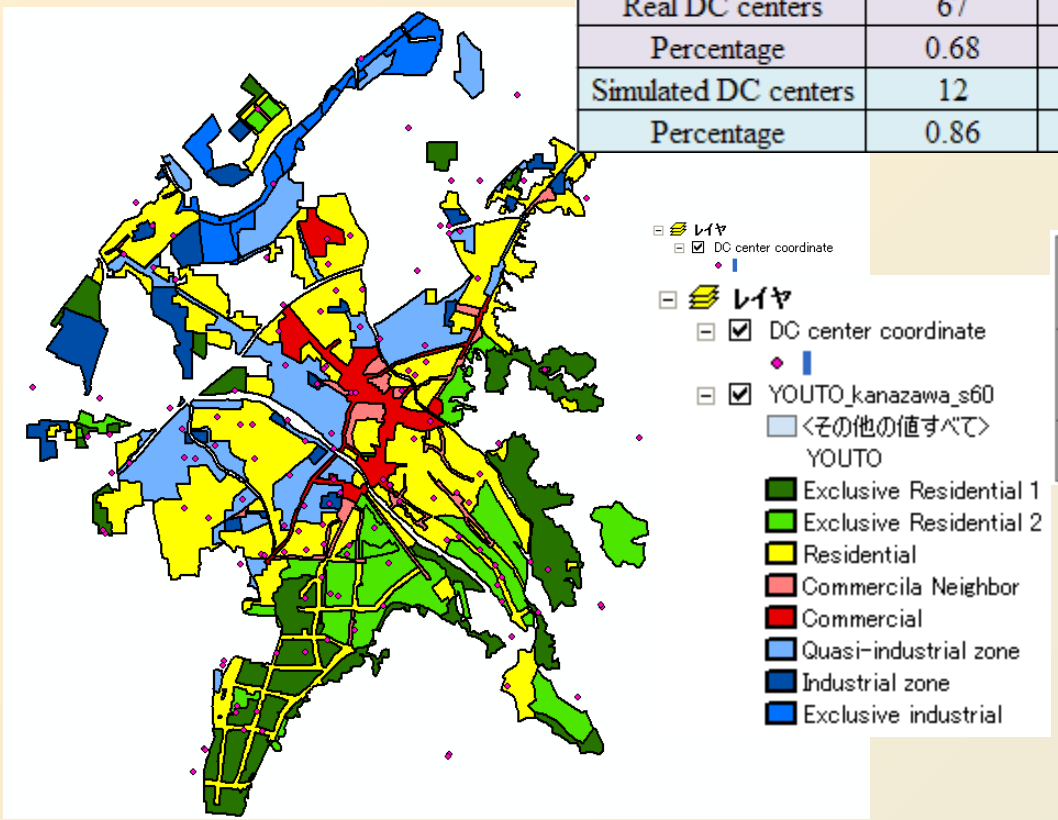


Fig. 21- Number of elderly people who visited DC centers with different care levels

系統計算的安定性和結果(利用保険的人数)

IV.2. Results analysis

Land use types	Residence	Commercial Neighbor	Commerce	Industry	Toal
Real DC centers	67	2	6	24	99
Percentage	0.68	0.02	0.06	0.24	
Simulated DC centers	12	0	1	1	14
Percentage	0.86	0	0.07	0.07	



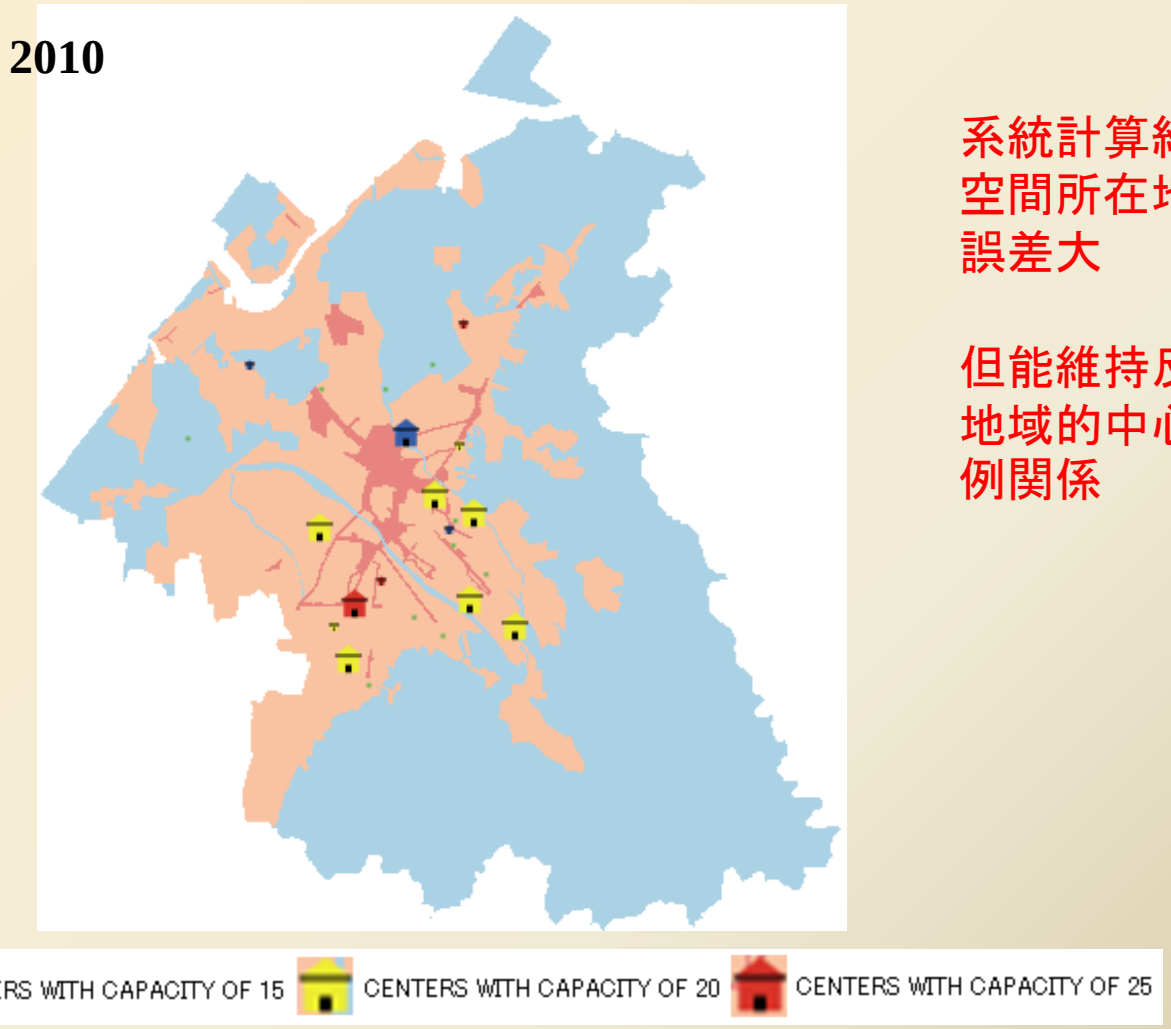
	Living area	Number of elderly visited DC centers		Increase in Elderly visitedDC centers (times)
		2000	2010	
Census data 177,686 households	Kanazawa City	7795	18072	2.3
Simulated data 6825 households	CCA, UPA, UCA	117	294	2.5

Years	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Used-elderly	7795	9478	10959	12436	14030	14629	14155	16185	16905	17427	18072
Aercentage of increase		21.59%	15.63%	13.48%	12.82%	4.27%	-3.24%	14.34%	4.45%	3.09%	3.70%
Average percentage	9.01%	http://www.mhlw.go.jp/topics/kaigo/toukei/joukyou.html									

和実際的歴史数据的比較
系統設計的有効性的検証

4. Simulation results

4.4. Simulated results



系統計算結果的
空間所在地的比較
誤差大

但能維持反映各用途
地域的中心数量的比
例関係

Fig. 15- Distribution of DC centers in urban space

4. Simulation results

4.4. Simulated results

Table-3 The real number of elderly people visited DC centers in Kanazawa City

Years	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Used-elderly	7795	9478	10959	12436	14030	14629	14155	16185	16905	17427	18072
Aercentage of increase		21.59%	15.63%	13.48%	12.82%	4.27%	-3.24%	14.34%	4.45%	3.09%	3.70%

http://www.mhlw.go.jp/topics/kaigo/toukei/joukyou.html

Table-4 A comparison between the simulated results and the census data

	Living area	Number of elderly visited DC centers		Increase in Elderly visited DC centers (times)
		2000	2010	
Census data 177,686 households	Kanazawa City	7795	18072	2.3
Simulated data 6825 households	CCA, UPA, UCA	117	294	2.5

系統計算結果和実際状況的比較

4. Simulation results

4.4. Simulated results

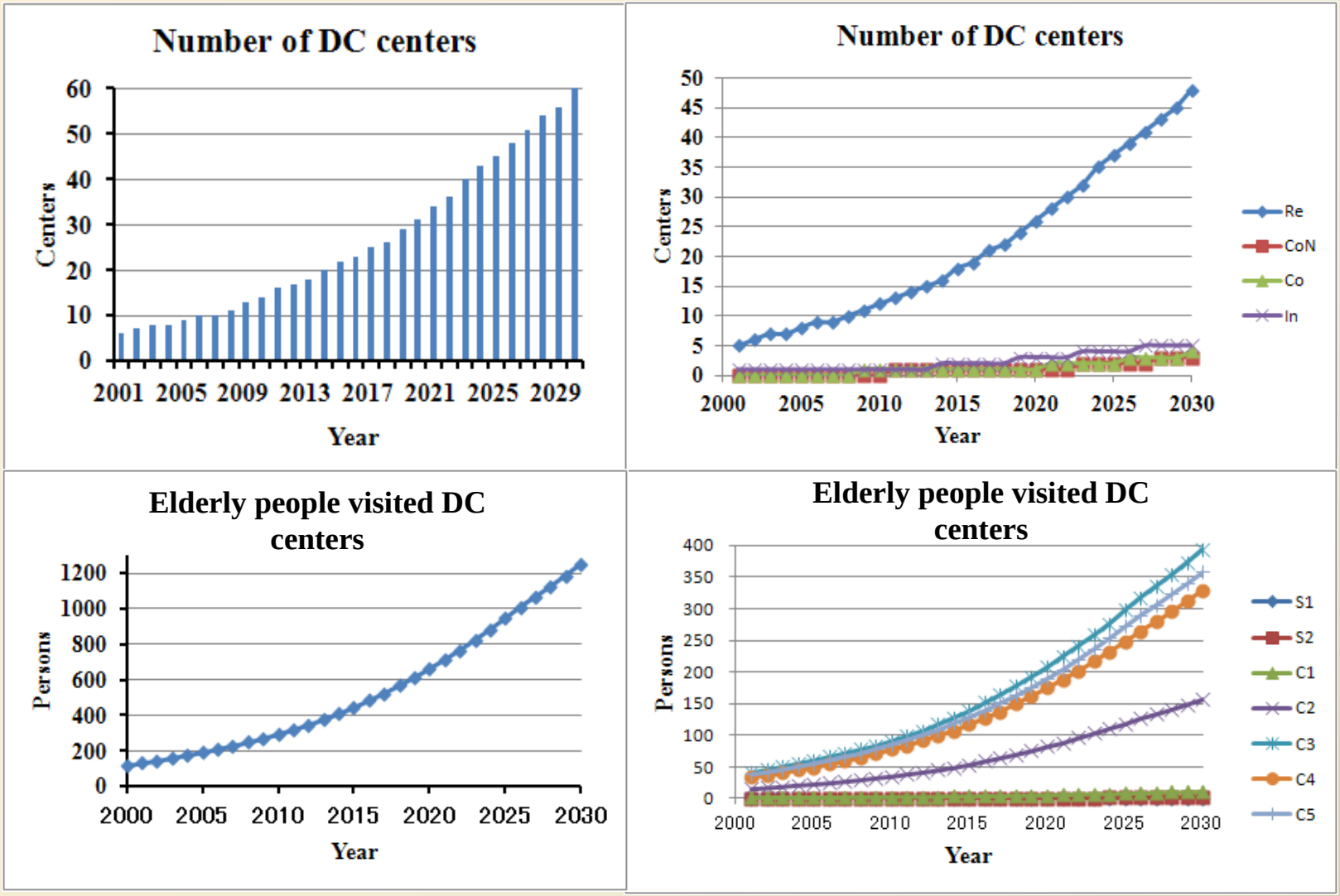


Fig- 22 Predictions for number of DC centers and visited elderly people in 2030

系統検証後、予測的結果

5. Conclusions

5.1. Conclusions

- ✓ In this research, an agent-based model for simulating locations of DC centers is developed and illustrated.

- By integrating 5 different modules, the model can predict future age structure of population in Kanazawa City and its corresponded demand for DC centers.

- ✓ This model can provide planners who make plans for DC centers with visualized reference.

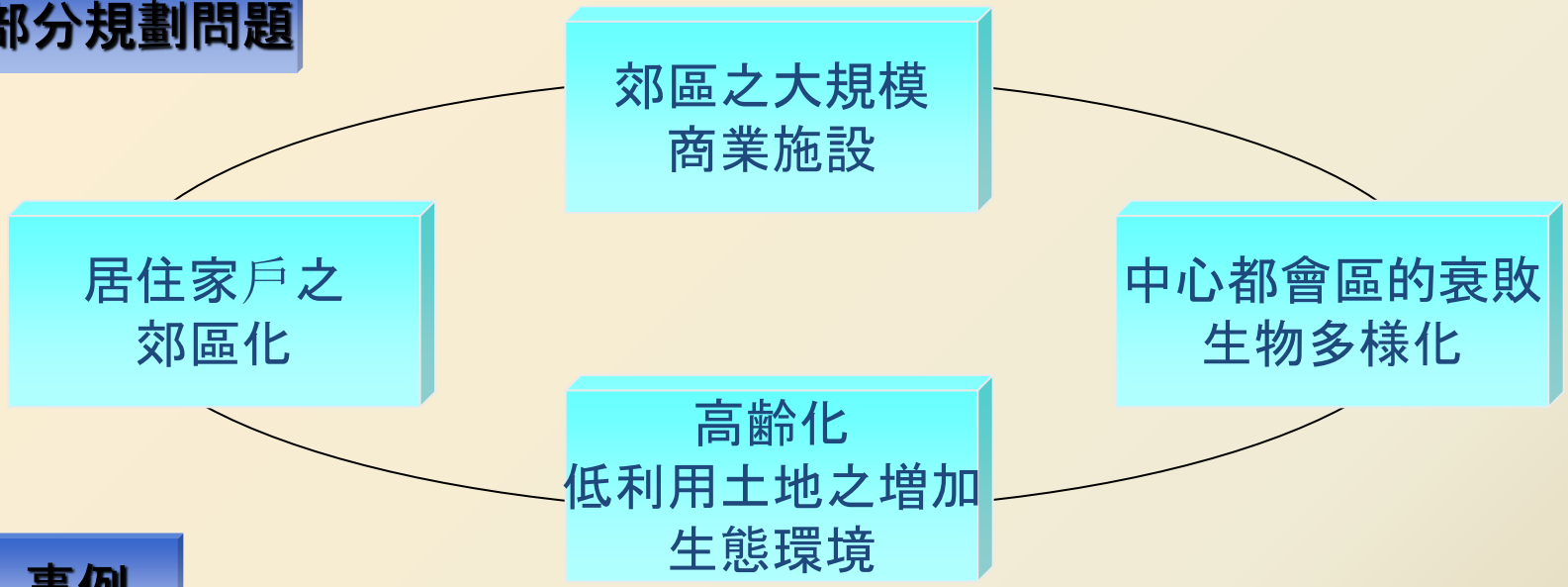
5. Conclusions

5.2. Further research

- Using real dataset of health status to predict the detailed demand of elderly people for different care levels.
- Considering the utility of the elderly people to the day-care centers when they make a decision on choosing the DC centers to visit.
- Validating simulated results on the locations of DC centers in order to indicate that whether they are matched with the real centers or not.

規劃策略研究—Planning Support

部分規劃問題



事例

中心建成区的居住促進
高齢者的養護施設的需要和建設
誘導新的大規模商業施設之設置區位及場所
郊外的土地区画整理開発事業
水資源・水価格和生態網絡的規劃

金沢市都市計画的課題

金澤市田上地區規劃案 (1996-2007)

規劃案概要

■面積 43.3公頃(ha)

■專案年期 1996-2008

土地使用管制與規劃條件

■公共設施

・經規劃之計畫道路
No.3.3.6 6 線 (長度=3.8km)

・次要道路 (長度=7.9km)

・公有公園 (4)

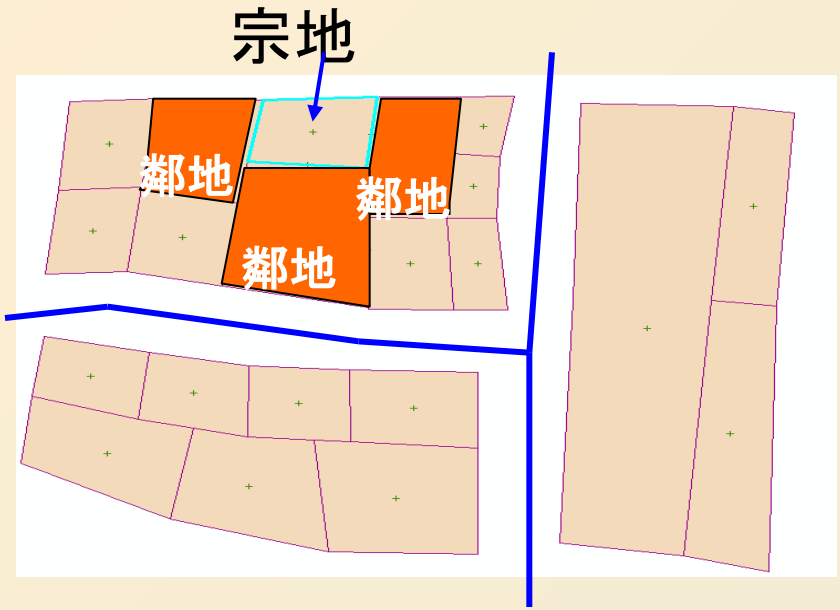
■土地使用

・商業區

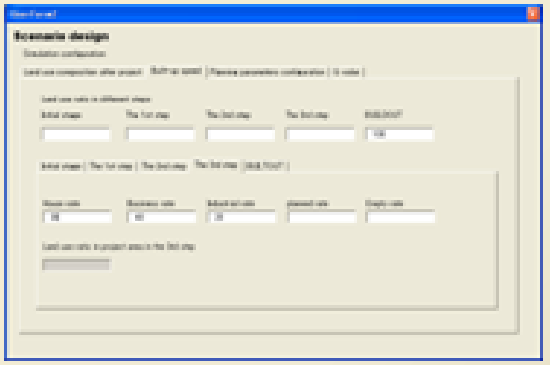
・中層住宅區

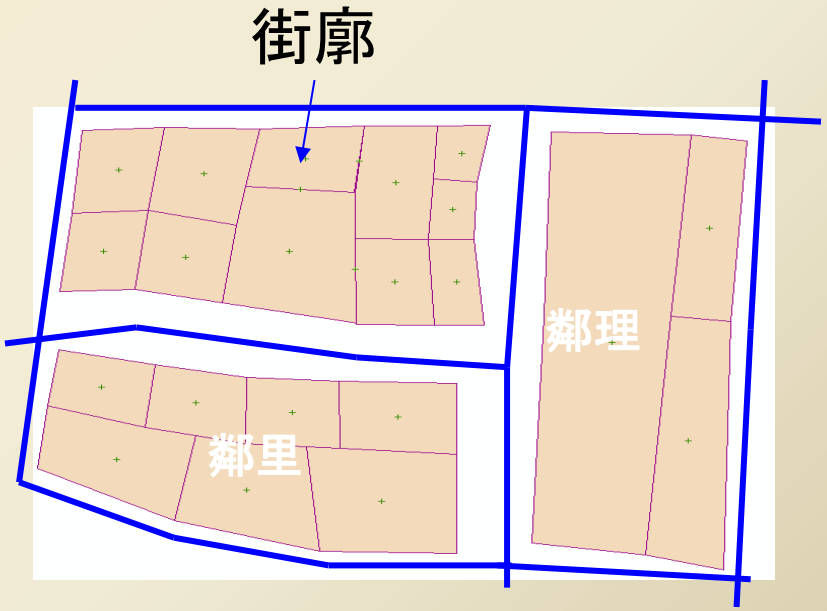
・第一種低層住宅區

規劃策略研究—Planning Support



第一層級以
宗地為單位





第二層級以
街廓為單位

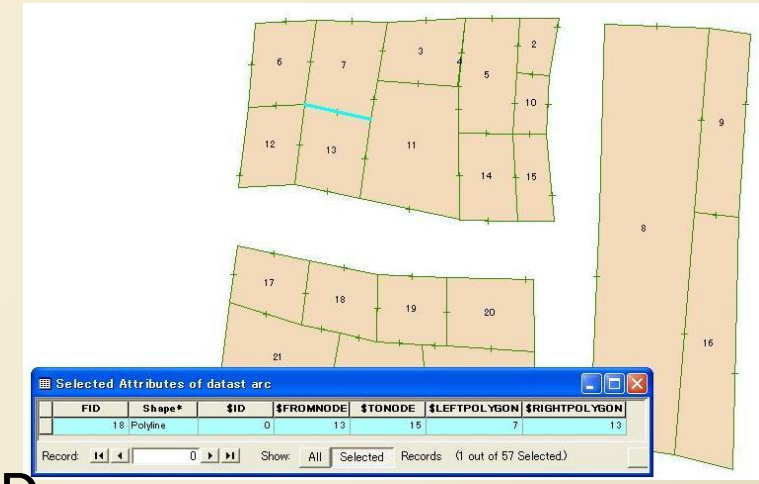
個體模擬的CA新概念

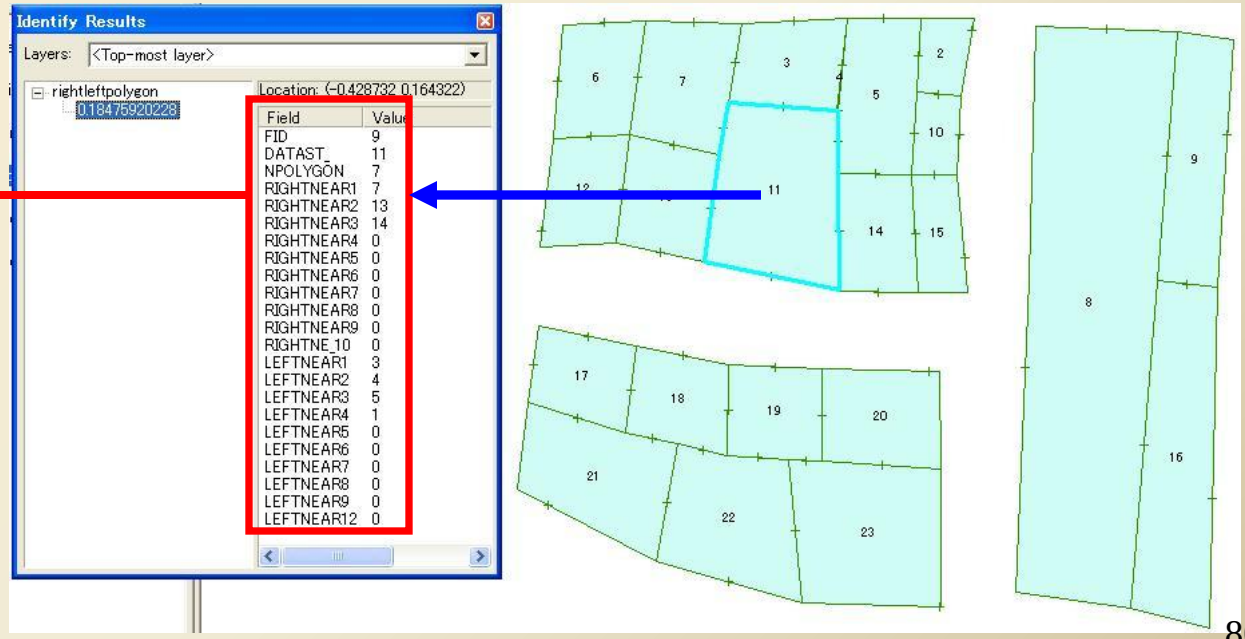
街廓中鄰近宗地間之資料產生器

Link in coverage data with left and right polygon ID

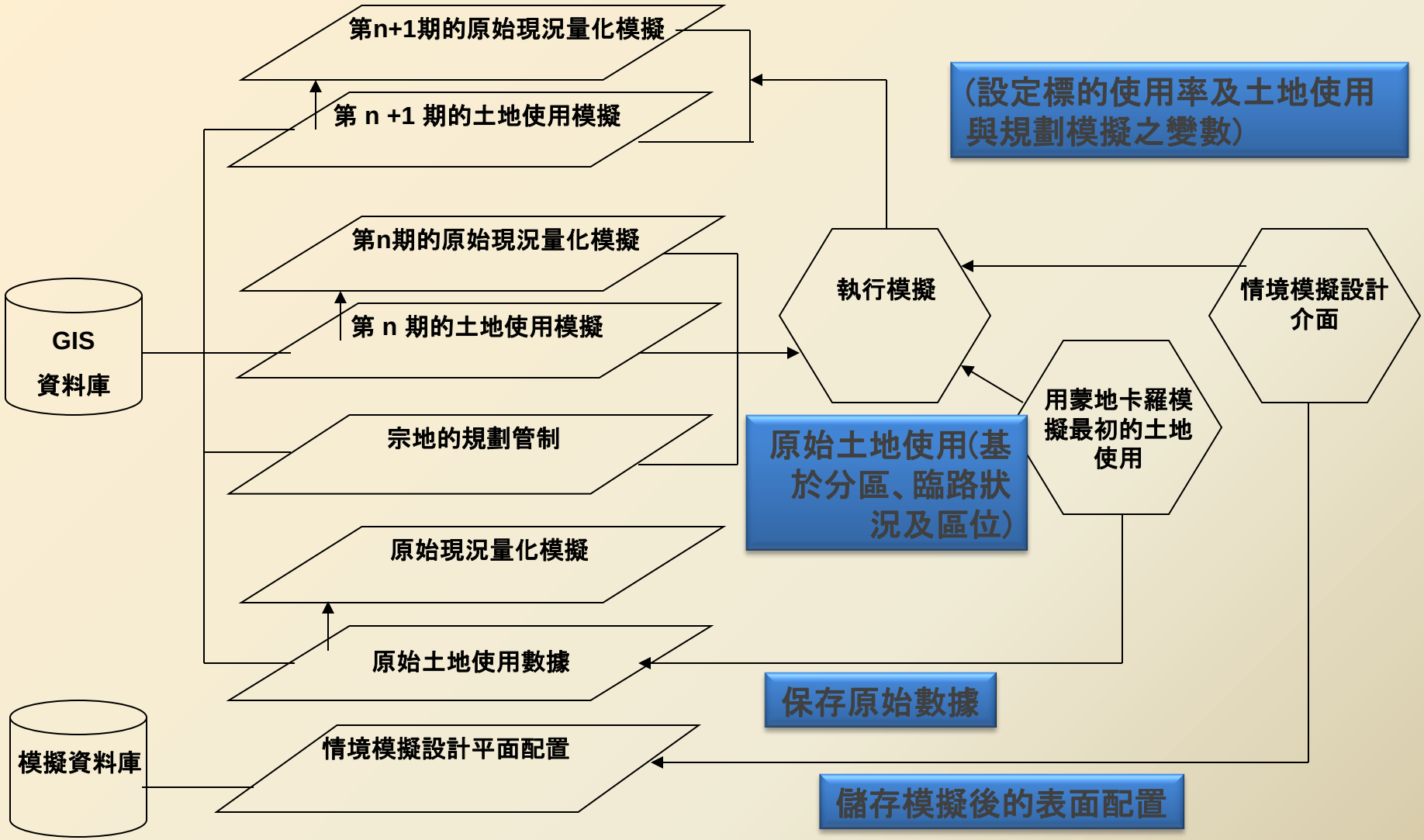
Polygon with neighbor polygon ID

Field	Value
FID	9
DATAST_	11
NPOLYGON	7
RIGHTNEAR1	7
RIGHTNEAR2	13
RIGHTNEAR3	14
RIGHTNEAR4	0
RIGHTNEAR5	0
RIGHTNEAR6	0
RIGHTNEAR7	0
RIGHTNEAR8	0
RIGHTNEAR9	0
RIGHTNE_10	0
LEFTNEAR1	3
LEFTNEAR2	4
LEFTNEAR3	5
LEFTNEAR4	1
LEFTNEAR5	0
LEFTNEAR6	0
LEFTNEAR7	0
LEFTNEAR8	0
LEFTNEAR9	0
LEFTNEAR12	0





規劃策略研究—Planning Support



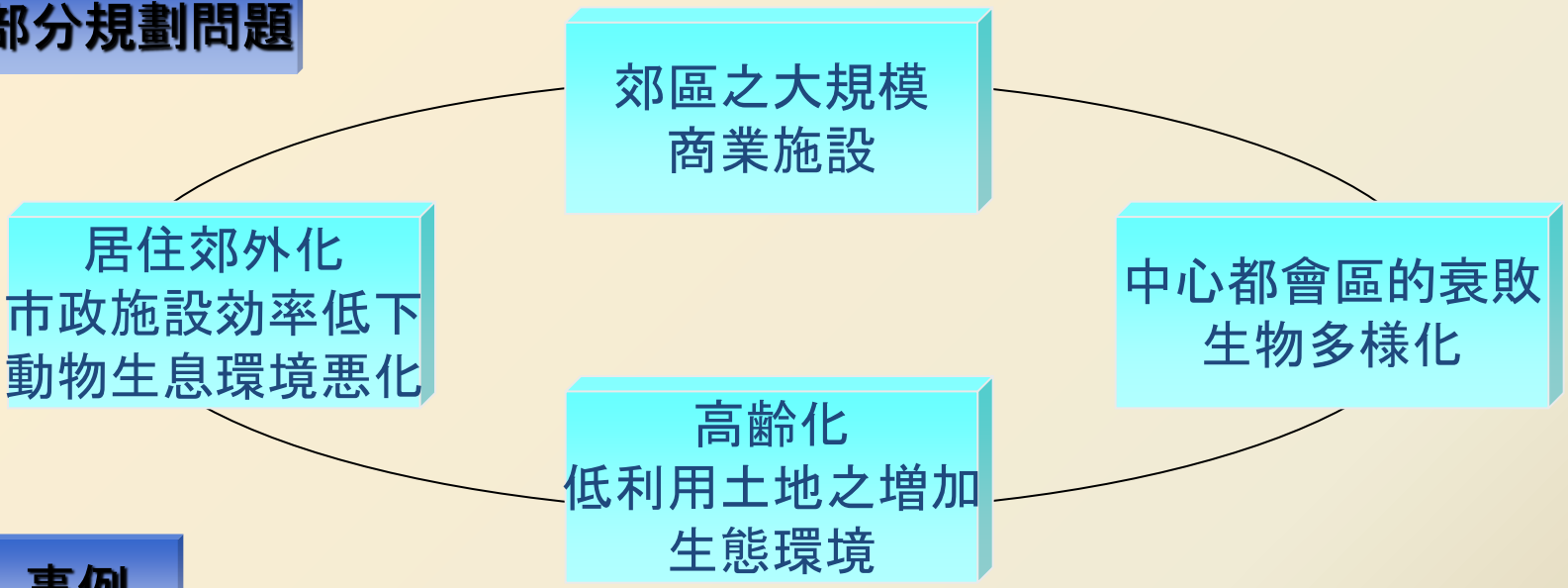
規劃策略研究—Planning Support

House
Commercial
Industrial
unoccupied
Planned land use

	1974	1980	1986	1992
House	35.8	36.0	40.3	63.7
Commercial	6.6	6.7	2.9	2.2
Industrial	5.3	5.4	4.4	0.4
Unoccupied	52.2	52.0	52.4	33.7
Total	100.0	100.0	100.0	100.0

規劃策略研究—Planning Support

部分規劃問題



事例

中心建成区的居住促進
高齢者的養護施設的需要和建設
誘導新的大規模商業施設之設置區位及場所
郊外的土地区画整理開発事業
水資源・水価格和生態網絡的規劃

金沢市都市計画的課題

Web-Based Decision Making Support System for Integrated Urban Water Management

中心区人口減少
一都市施設的効率低下
一＞家庭負担増加
一＞毎年水価格増加
（水量比較豊富）

部門計画的各部門的合作可能性

Contents

- Purpose & Contribution
- System Framework
- Conclusions and Future Work
- Reference

Literature Review

- Water is one of the key resources which restrict urban development
  - With the rapid urbanization process, water scarcity is especially serious in developing countries
  - Human carrying capacity factor of Beijing city has exceed by 2.
  - The cities which lack in water resource, development is highly connected by the ability of manage water resource.
  - Unsustainable utilization of water resource leads serious ecological problems

- Two aspects for urban water management
  - Urban water resource management
  - Urban water demand management

模擬系統包括資源管理和水需要的两部分

Purpose & Contribution

- Support decision making in urban water management to achieve sustainable urban water management
  - Use agent-based model in water consumption calculation to reflect individual decision under water management policy (scenario analysis)

    水価格系統
  - By applying system dynamics model to give a visualized stock-flow interface of urban water cycle

    水資源系統的統合
  - Integrate web-conferencing environment to achieve participatory approach in urban water resource conservation planning

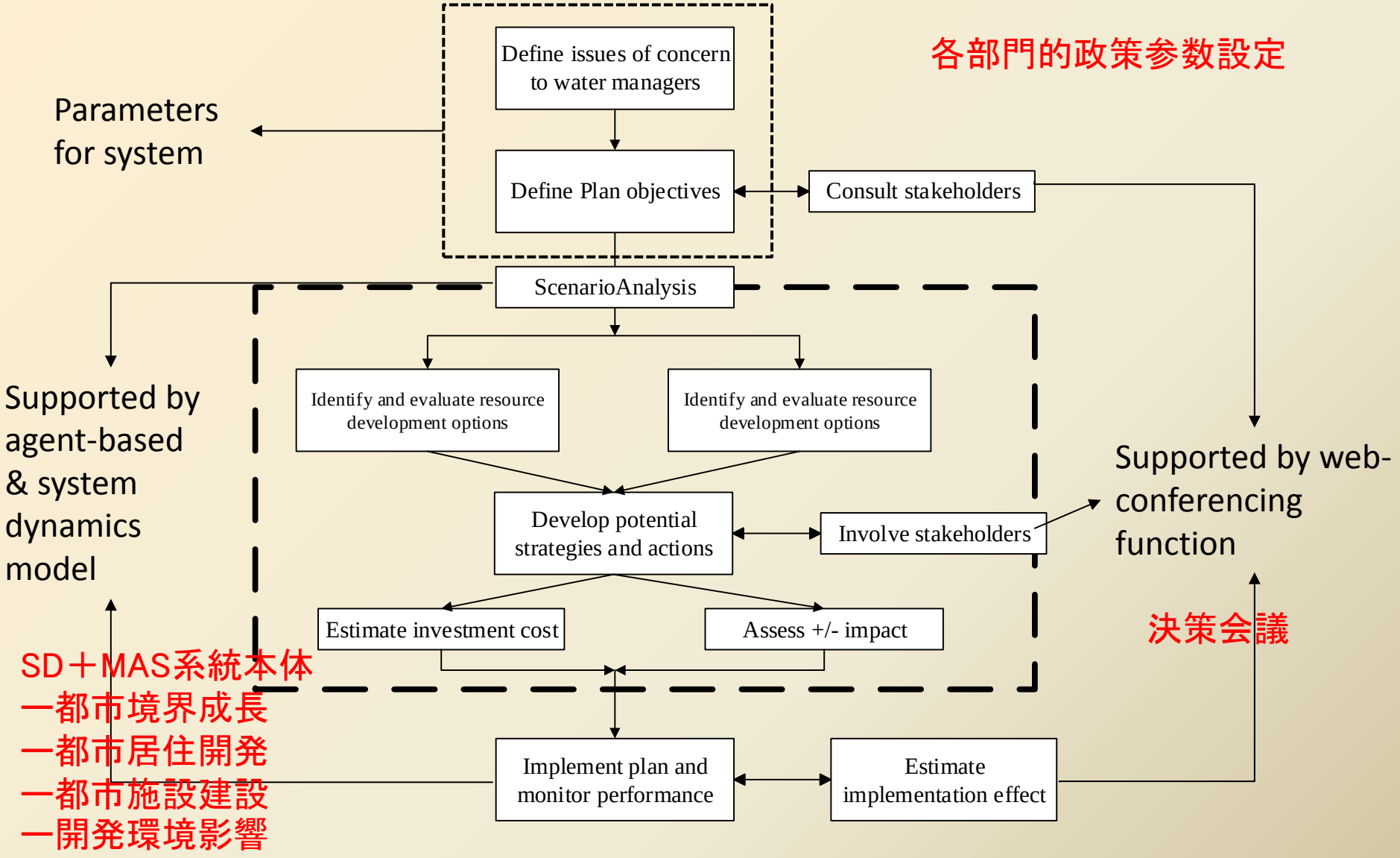
    各部門的協力系統的試作

Methodology

- Agent-based modelling
  - Developed upon NetLogo Platform
  - Bottom-top simulation of urban system
- Web-based decision-making environment for urban water management
  - Supported by TeamViewer software and HubNet function of NetLogo Platform
  - Improve participation and public understanding
- System dynamic modelling
  - Developed upon System Dynamic modeler function on NetLogo Platform
  - Simulate the connection of urban water management related units
- Constraint Cellular Automata theory
  - Theory of urban development

政策決策系統的設想
SD＋MAS＋WEB

Decision Making Process

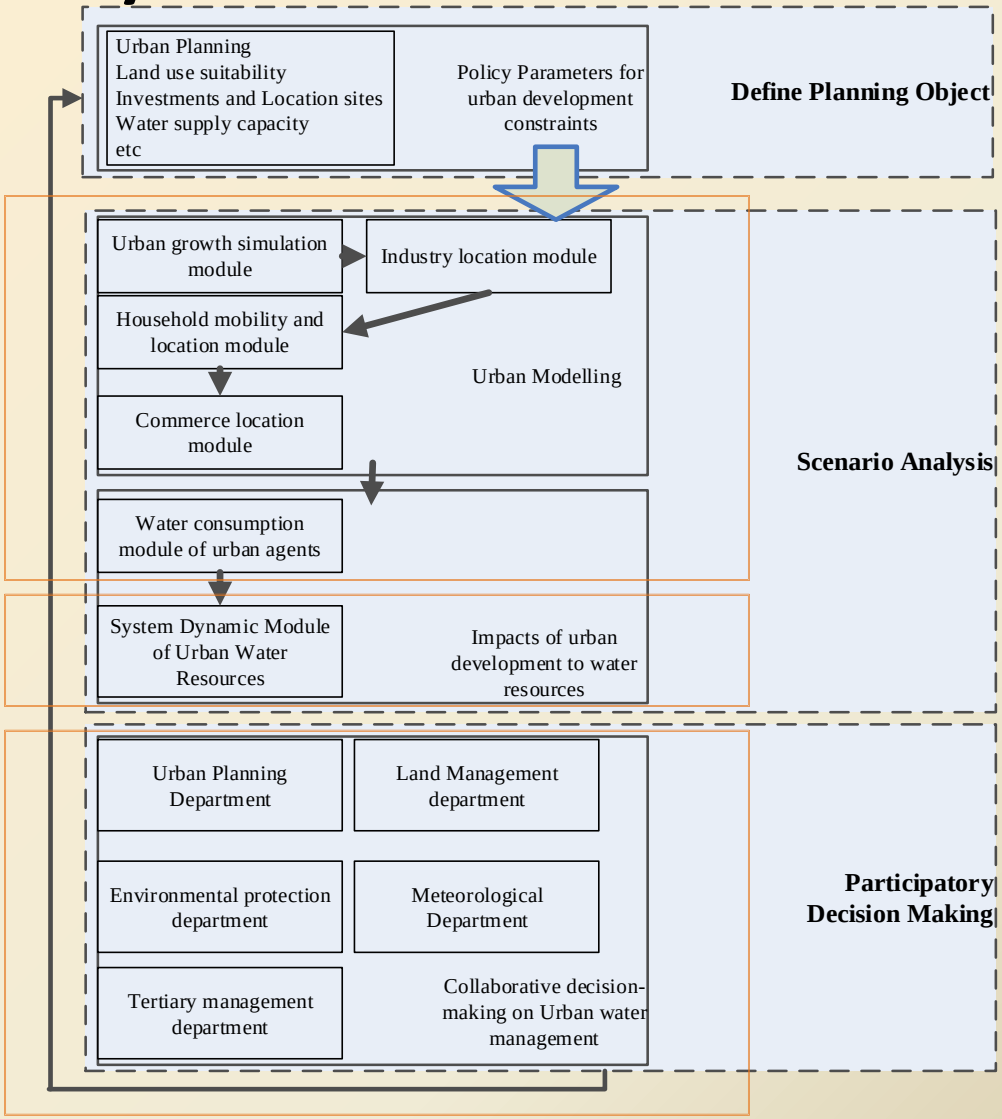


System Framework

Agent-based modelling

System Dynamics modelling

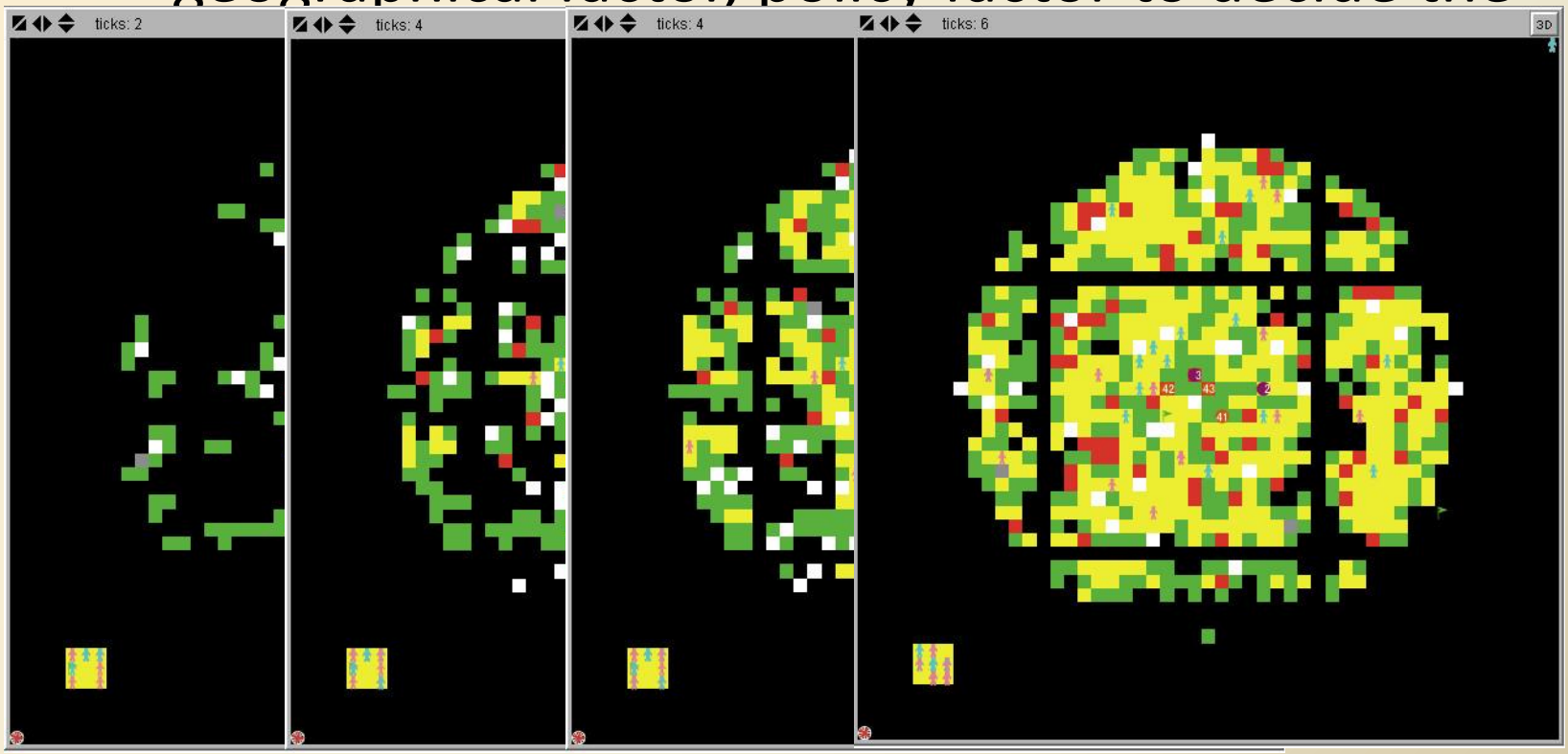
Web-conferencing environment



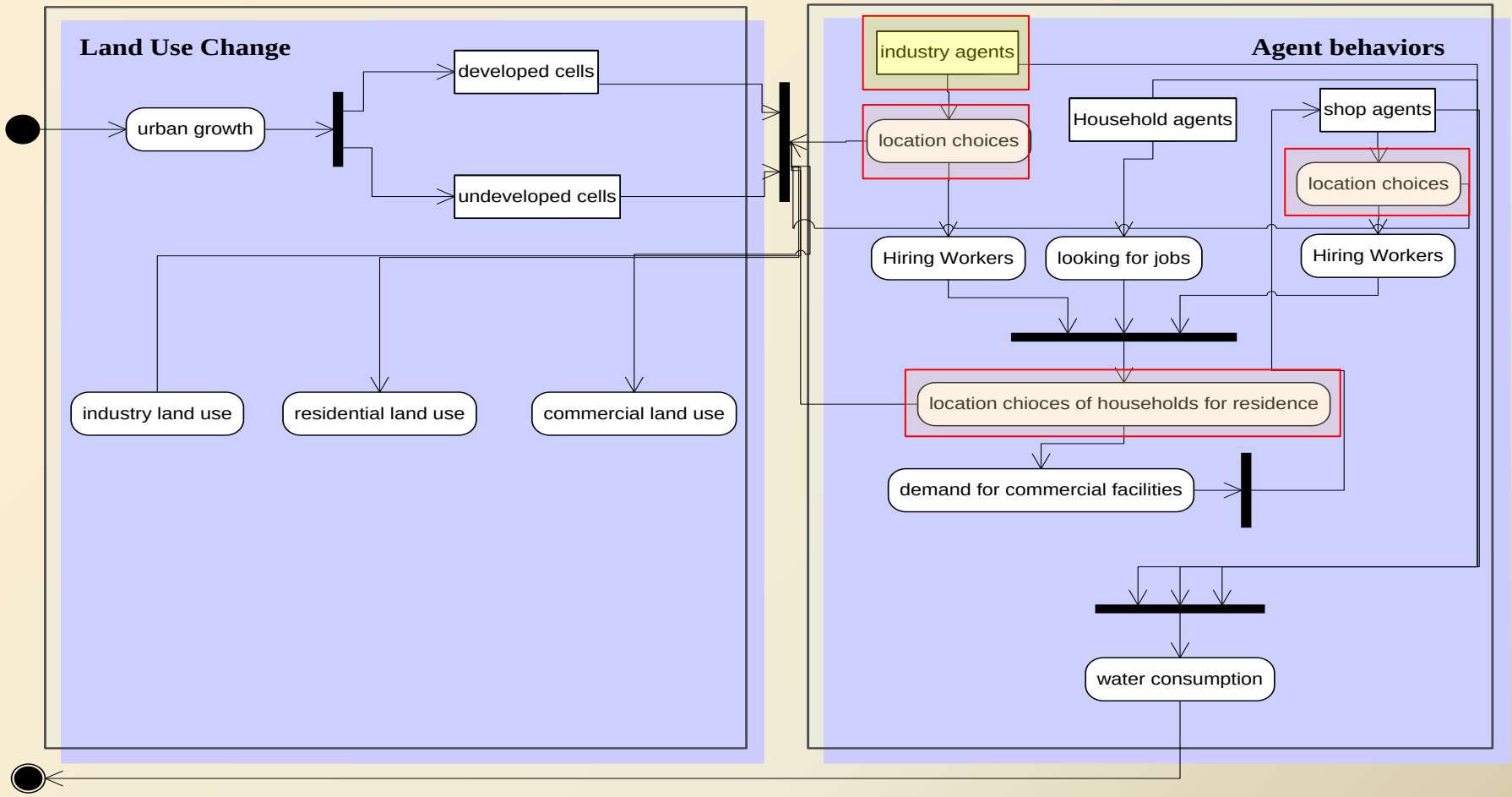
Simulation of Land Use Change
-Agent Environment

CA的都市成長系統

- Based on Constraint Cellular Automata theory
  - By considering neighborhood effect, traffic factor, geographical factor, policy factor to decide the

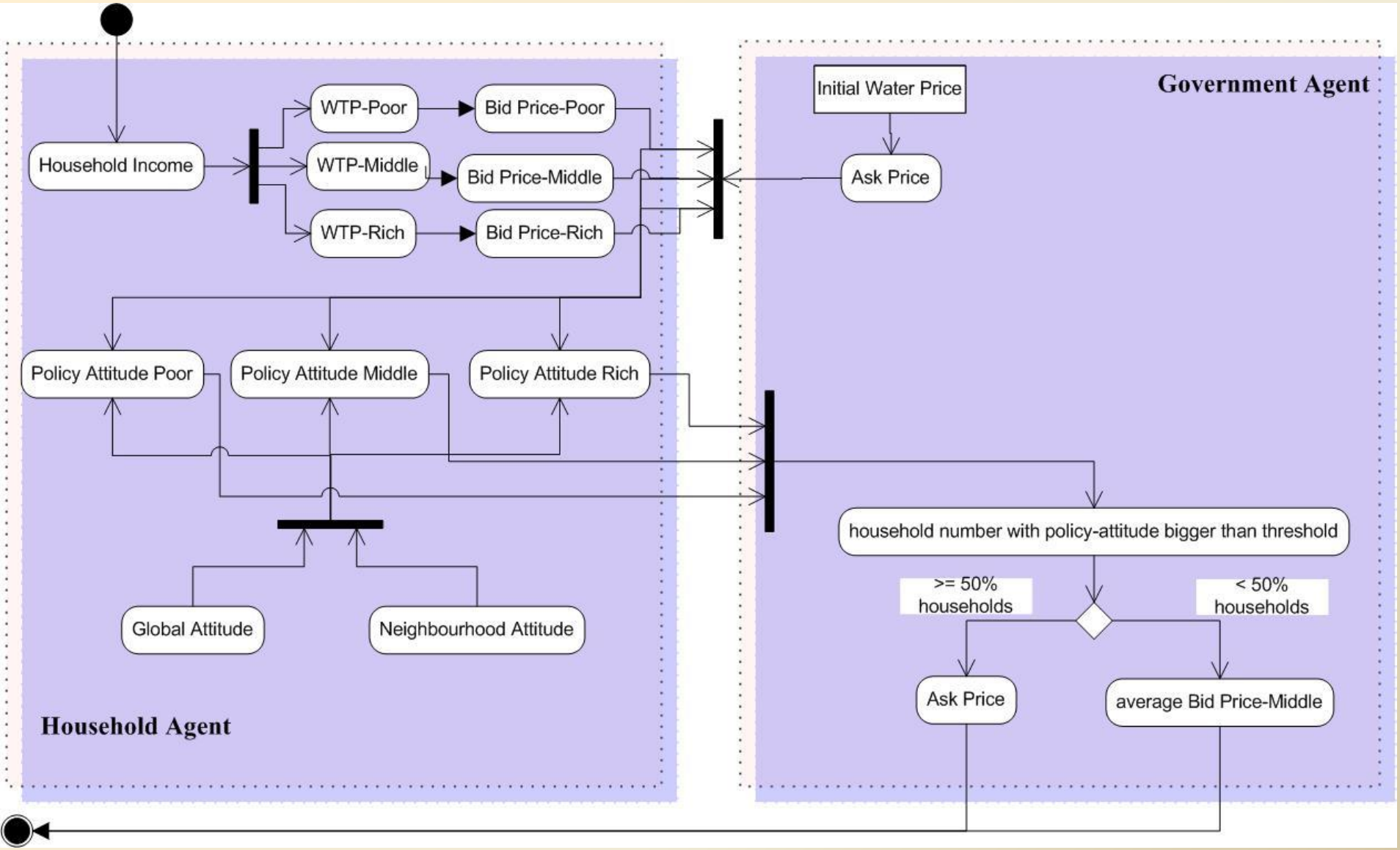


Urban Development
-Agent Environment



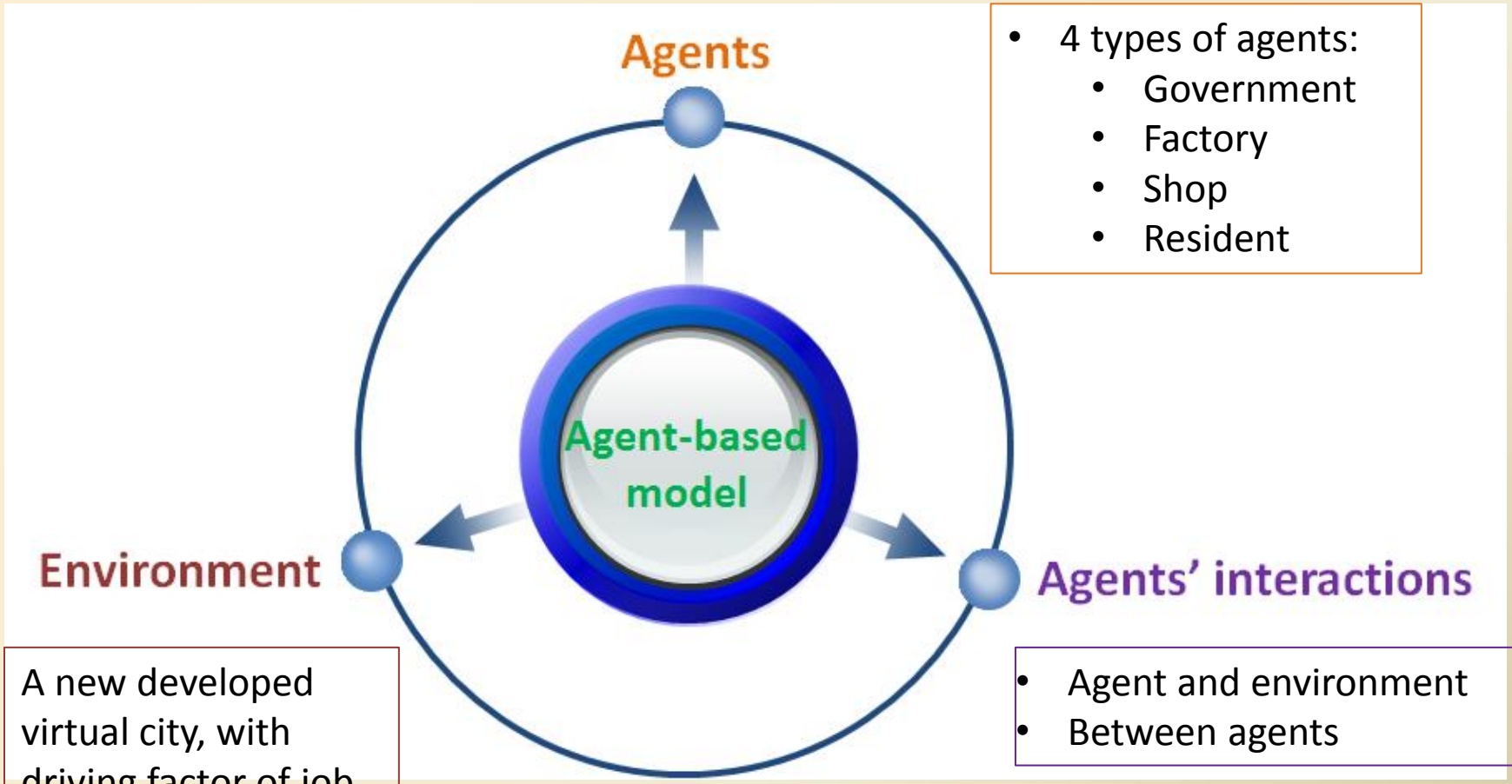
CA都市成長＋MAS的都市開発模擬

規劃策略研究—Planning Support



水價格的系統

Micro-simulation of urban system -Agent-based modelling

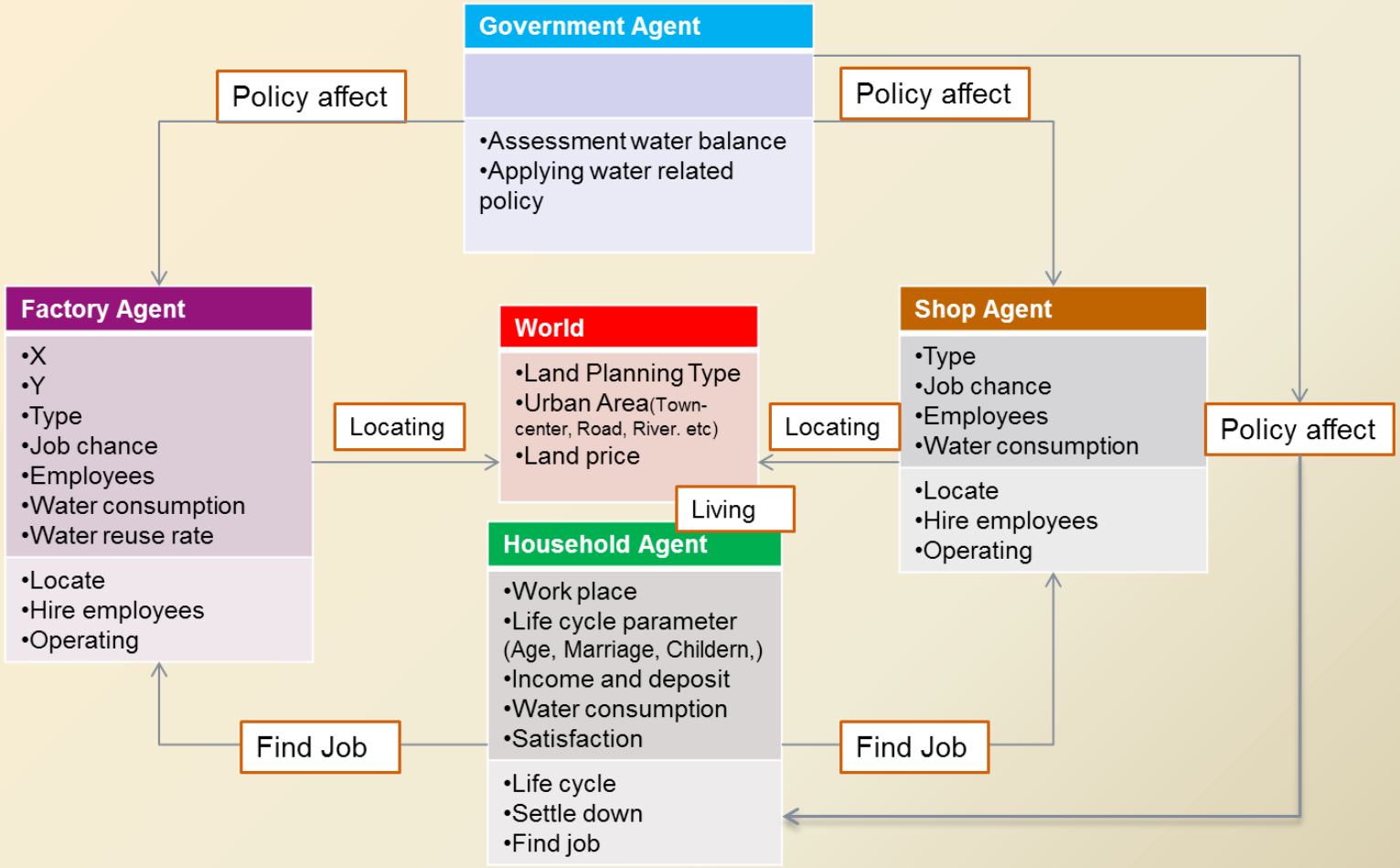


- 4 types of agents:
  - Government
  - Factory
  - Shop
  - Resident

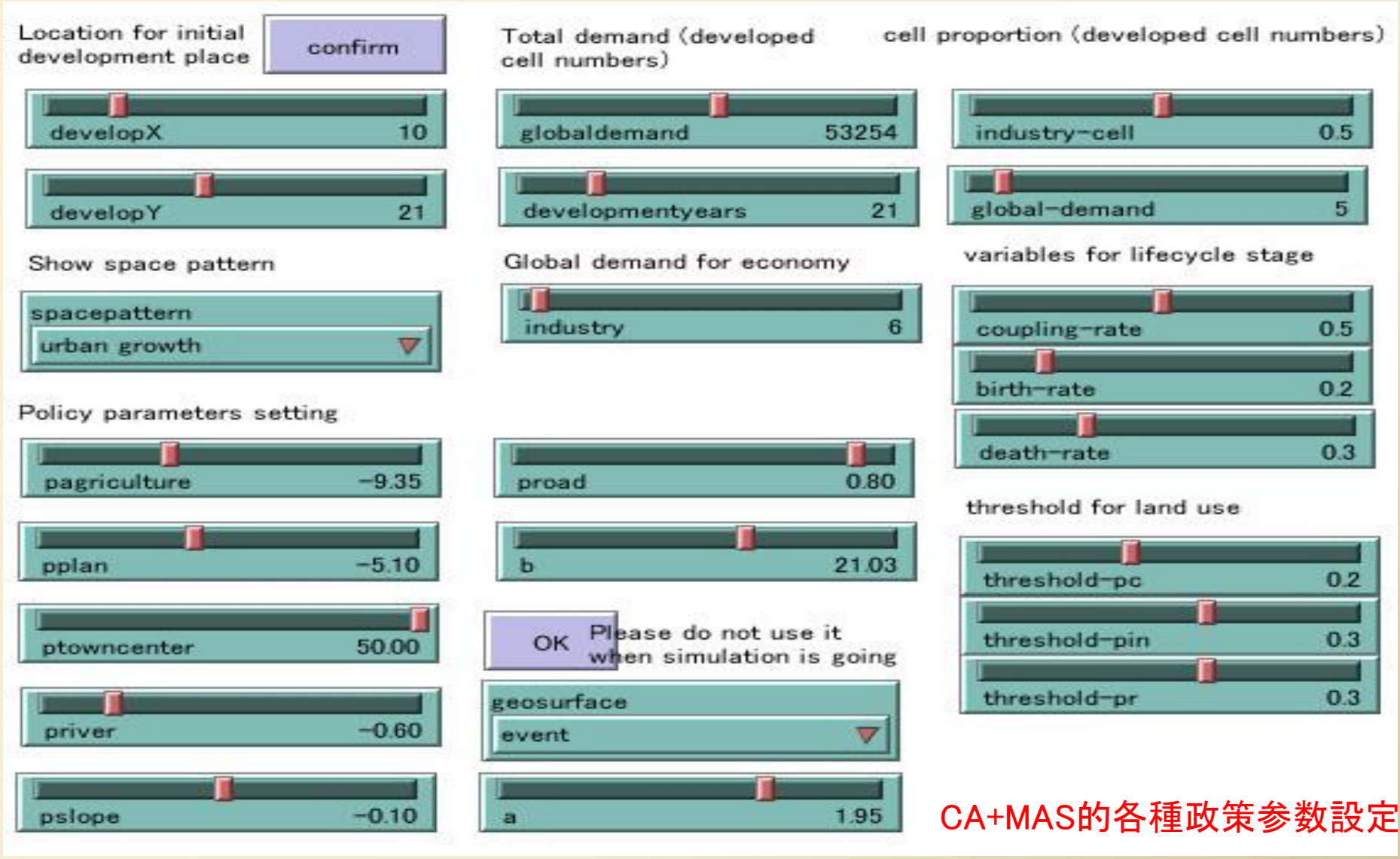
A new developed virtual city, with driving factor of job

- Agent and environment
- Between agents

Micro-simulation of urban system -Agent-based modelling

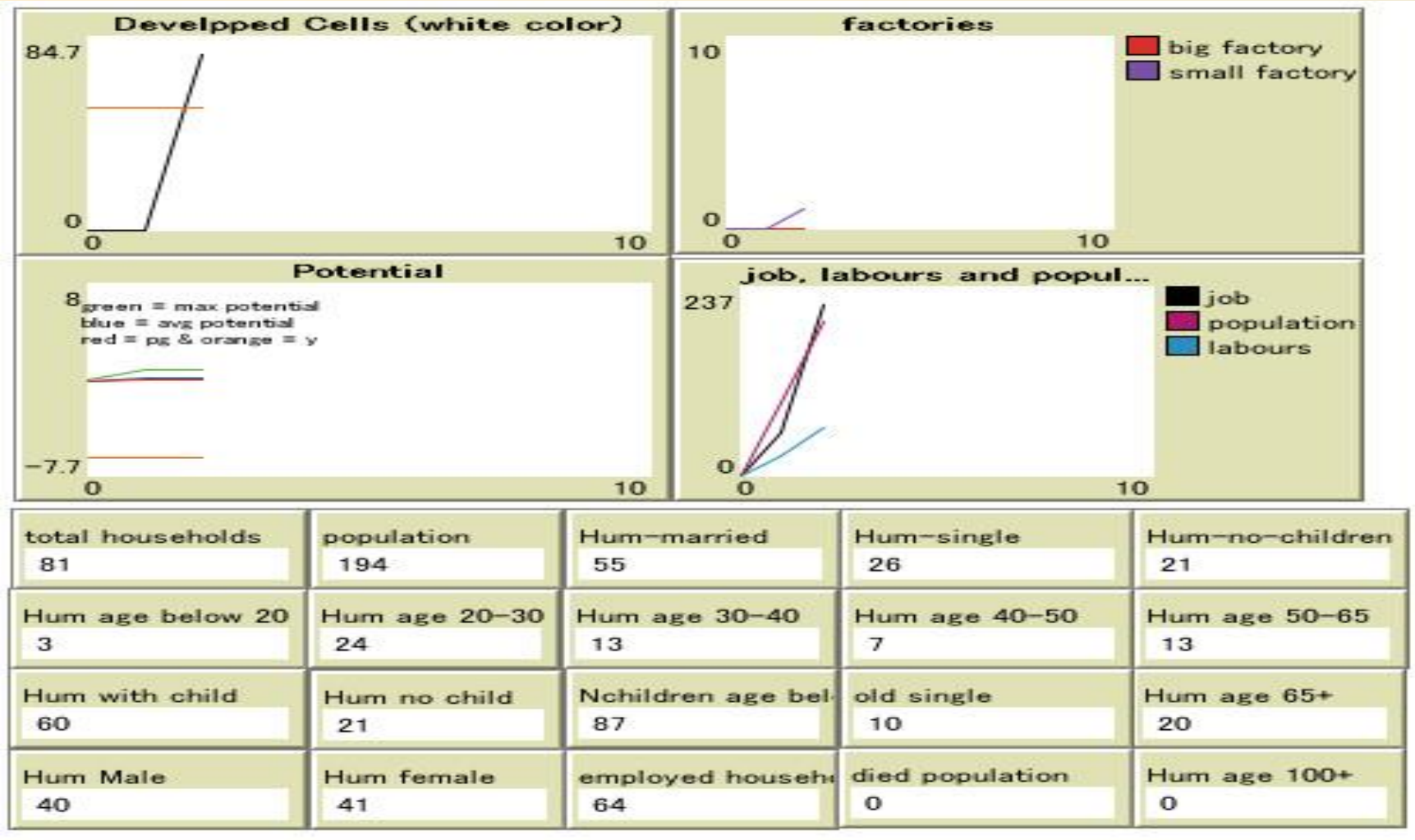


Simulation of Land Use Change
-Urban development control parameters



CA+MAS的各種政策参数設定

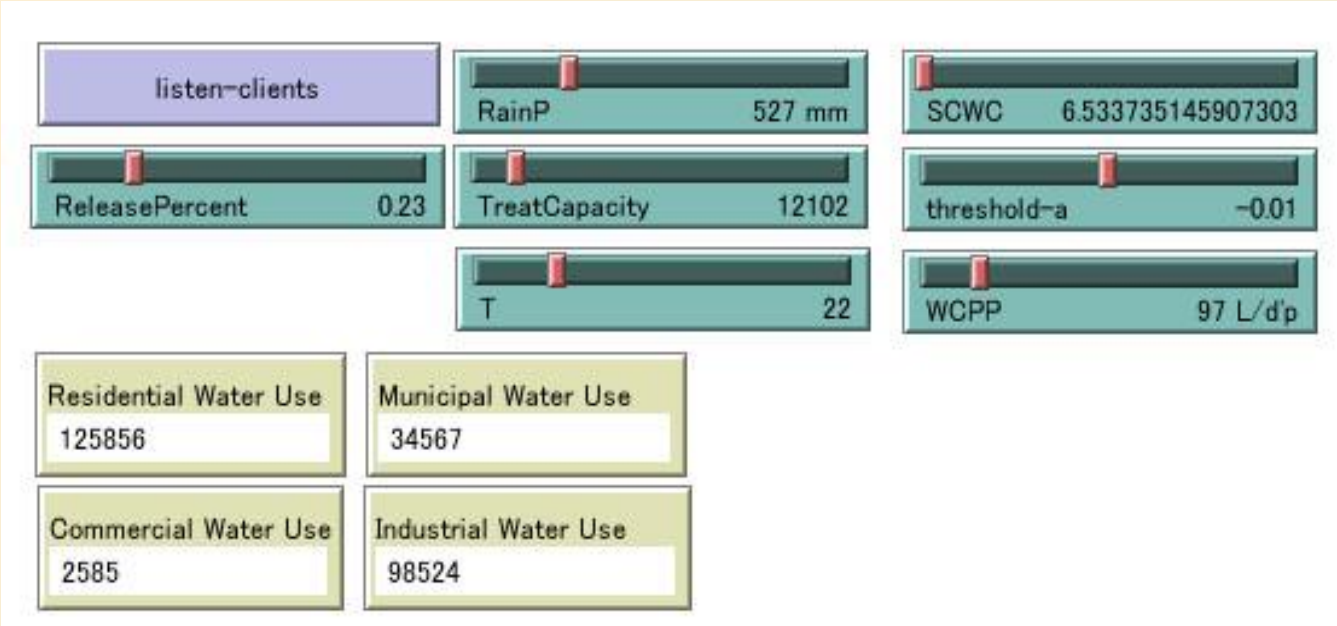
Urban Status Monitoring



total households	population	Hum-married	Hum-single	Hum-no-children
81	194	55	26	21
Hum age below 20	Hum age 20-30	Hum age 30-40	Hum age 40-50	Hum age 50-65
3	24	13	7	13
Hum with child	Hum no child	Nchildren age bel	old single	Hum age 65+
60	21	87	10	20
Hum Male	Hum female	employed househ	died population	Hum age 100+
40	41	64	0	0

各部門結果的共同參照

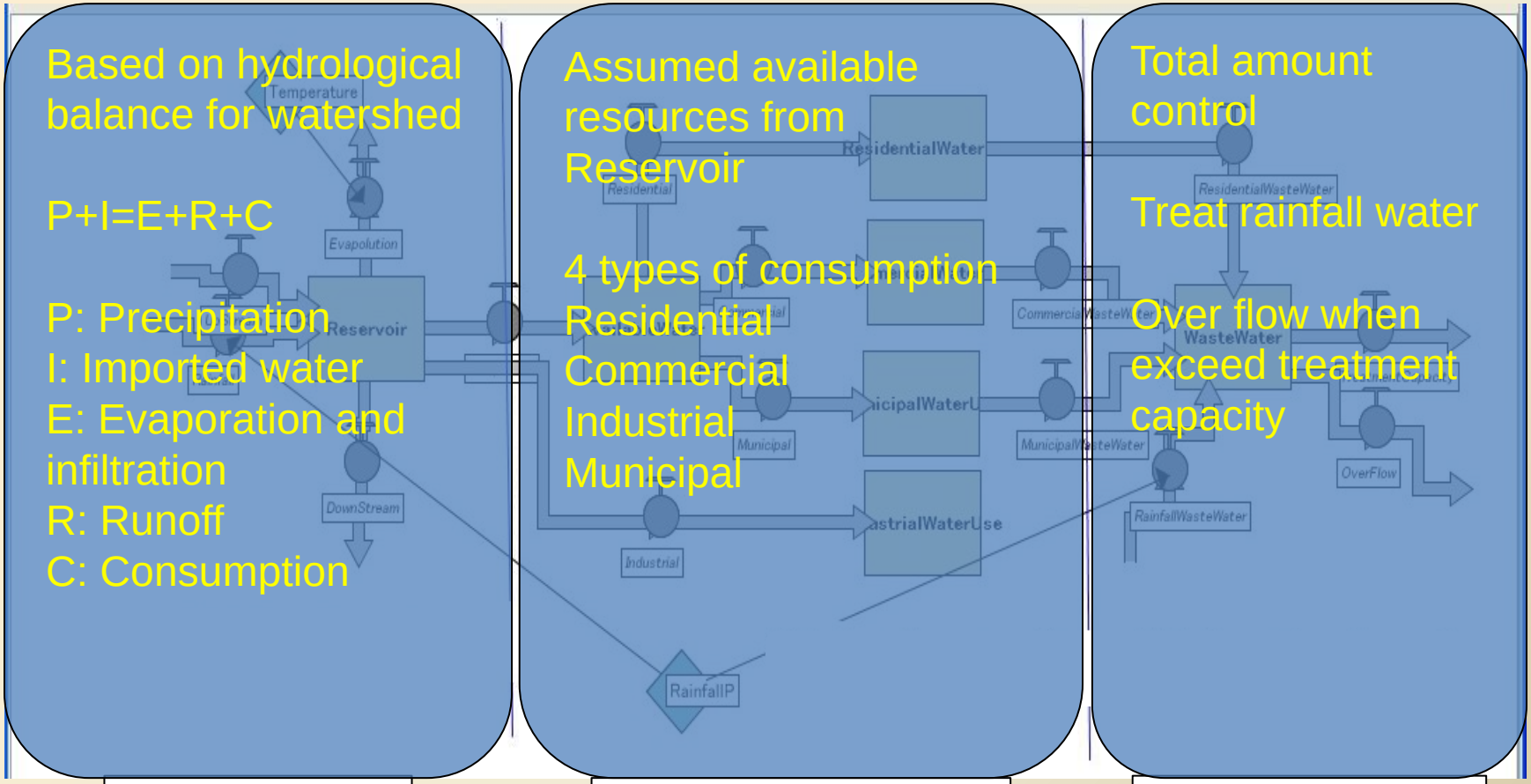
Water section related parameters and monitoring



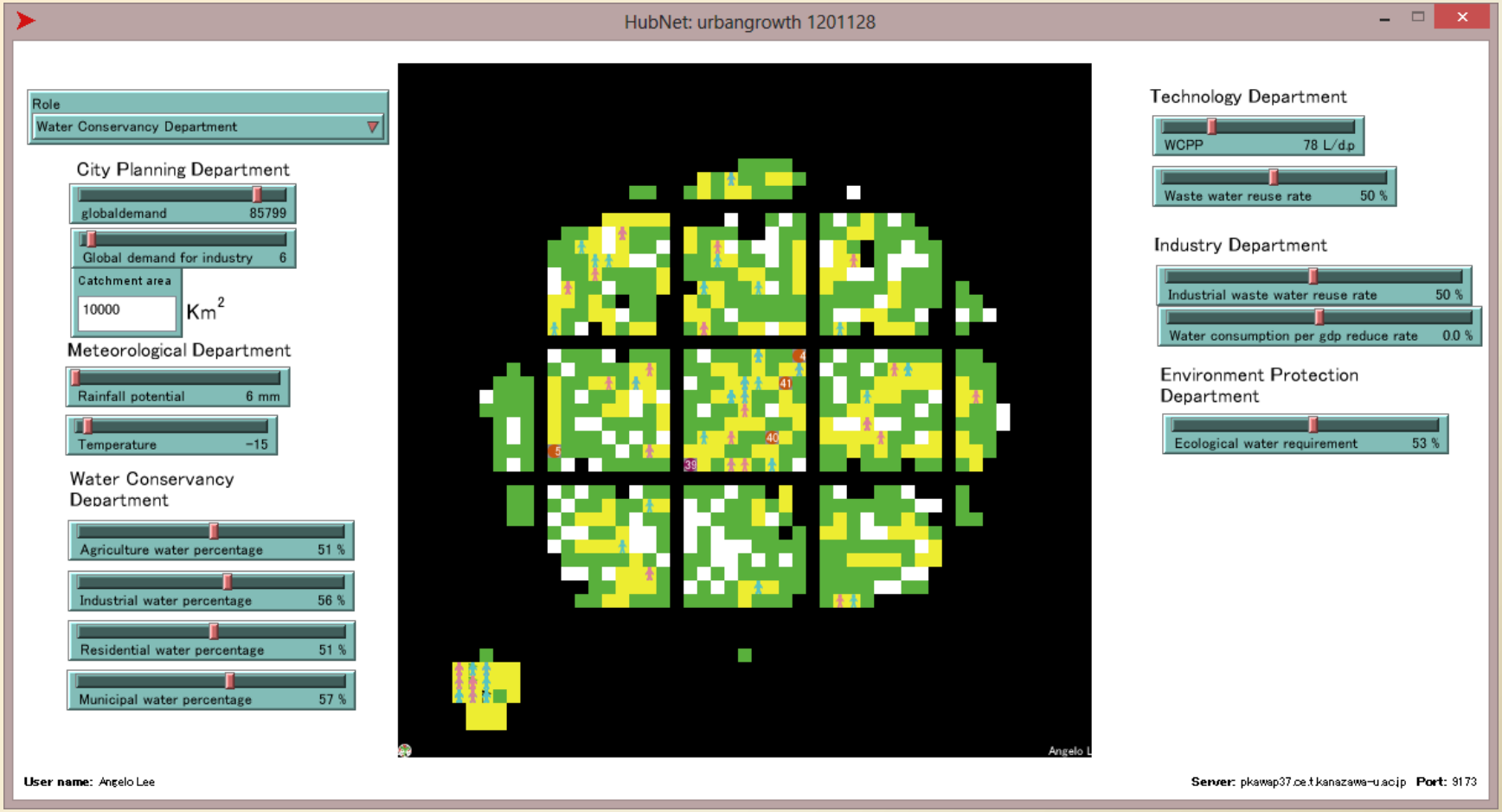
Other parameters related in water sector is designed to be set in web-conferencing environment

事例:水価格的関連参数

Simulating Urban Water Cycle
-System Dynamic modeling

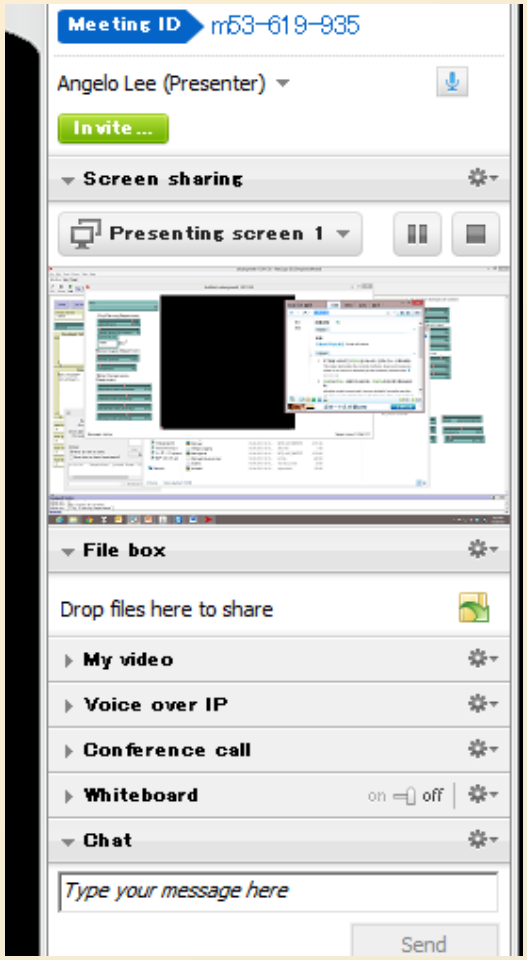


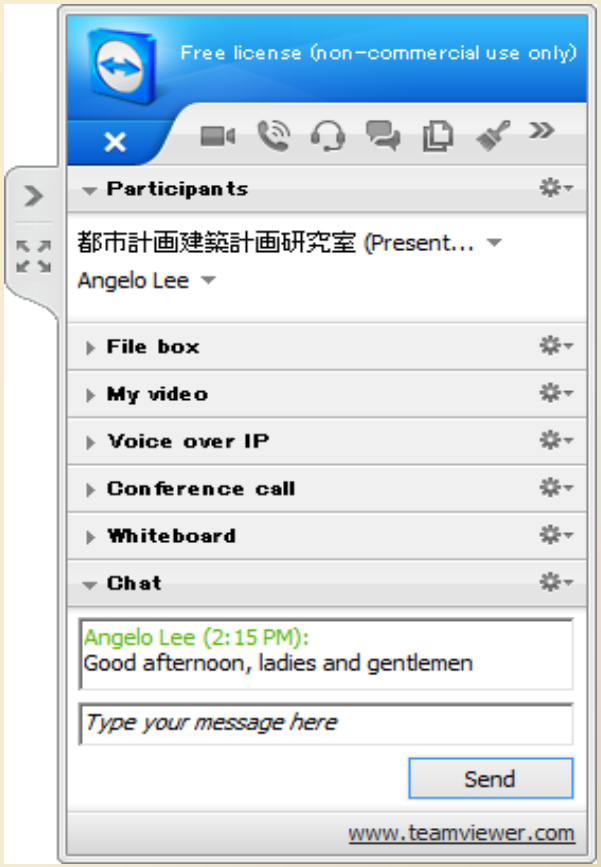
Web-based Decision-making Environment



部門責任者的参数調整

Web-based Decision-making Environment

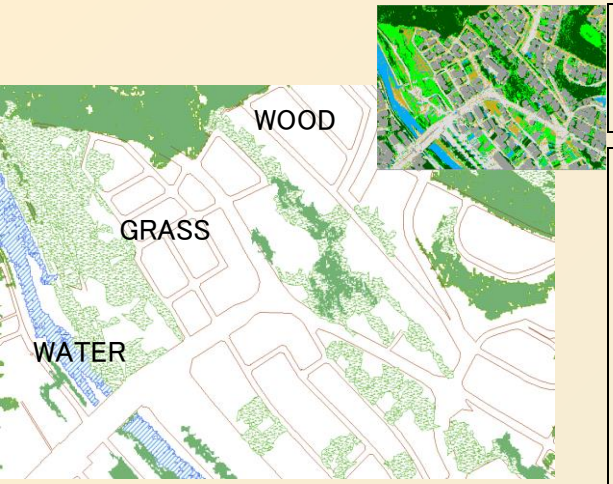




Conclusion

- A conceptual decision support system for urban water management
- Integrated
  - Agent-based model
  - System dynamics model
  - Web-based conferencing environment
- The function module performance well
- Improve public understanding for decision process and improve public awareness

規劃策略研究—Planning Support



Natural land use from classification by raster binary process

都市計畫基礎調查survey data

航空照片

排除人工的土地利用影響

建築 mask data

人工的、自然的土地使用資料data

圖像分類

水面 草地 道路等 空地 樹林

土地利用data矢量化

水面 草地 道路等 空地 樹林

利用專家知識系統判斷

利用屬性抽出

產生Buffer地區

利用專家知識系統判斷

河川回廊地區

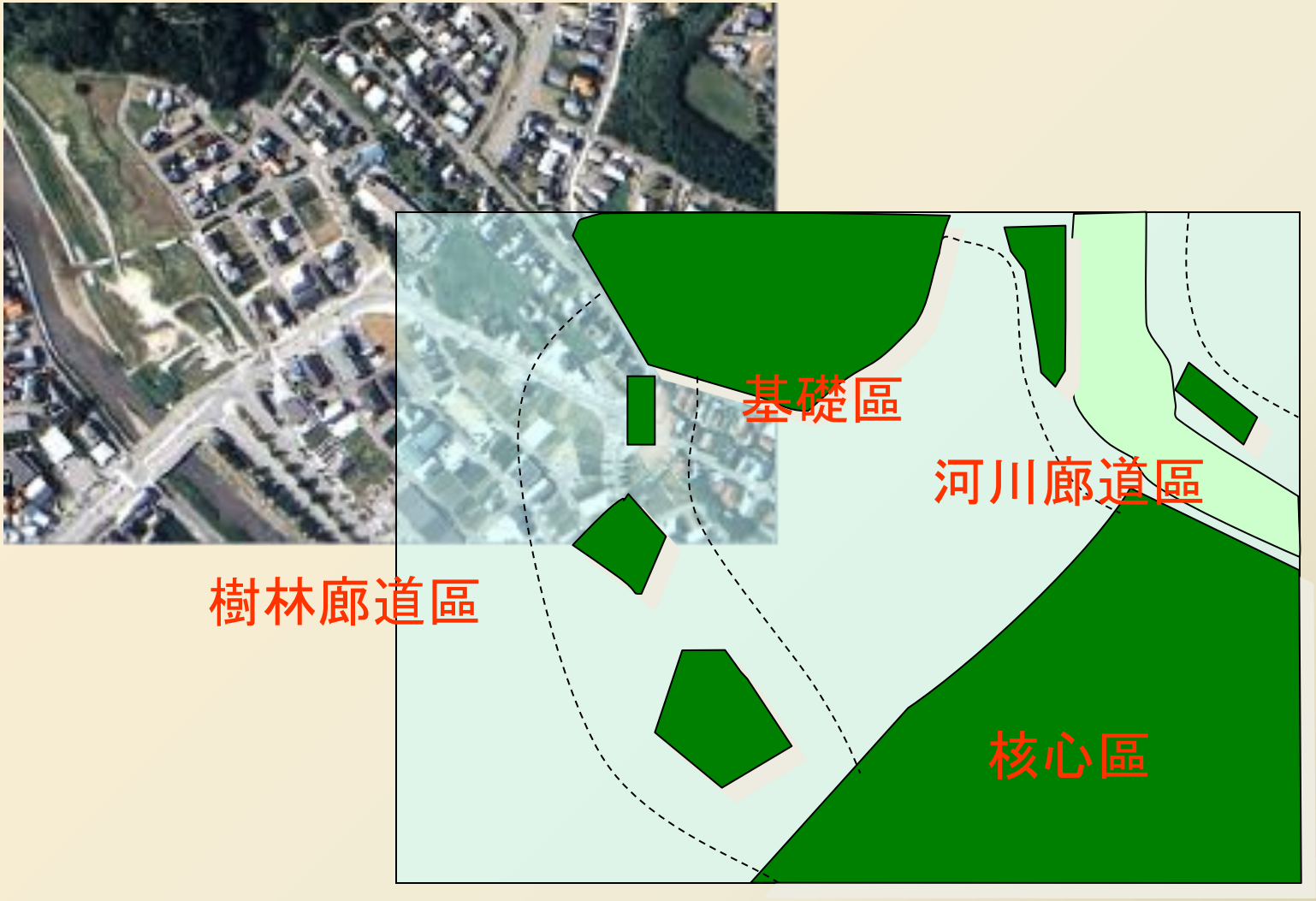
樹林回廊地區

據點地區

核心地區

自動產生地區生態網絡的基礎圖

規劃策略研究—Planning Support



DENP 的生態網絡案例

計畫支援研究與實踐

総体規劃的部門戦略規劃研究

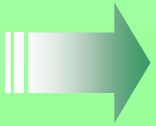
- 投資総量的分配（GA＋GIS）
- 中心区居住人口戦略（MAS）
- 高齢者養護施設的戦略（MAS）
- 商業環境形成戦略·相関公共交通政策（MAS）
- 都市開発/土地重劃（CA）

都市設計（VR）

- 公共空間·公園
- 重点地区·街道景観
- 歴史街區的保護

規劃支持的将来

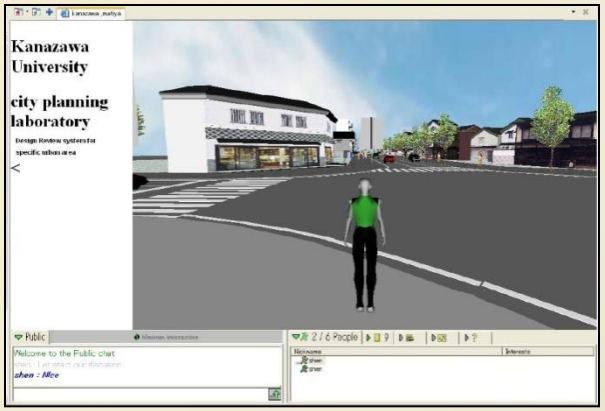
- CA+MAS+GIS＋VR＋Internet



政策＋計画＋設計

都市設計—計畫支援系統

支援系統中、為了解決委員會受限於時間與地點的解決，其策略便是運用網際網路。為了使意見共通的圖像成形、則利用假想空間VR之技術

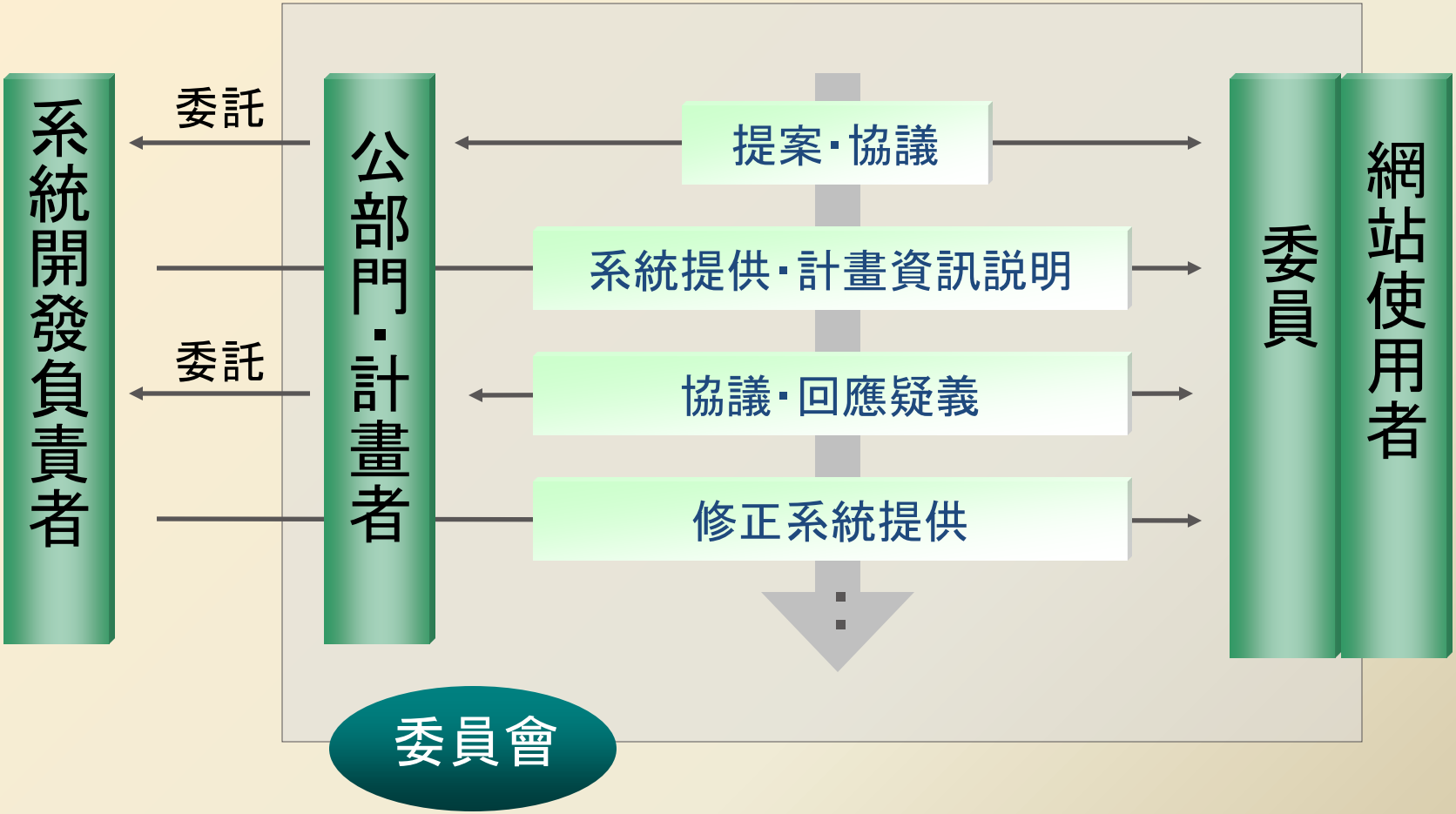


支援系統案例

在網路上、透過數位使用者共有最新的圖像，可以同時性地提案並評價計畫案。

計畫支援系統之案例

利用系統之委員會下各關係者之使用程序



石川縣七尾市意象道路第二期區間

Access from a meeting

Access from home

Access from public facilities

利 用 ＷＥＢ・３Ｄ 支 援 參 與 式 規 劃

於地區層級的
委員會檢討

利用視覺上
易理解的3D

透過網路之
居民參與

課　　題

為參與地區營造相關委員會、參與者共通意象、形象之形成、時間與空間上的限制

事例

參加型公園設計
參加型街景設計・歷史街區的保護
密集建成區的居住環境的整備

利 用 ＷＥＢ・３Ｄ 支 援 參 與 式 規 劃

於地區層級的
委員會檢討

利用視覺上
易理解的3D

透過網路之
居民參與

課　　題

為參與地區營造相關委員會、參與者共通意象、形象之形成、時間與空間上的限制

事例

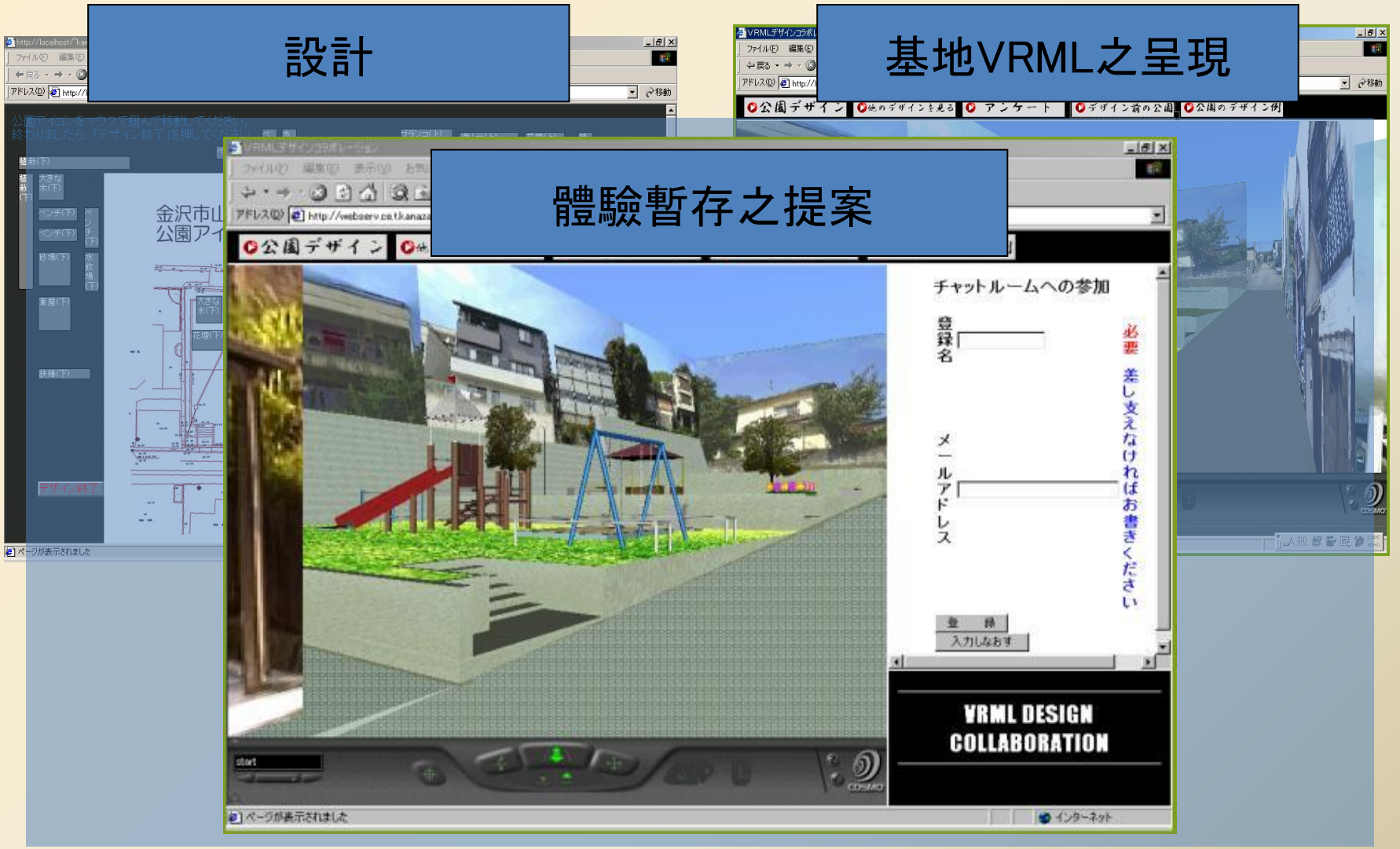
參加型公園設計
參加型街景設計
密集建成區的居住環境的整備

參與式公共空間之計畫設計

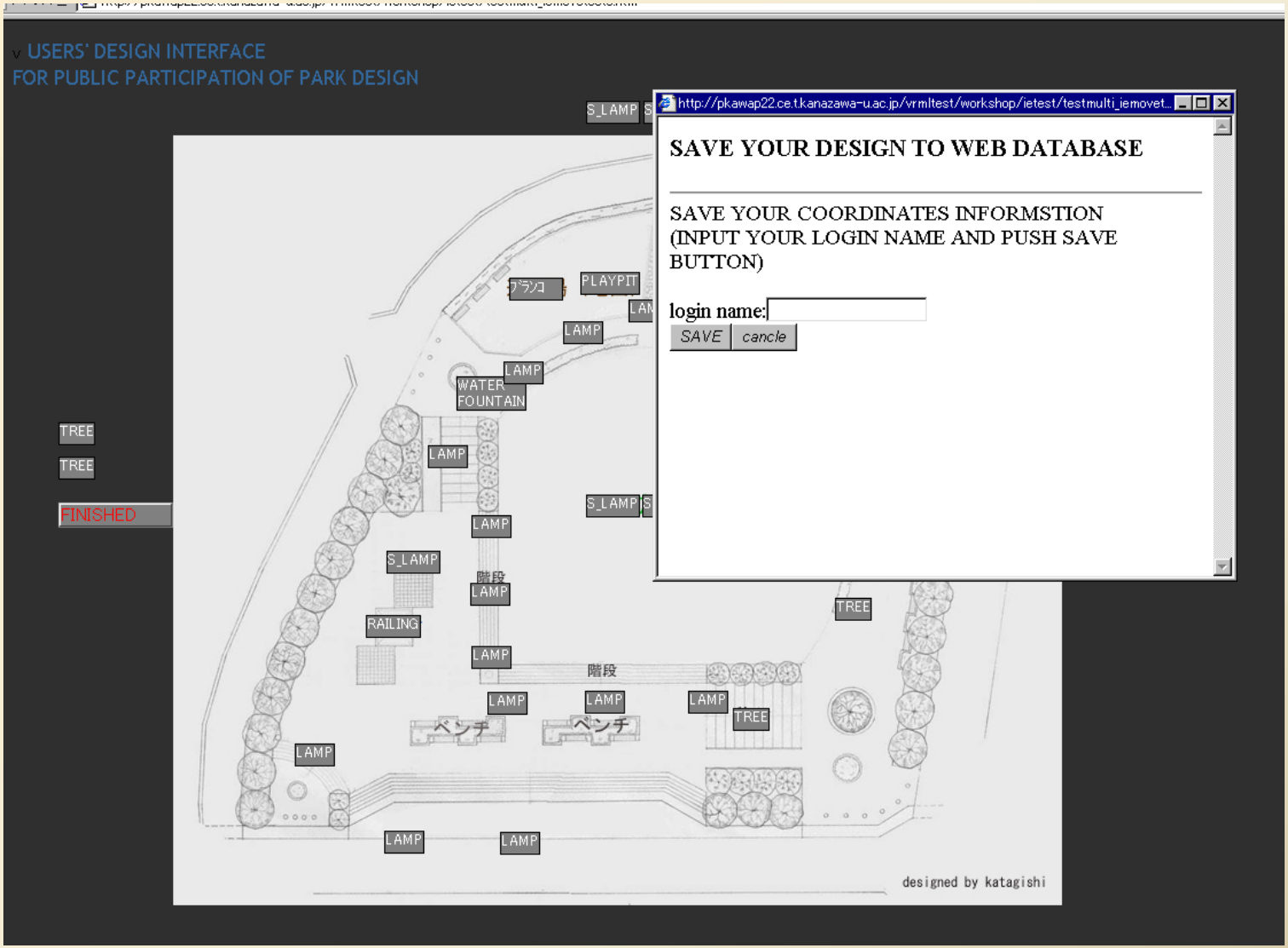
7個階段

- 彼此互知
- 課題整理
- 了解社區與基地
- 思考事業計畫
- 綜整提議
- 設計
- 評比、評價

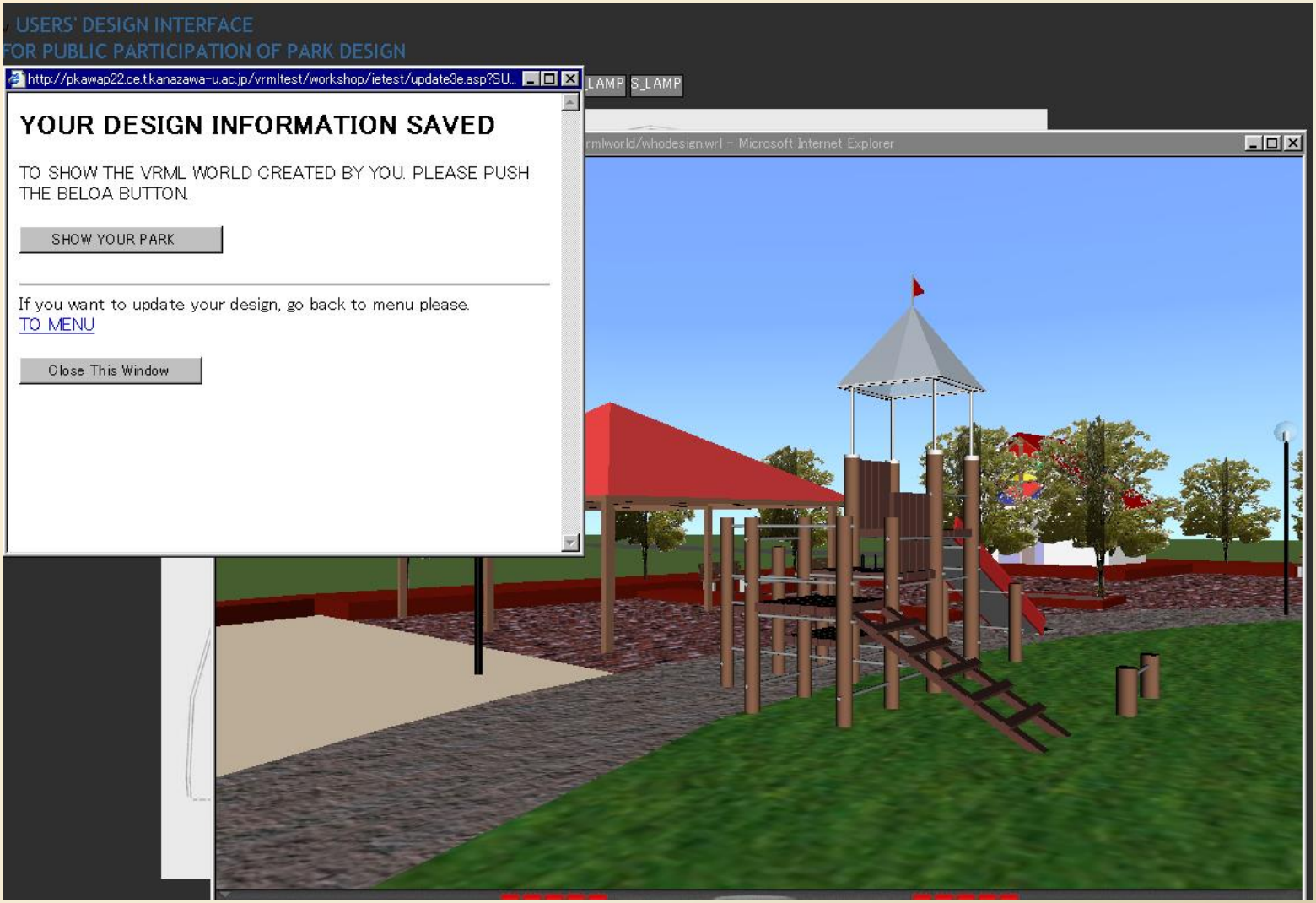
系統案例–金澤市山上町街區公園



設計案製作


USERS' DESIGN INTERFACE
FOR PUBLIC PARTICIPATION OF PARK DESIGN
TREE
TREE
FINISHED
S_LAMP
PLAYPIT
LAMP
WATER FOUNTAIN
S_LAMP
階段
RAILING
階段
ベンチ
ベンチ
TREE
TREE
designed by katagishi
http://pkawap22.ce.t.kanazawa-u.ac.jp/vrmltest/workshop/ietest/testmulti_iemovet...
SAVE YOUR DESIGN TO WEB DATABASE
SAVE YOUR COORDINATES INFORMSTION
(INPUT YOUR LOGIN NAME AND PUSH SAVE BUTTON)
login name:
SAVE
cancle

設計案呈現


USERS' DESIGN INTERFACE
FOR PUBLIC PARTICIPATION OF PARK DESIGN
http://pkawap22.ce.t.kanazawa-u.ac.jp/vrmltest/workshop/ietest/update3e.asp?SU...
YOUR DESIGN INFORMATION SAVED
TO SHOW THE VRML WORLD CREATED BY YOU. PLEASE PUSH THE BELOA BUTTON.
SHOW YOUR PARK
If you want to update your design, go back to menu please.
TO MENU
Close This Window
LAMP
S_LAMP
rmlworld/whodesign.wrl - Microsoft Internet Explorer

利 用 ＷＥＢ・３Ｄ 支 援 參 與 式 規 劃

於地區層級的
委員會檢討

利用視覺上
易理解的3D

透過網路之
居民參與

課　　題

為參與地區營造相關委員會、參與者共通意象、形象之形成、時間與空間上的限制

事例

參　加　型　公　園　設　計

參 加 型 街 景 設 計 ・ 歷 史 街 區 的 保 護

密　集　建　成　区　的　居　住　環　境　的　整　備

街道整備事業

對象地區

石川縣七尾市意象道路

事業名稱

七尾都市復興事業

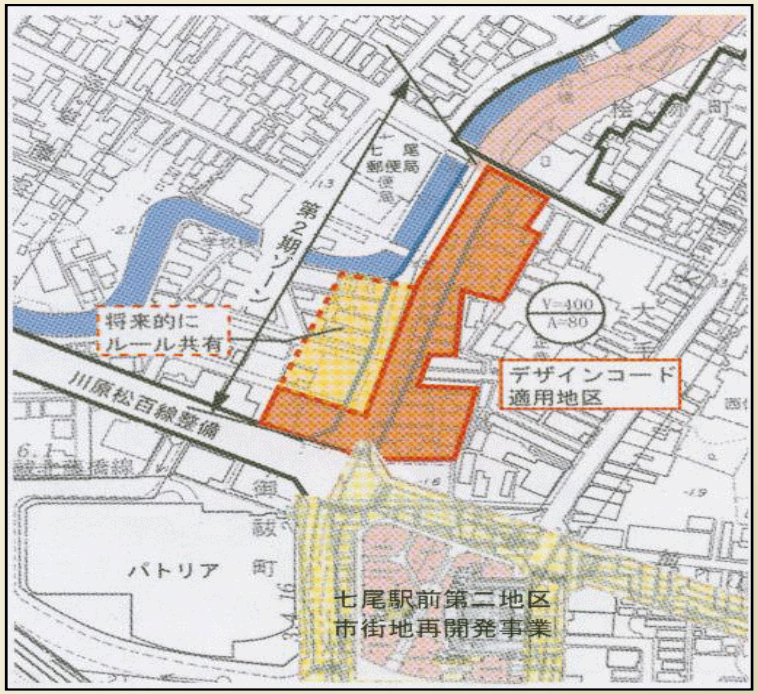
參與者

居民:10名　　專家:4名

事務局:8名

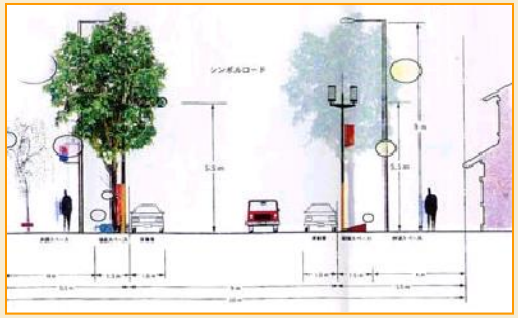
（顧問公司:2名　公部門:6名）

籌備協調者:1名



街道整備事業

道路斷面	公共空間設計	個別建築物
車道、人行歩道等	行道樹、樹箱、號誌、街燈等	建築設計、基地使用等



地區層級的地區營造

地區整備計畫、地區營造規則

<公共空間>

- 公園整備
- 街道景觀整備
  街道整備
- 社區專區
  小廣場
  街道家具

<私有空間>

- 基地使用
- 建物設計、分區及形態等管制

<地區整體>

- 街道景觀
- 行道樹
- 街道家具
- 街道景觀的統一感

公共空間設計檢討

街道空間

檢討課題	檢討項目	選項案例
車道部	車道	位置、寬度、車道數、舖面
步道部	斑馬線	位置、數量
	出入口	位置、數量、寬度、舖面
	步道	位置、數量、寬度、舖面
	自行車	位置、數量、寬度、舖面
	街道家具	種類、位置、數量、尺寸
中央分離帶	步行空間	位置、寬度、舖面
用水	水路	位置、寬度、舖面、數量
	親水空間	深度、設計
	橋	位置、寬度、數量、設計
植樹帶	高木	位置、尺寸、數量
	低木	
	花壇	種類、數量

公園

檢討課題	檢討項目	選項案例
分區		
設計	植栽	種類、位置、數量、尺寸
	花壇	種類、位置、數量、尺寸
	溜滑梯	有無、設計、位置、尺寸
	盪鞦韆	有無、設計、位置、尺寸
	單槓	有無、設計、位置、尺寸
	沙坑	有無、設計、位置、尺寸
	街燈	種類、位置、數量、尺寸
	飲水場	有無、設計、位置、尺寸
	長椅	有無、設計、位置、尺寸
	電線桿	設計、位置、數量、尺寸
	樹木	種類、位置、數量、尺寸

- 個別建築物設計之檢討
- 公共空間之設計檢討

地區計畫·地區營造協定

個別建築物設計之檢討

		項目	
地区整備計画	建築物等及び建築敷地の制限	建築物等の形態の制限	建築物等の用途の制限
			容積率の制限
			建蔽率の制限
			建築物の高さの制限
			建築面積の制限
			敷地面積の制限
			壁面の位置の制限
		建築物等の意匠の制限	屋根·庇の制限
			外壁の制限
			広告物の制限
		垣·柵·門の制限	

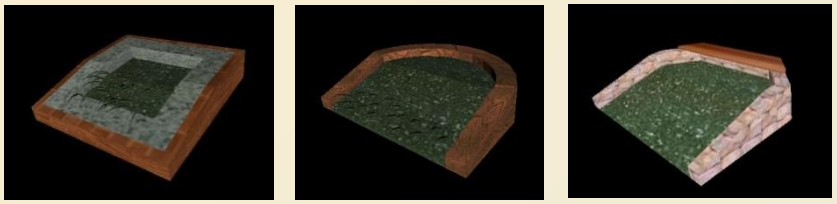
- 個別建築物設計之檢討
- 公共空間之設計檢討

街道整備事業

公共空間

行道樹

樹箱



車道與步道分離

個別建物

花與綠

建物設計

街道整備事業

(1-a) 桂花樹(春)

(1-b)桂花樹(秋)

(1-c) 橡木 (春)

(1-d) 橡木 (秋)

街道整備事業

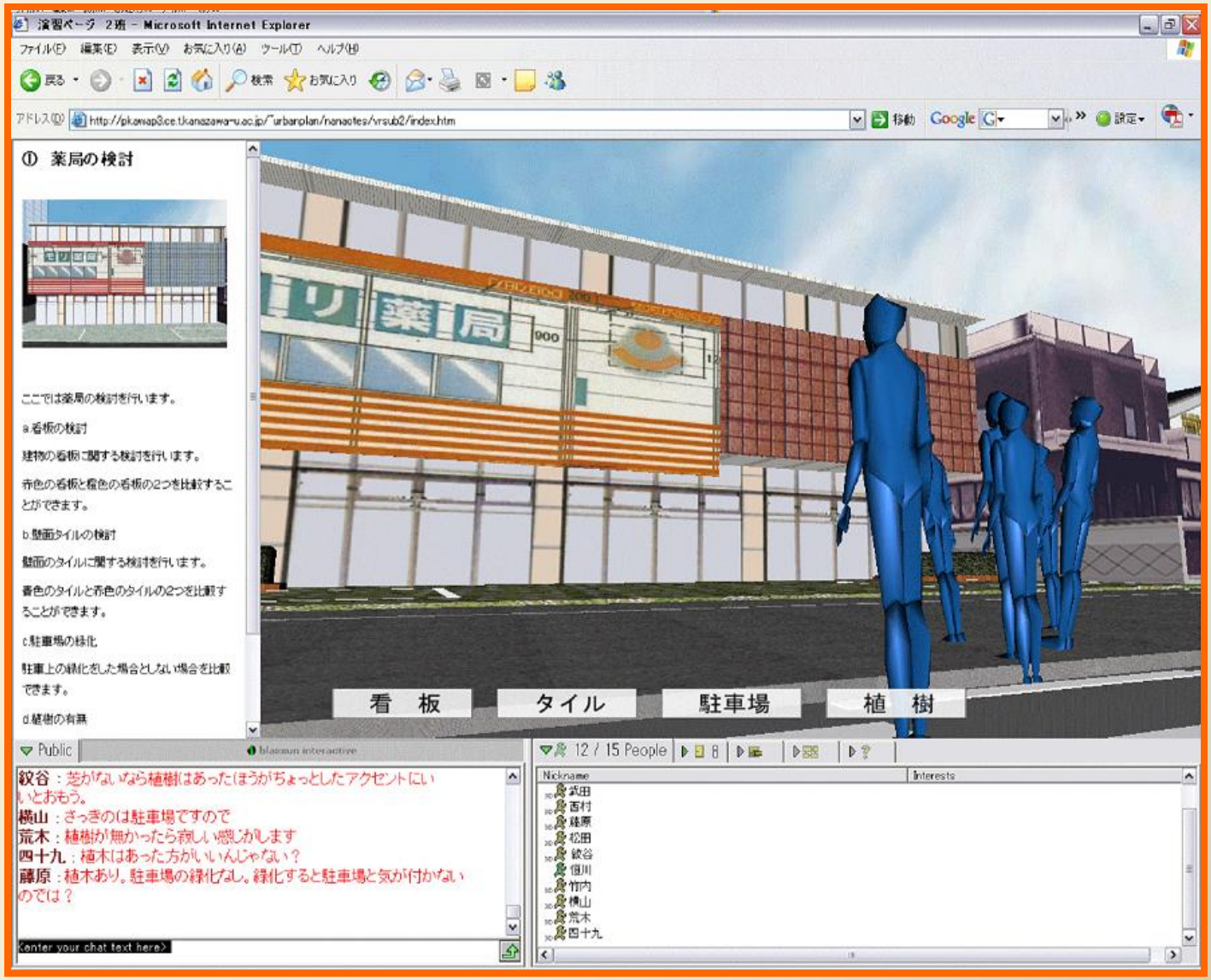
(1-a)現況基地

(1-b)基地共同化

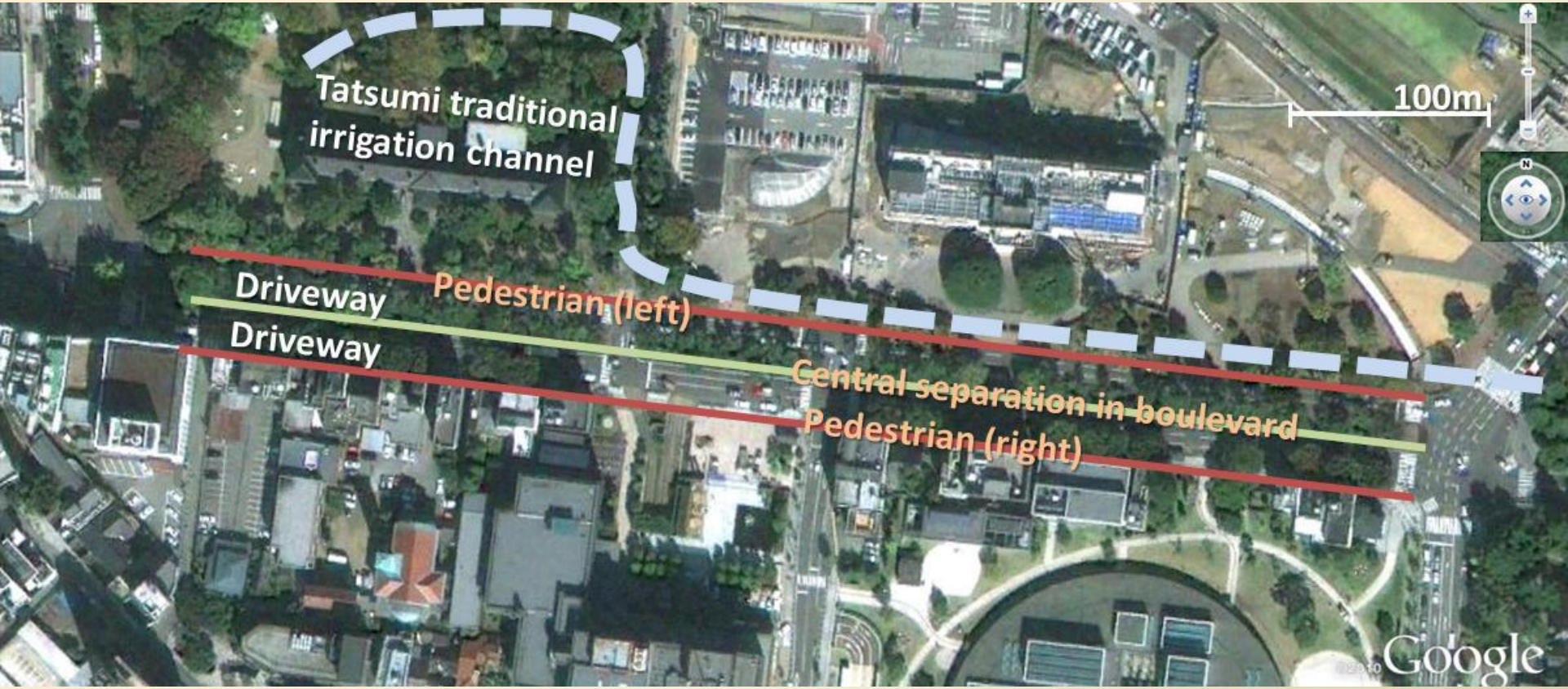
(2-a)建物設計

(2-b)建物設計

計畫設計審査


演習ページ 2班 - Microsoft Internet Explorer
① 薬局の検討
ここでは薬局の検討を行います。
a.看板の検討
建物の看板に関する検討を行います。
赤色の看板と橙色の看板の2つを比較することができます。
b.壁面タイルの検討
壁面のタイルに関する検討を行います。
香色のタイルと赤色のタイルの2つを比較することができます。
c.駐車場の緑化
駐車上の緑化をした場合としない場合を比較できます。
d.植樹の有無
薬局
看 板
タイル
駐車場
植 樹
Public
紋谷：芝がないなら植樹はあったほうがちょっとしたアクセントにいいとおもう。
横山：さっきのは駐車場ですので
荒木：植樹が無かったら寂しい感じがします
四十九：植木はあった方がいいんじゃない？
藤原：植木あり。駐車場の緑化なし。緑化すると駐車場と気が付かないのでは？
Enter your chat text here>
12 / 15 People
Nickname
Interests
武田
西村
藤原
松田
紋谷
恒川
竹内
横山
荒木
四十九

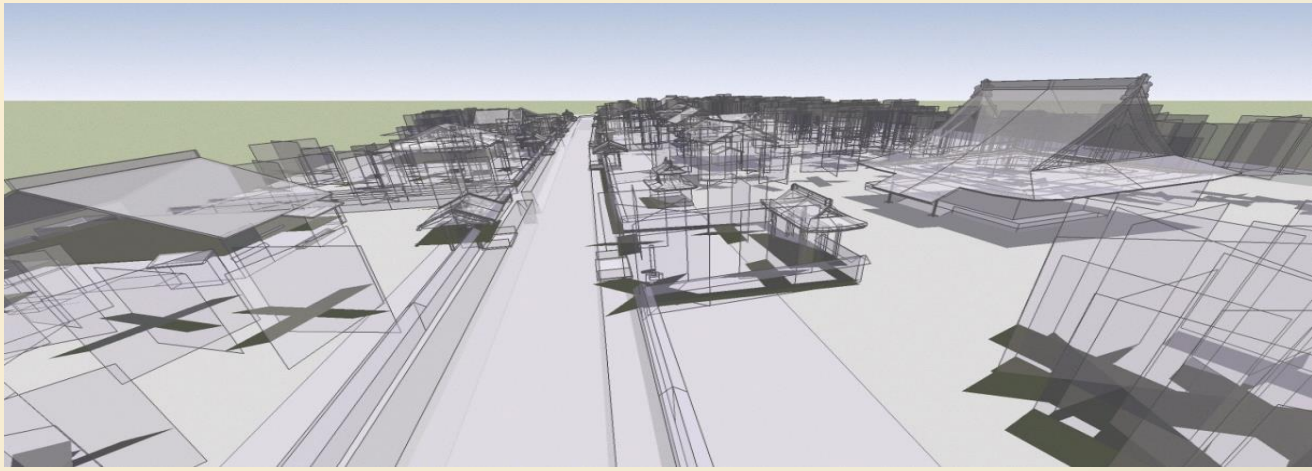
街道整備事業


Tatsumi traditional irrigation channel
100m
Driveway
Pedestrian (left)
Driveway
Central separation in boulevard
Pedestrian (right)
Google

街道整備事業


Alternative plan A
Plan information C
Open VRML
Alternative plan C
Audio explanations
Open BBS
Deliberation using BBS

歴史街区—Planning Support



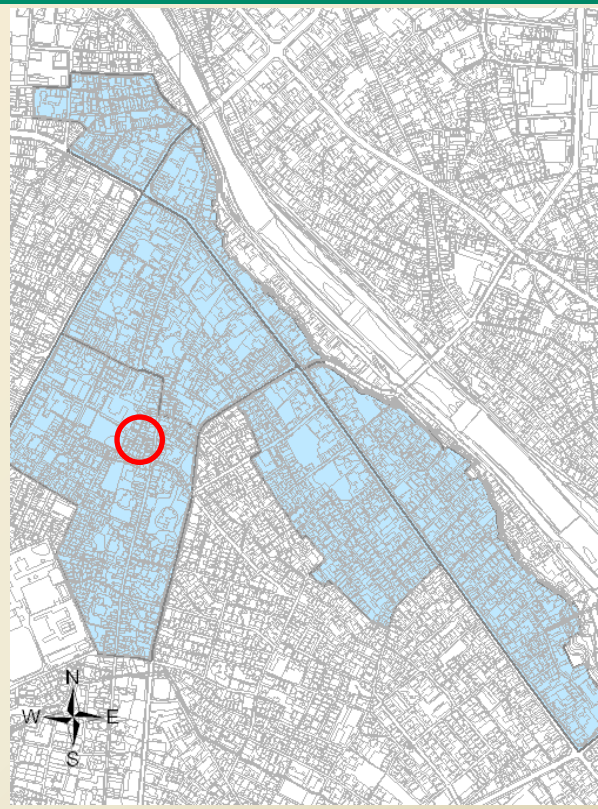
金澤市寺町寺院群圖像

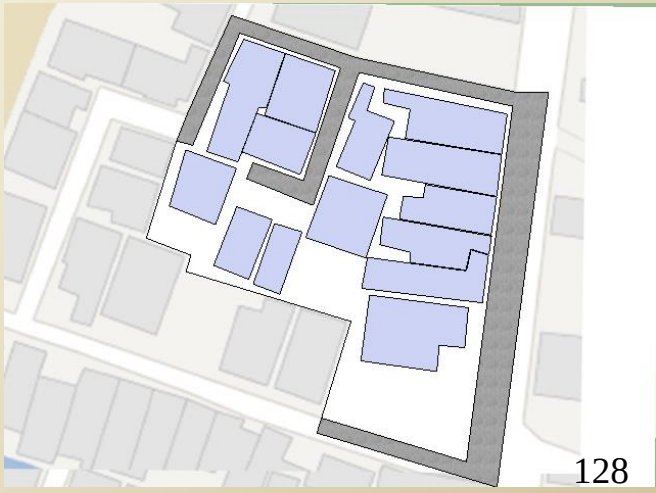
- 都市構造
- 寺院群
- 足輕房舍·町家
- 保存樹
- 環境工作物

歷史街区—Planning Support

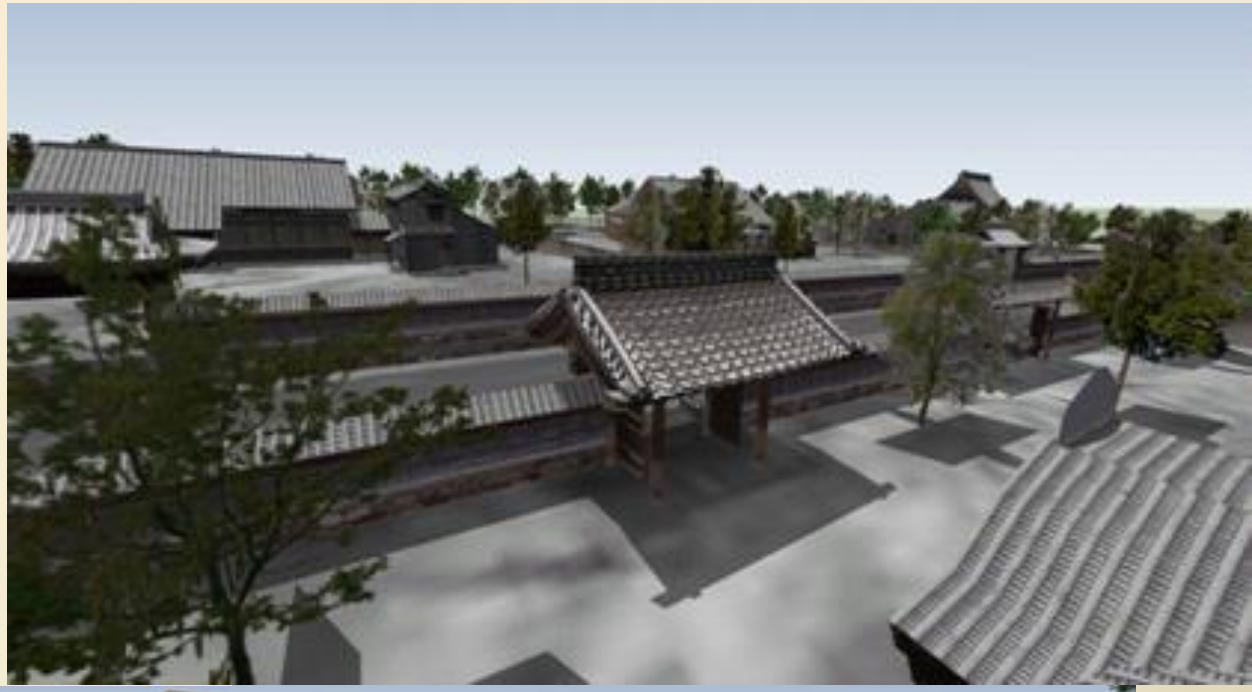
- 寺町是傳統建物及歷史街道型式密集分布的地區
- 狹窄而有曲折的路型影響了緊急避難與防火
- 基於都市計劃管制下斜線限制、建築基準法之臨路容積限制等，此地區無法重建

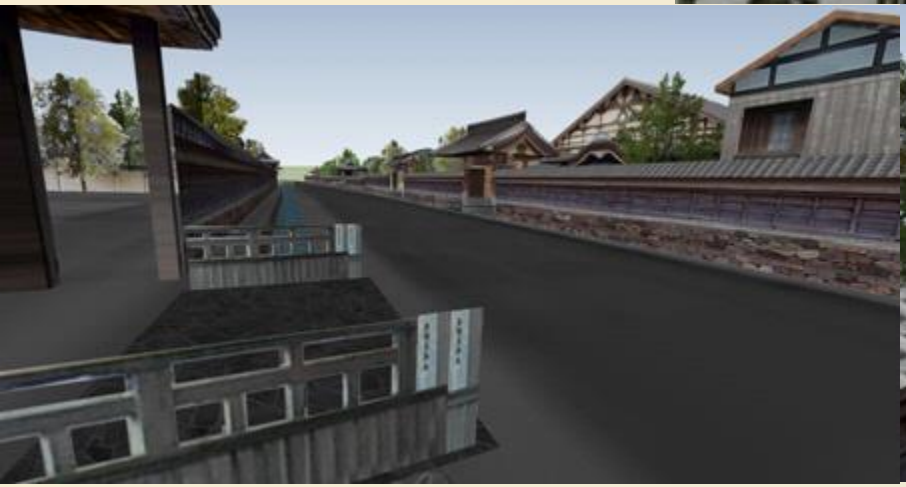
就現況的建築基準法下而言，此地區難以重建，然而，居住環境確實需要改善。

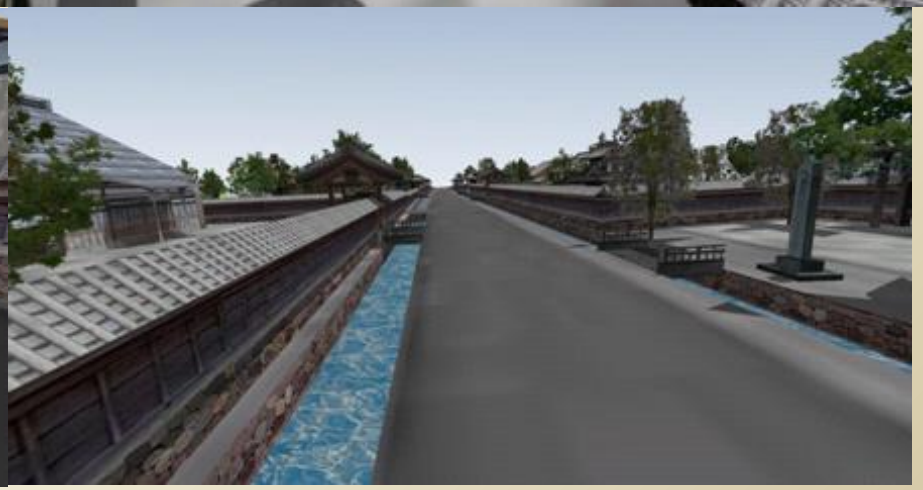




歴史街区—Planning Support







利 用 ＷＥＢ・３Ｄ 支 援 參 與 式 規 劃

於地區層級的
委員會檢討

利用視覺上
易理解的3D

透過網路之
居民參與

課　　題

為參與地區營造相關委員會、參與者共通意象、形象之形成、時間與空間上的限制

事例

參　加　型　公　園　設　計
參加型街景設計・歷史街區的保護
密集建成區的居住環境的整備

Planning Learning for Stakeholders to Consider Residential Environment Improvement in Densely Built-up Area using 3DVIR

Background

Planning issues in Densely Built-up Area in Japan

- Urban Infrastructure : Narrow road and dead-end streets
- lack of open space (Public Park)
- Fire-prevention : Old and traditional Wooden building
  weak earthquake resistance and
  weak fire prevention
- Residential Environment. : Sunshine and ventilation,
  limited buildable space

Most of rebuilding activities in densely built-up area are impossible due to Building Standards Act.

＋How to improve the residential environment ?

Background

- How to improve residential environment of densely built up area through rebuilding activities
- for stakeholders to understand the planning issues and share planning solutions

Special design code of Building Standards Act is a possible solution. Visualization of the design guideline based on the design code for gaining consensus between stakeholders is helpful.

(Take Teramachi community as a case study area)

◆絶対的高さ制限

- 建築基準法が定める絶対的高さ制限は、第1種低層住居専用地域と第2種低層住居専用地域だけに適用される。
- この両地域では、建築物の高さは10mか12mのいずれか都市計画で指定された高さを超えることができない。

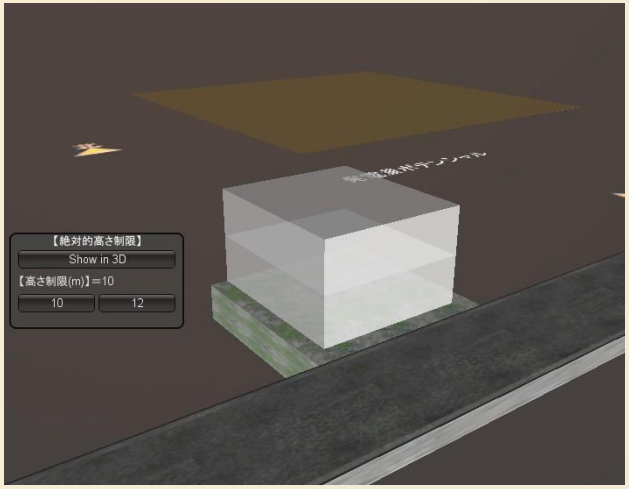


図13. 絶対的高さ制限 ＝ 10m

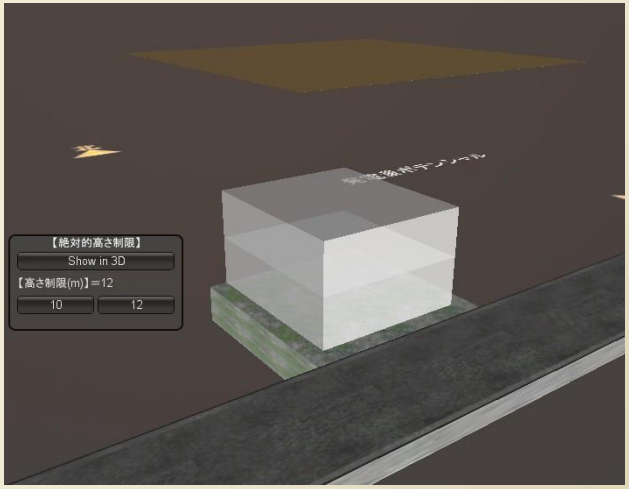


図14. 絶対的高さ制限 ＝ 12m

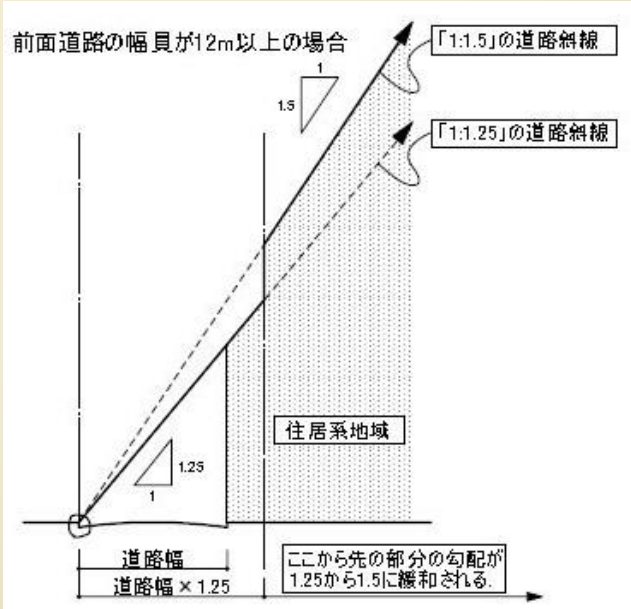
◆道路斜線制限

【道路斜線の勾配】

①住宅系は、1.25とする。

②第一種・第二種中高層住居専用地域、第一種・第二種住居地域、準住居地域のうち、特定行政庁が指定する区域内では、1.5とする。

③道路幅員が12m以上、前面道路の反対側の境界線からの水平距離が道路幅員に1.25を乗じて得た数値以上となる区域内においては、1.5とする。



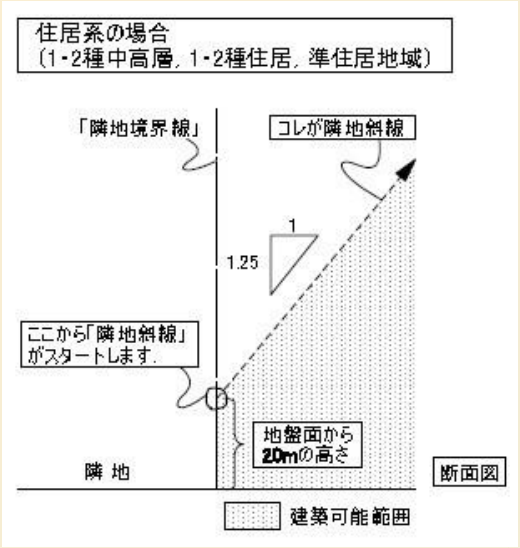
【道路斜線の適用限界距離】

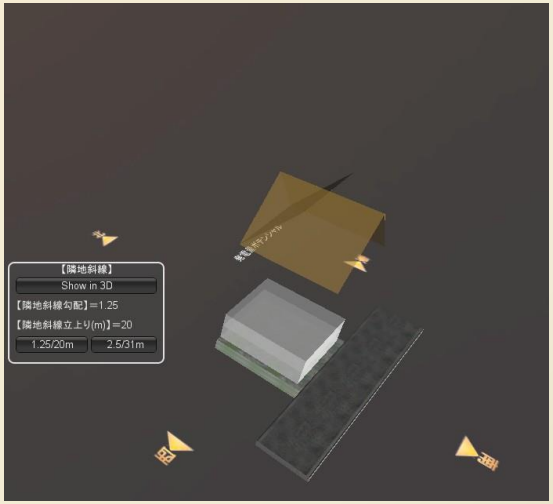
容積率	道路斜線の適用限界距離
20/10以下	20m
20/10～30/10	25m
30/10～40/10	30m
40/10超	35m

◆隣地斜線制限

① 第1種/第2種低層住居専用地域以外の住居系について、建築物の各部の高さは、その部分から隣地境界線までの水平距離を1.25倍した数値に20mを加えた数値以下にする。

② 第1種/第2種中高層住居専用地域、また第1種/第2種住居地域、準住居地域のうち、特別行政庁が都道府県都市計画審議会の議を経て指定する区域内の建築物は隣地境界線までの水平距離を2.5倍した数値に31mを加えた数値以下にする。





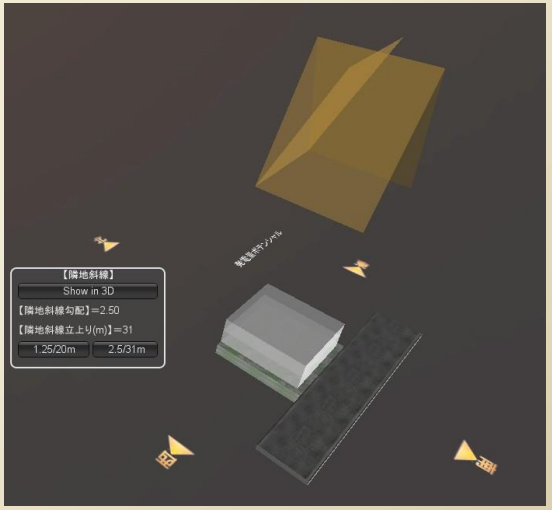
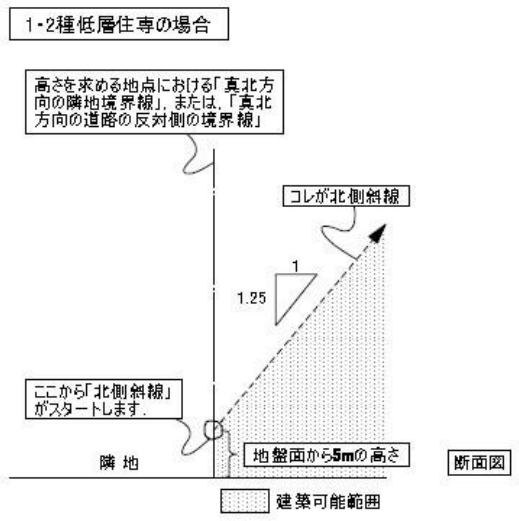


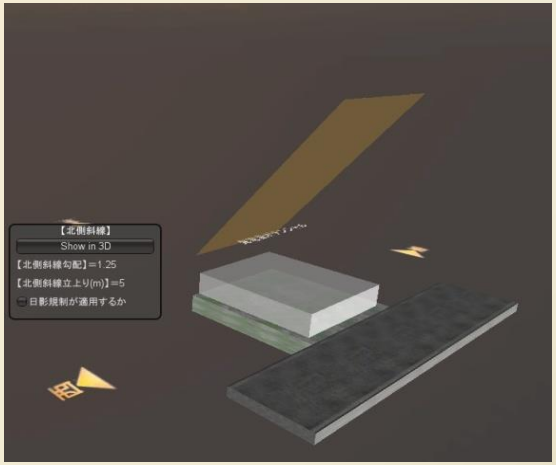
図19. 隣地斜線勾配＝1.25　立上り距離＝20m　図20. 隣地斜線勾配＝2.5　立上り距離＝31m

◆北側斜線制限

① 第1種/第2種低層住居専用地域では、建築物の高さは、当該部分から前面道路の反対側の境界線または隣地境界線までの真北方向の水平距離に1.25を乗じた数値に5mを加えた数値以下でなければなりません。

② 日影規制の適用のない第1種/第2種中高層住居専用地域では、建築物の高さは、当該部分から前面道路の反対側の境界線または隣地境界線までの真北方向の水平距離に1.25を乗じた数値に10mを加えた数値以下でなければなりません。





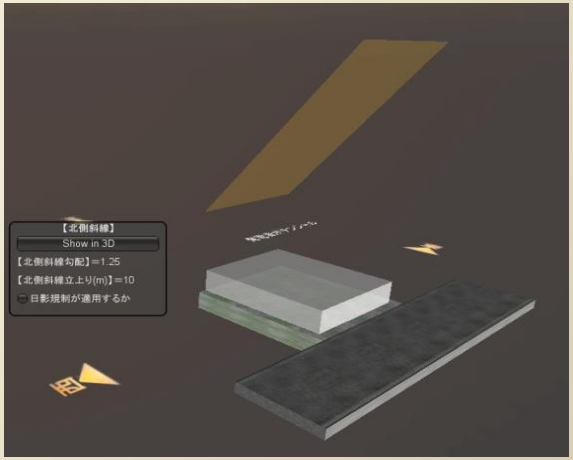
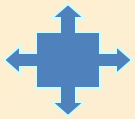


図21. 北側斜線勾配＝1.25　立上り距離＝5m　図22. 北側斜線勾配＝1.25　立上り距離＝10m

Buildings (SDCPB)

構成		基準設定の考え方
適用区域	範囲	・現に存する通路を含み、それに面する連続した一団の土地であること ・上記の通路に接するすべての敷地を含むこと
	面積	記載なし
	区域の接道	記載なし
通路	幅員	・幅員は全長にわたり2メートル以上であること
	配置	・各建築物の出入り口から、区域が接する道路まで通じるものであること ・動線形態が複雑でないこと ・終端が区域の境界線に接するものであること ・延長は50メートル以下であること。ただし、有効な形で通り抜けが確保できる場合はこの限りでない ・自由に通行できるものであること ・上空が開放されたものであること
敷地		・各敷地は原則として上記で定めた通路に2メートル以上接すること ・敷地の数は、従前より増加しないこと
建築物等	用途	・用途は、原則として専用住宅であること
	階数高さ	・階数は3以下であること
	外壁後退	・各建築物の出入り口は、通路に面して設けること ・通路に面する各建築物の外壁又はこれにかわる柱の面相互の距離は、区域内に階数3の建築物がある場合は4メートル以上とすること ・外壁面から区域の境界線までの距離は、50センチメートル以上とすること
	建ぺい率 ・容積率	記載なし
	構造	・各建築物は、耐火建築物又は準耐火建築物とすること。ただし、階数が1又は2である場合は、外壁を防火構造とすれば足りるものとする ・建築物の各部分の高さは、通路の反対側の建築物の外壁面からの水平距離に1.5を乗じて得られた数値以下とすること ・階数が3の建築物にあっては、3階の外壁面が2階の外壁面よりも後退していること

Research Approach - using 3DVIA



cloud providers

productivity applications

Desktop: Multiuser environment

3DVIA Server + database

3DVIA player

3DVIA tool(M)

VR digital asset

Avatars

Chat system

Mobile device

E-book

E-book

VR digital asset

Users

3D modeling

Account registration

Data Management

E-book management

PC user

Mobile user

Users

Platform(Paas)

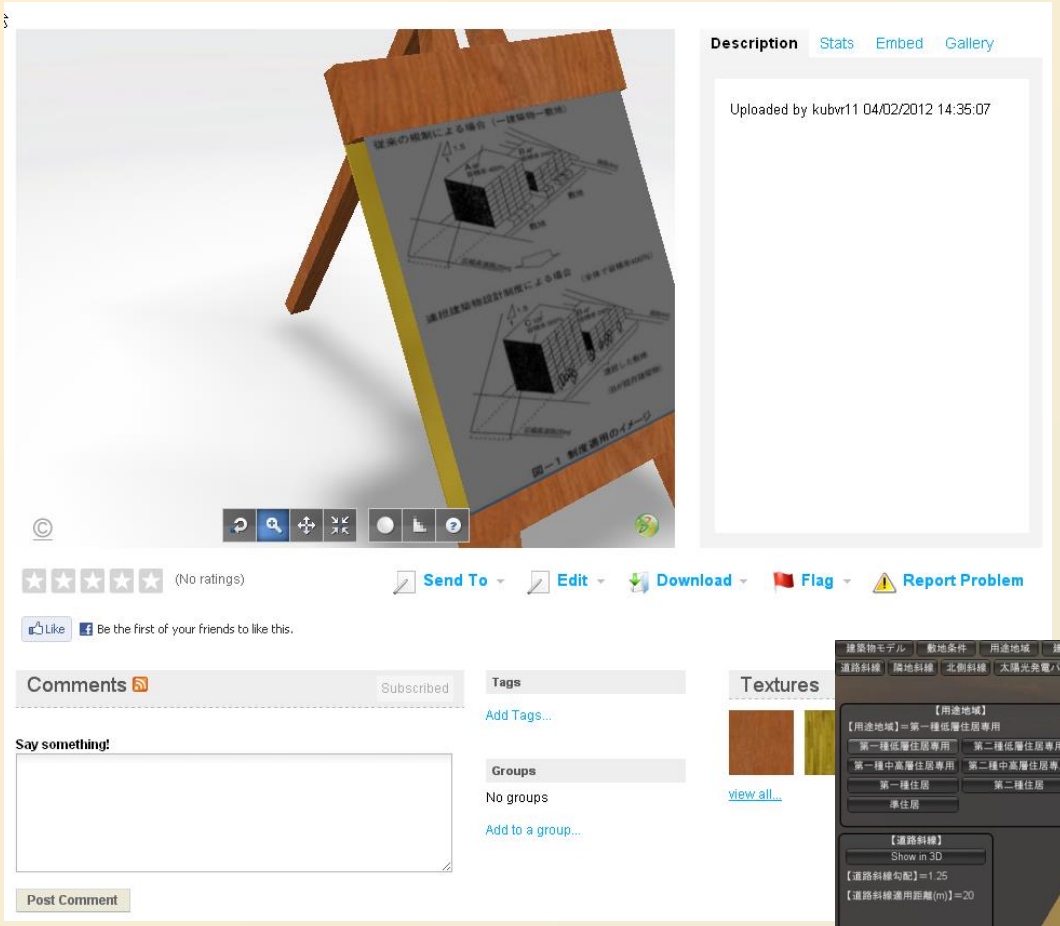
Application(Saas)

Research Approach - using 3DVIA

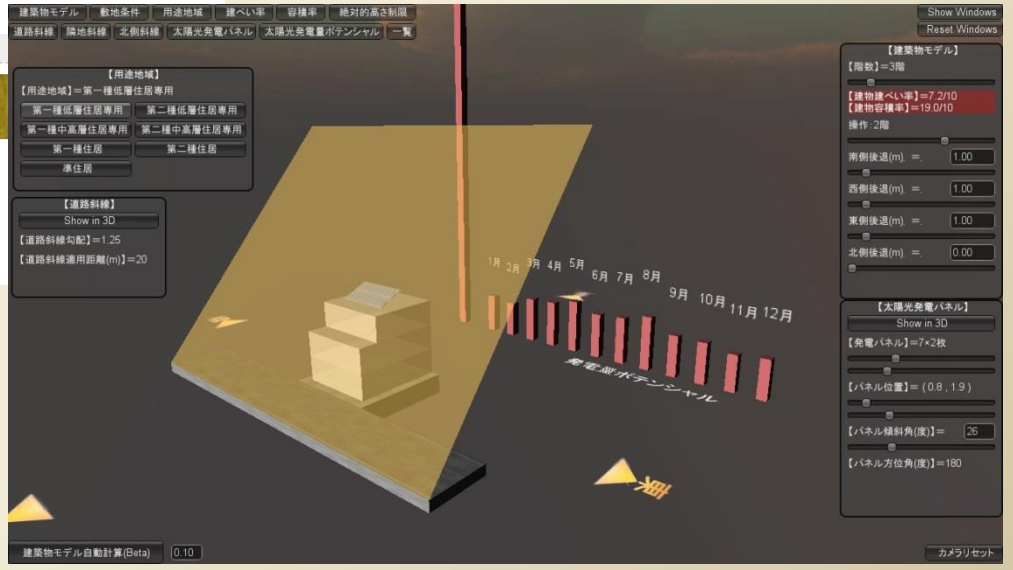
Users can prepare their digital assets after he/she register an account using 3DVIA

Users can prepare VR world using the digital assets within his/her database

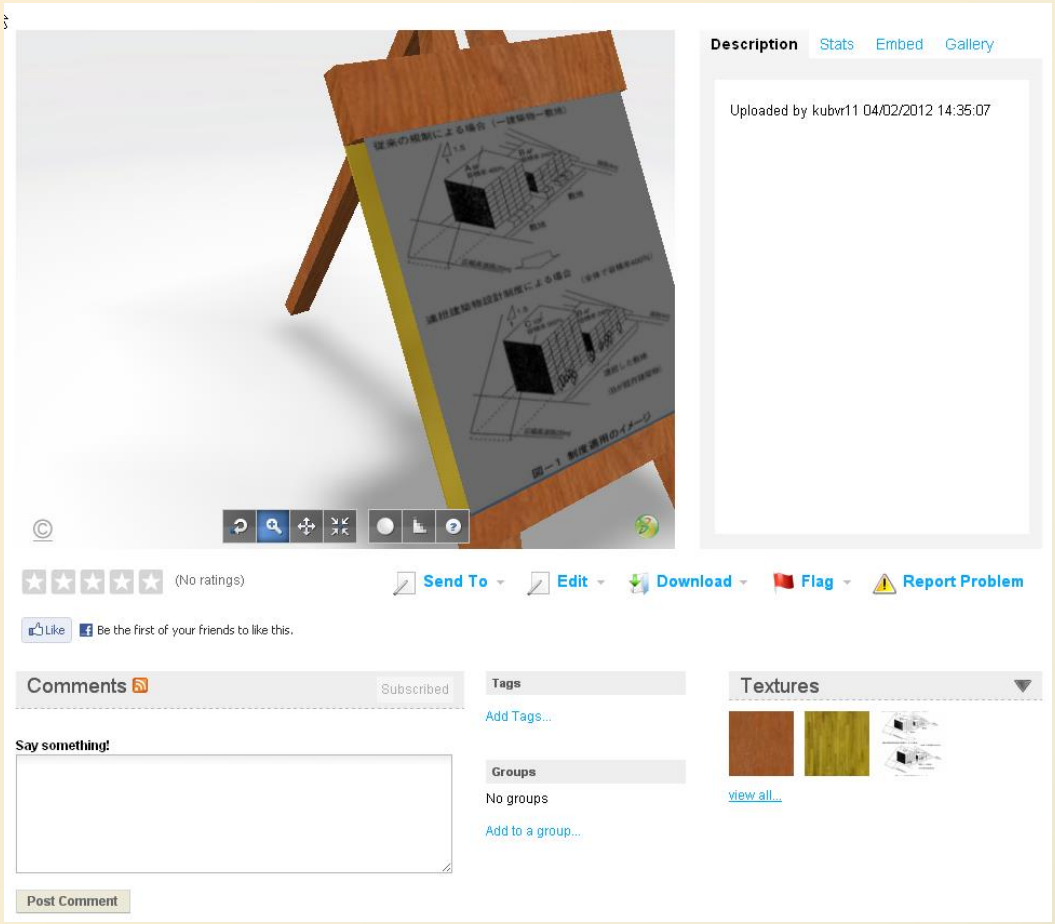
規劃策略研究—Planning Support



此為用以解釋規劃管制的數位化物件

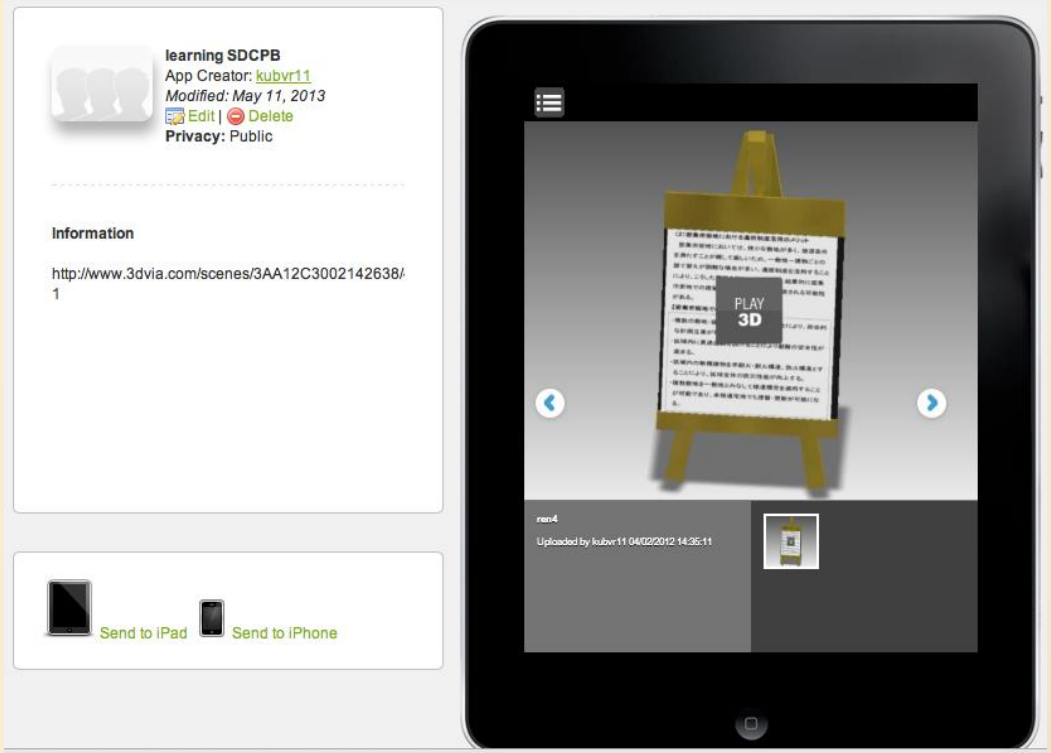


Research Approach - using 3DVIA



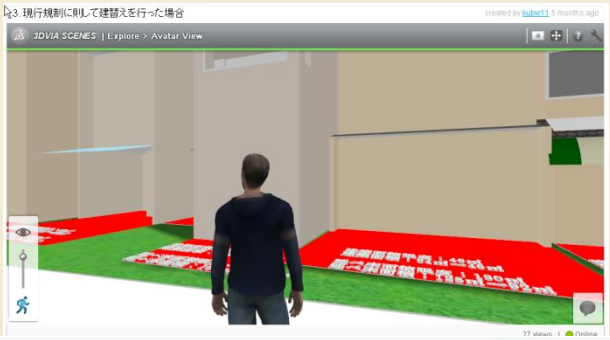
It is a digital object for explanation planning regulation.

Research Approach - using 3DVIA



E-book for mobile device

Research Approach - using 3DVIA



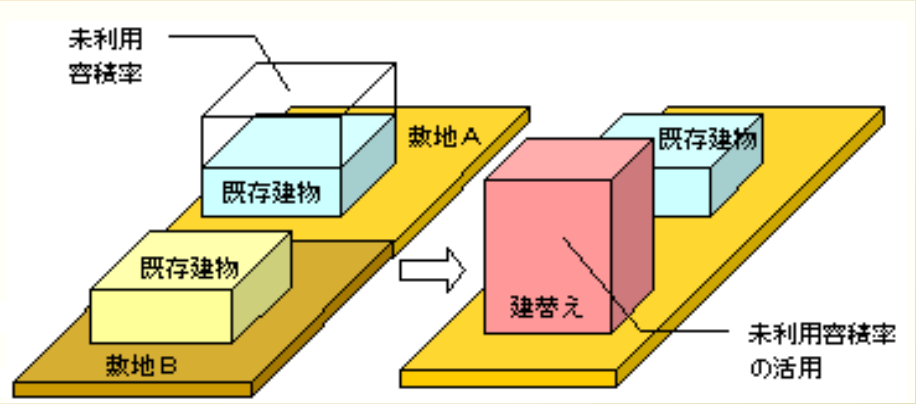
VR world for planning learning and communication within multi-user environment

Research approach

1. Investigating the previous studies on special design code of plural buildings
2. Field survey of current situation of townscape and buildings in case study area
3. Creating digital asset for representation of current townscape using Google SketchUp
4. Visualizing different planning measures for rebuilding using SketchUp and opening up through the platform of 3DVIA
5. System Evaluation and Questionnaires
6. Discussion and Future works

Special Design Code for Plural Buildings

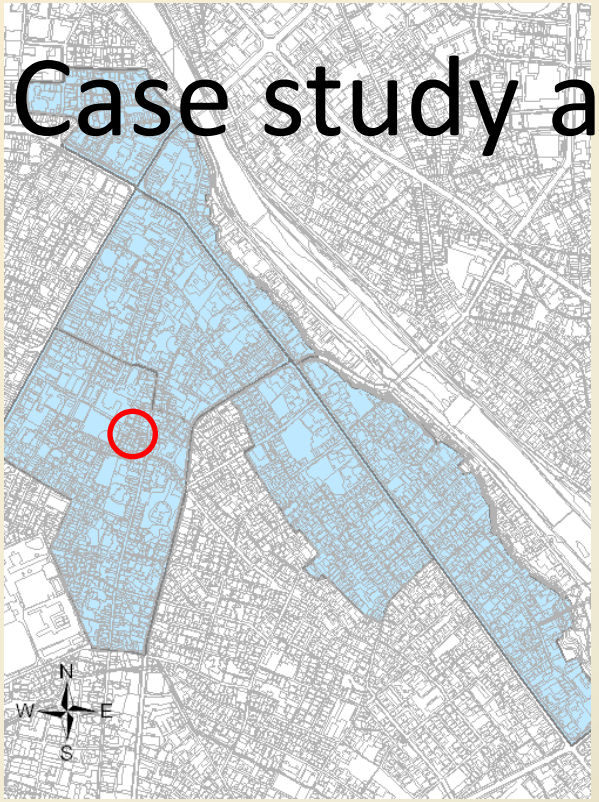
- Small connecting parcels can be recognized as one united parcel and planning regulations will not be implemented to each parcel.
- Related regulations on single parcel: Connection to front road, FAR, BCR, oblique line



In the case of FAR

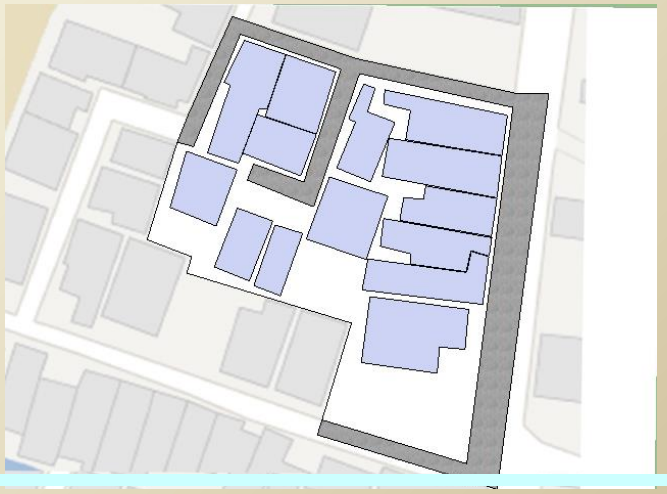
（based on Article 86(2) of Building

Field survey - Case study area



- Teramachi is a densely built-up area with traditional buildings and historical road patterns
- Narrow roads with a zigzag pattern that effect on evacuation route and fire-prevention
- Impossible to rebuild because of planning regulations such as oblique line, FAR limitation of frond road in Building Standards Act

It is difficult to rebuild based on current Building Standards Act. However, residential environment need to be improved.



Field survey

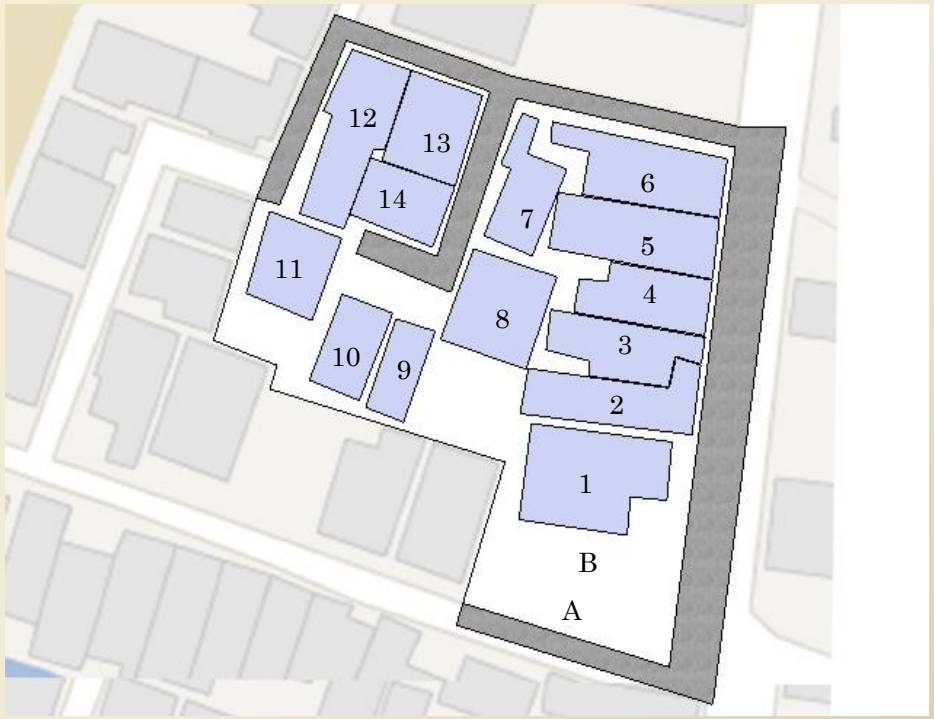
Investigating the necessary information for implementation of Special Design Code of Plural buildings.

For example:

- Road information : width, Road length
- Parcel boundary and shape
- Building shape: roof, wall and others (using GPS Total station)
- others

Field Survey – planning issues

- All buildings except No.11 are impossible to be rebuilt respectively because of too small space if planning regulations of BSA are implemented
- If special design code of plural buildings can be applied, all rebuilding activities is possible to be considered on one united parcel.



Building coverage

Floor area

Building coverage

Floor area

Building number

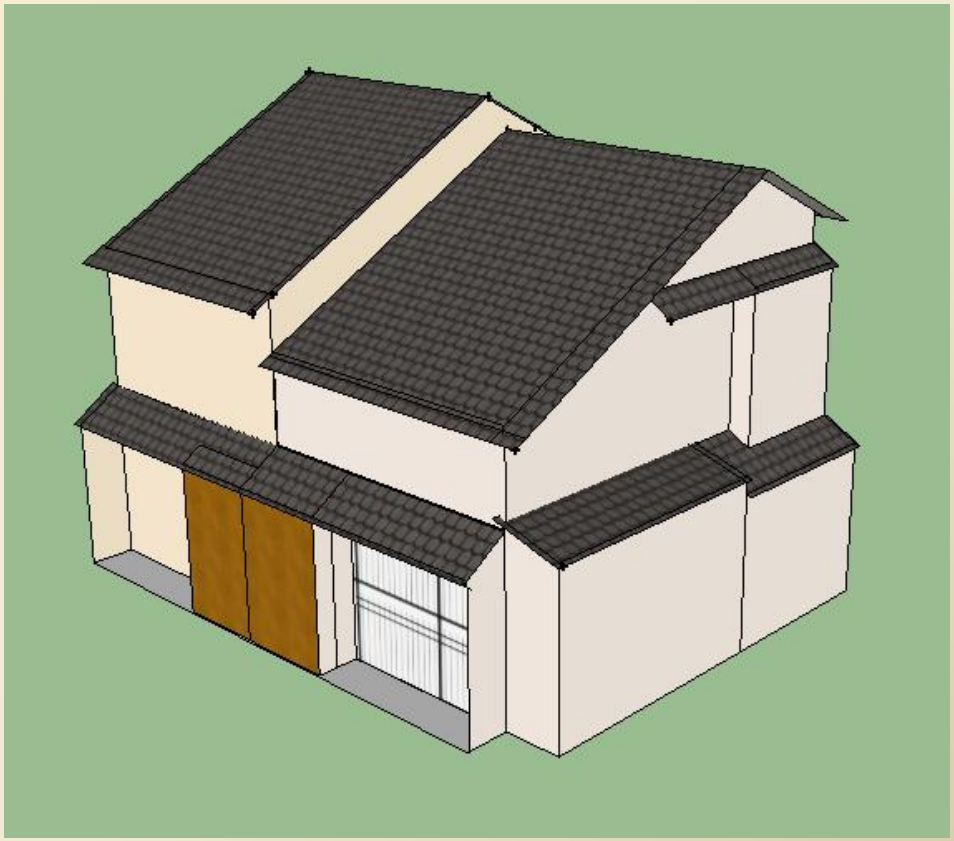
	敷地面積	1F面積	2F面積	3F面積	建築面積	延床面積	建ぺい率	容積率	建築面積限度	延床面積限度
	82.9									
	83.9									
1	157.1	103.527	95.8647		103.527	199.3917	0.658988	1.269202	94.26	268.9552
2	66.9	45.2728	51.9138		51.9138	97.1866	0.775991	1.452714	40.14	114.5328
3	84.5	56.447	53.837	53.866	56.447	164.15	0.668012	1.942604	50.7	144.664
4	76.3	59.0868	55.6764		59.0868	114.7632	0.774401	1.504105	45.78	130.6256
5	66.3	49.9144	48.0224		49.9144	97.9368	0.752857			
6	105.9	88.0098	71.7756		88.0098	159.7854	0.831065			
7	74.4	57.7025	40.2225		57.7025	97.925	0.775571			
8	159.9	66.9378	62.2919		66.9378	129.2297	0.418623			
9	53.3	46.307	34.452		46.6008	80.759	0.874311			
10	66.9	46.9402	27.9091		46.9402	74.8493	0.701647			
11	99.1	34.5032	31.466		42.6642	65.9692	0.430517	0.665683	59.46	69.7664
12	94.69	75.1587	57.852		75.1587	133.0107	0.793734	1.404696	56.814	66.66176
13	58.69	59.7582	52.8465		63.4704	112.6047	1.081452	1.918635	35.214	40.61348
14	41.65	34.2588	26.1612		38.7387	60.42	0.930101	1.45066	24.99	28.8218
通路	43.4707									
連担	1415.901				847.1121	1587.981	0.598285	1.121534	849.54042	2265.44112

Estimating the possible building coverage area and floor area based on Building Standards Act for each parcel

Illegal parts of current building based on BSA: Red color (if rebuild)

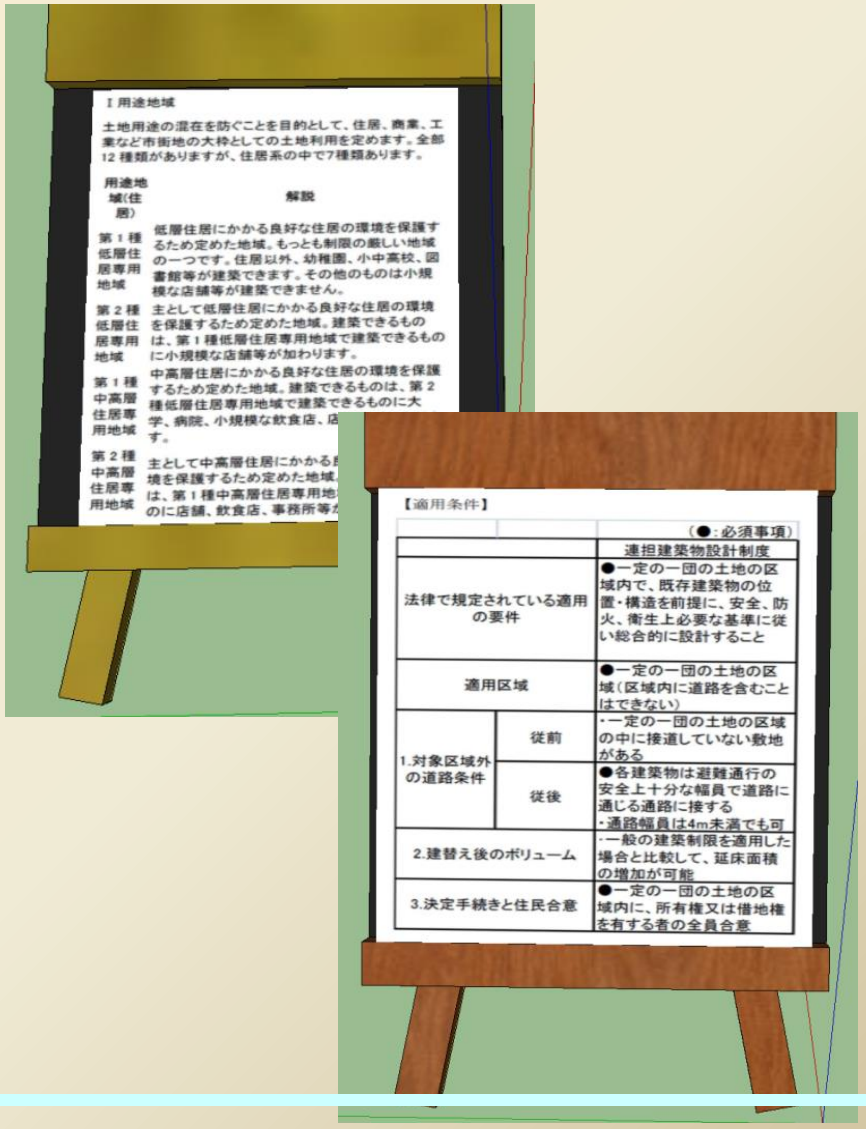
Creating Digital Asset

- Coordination information in survey
- 3D Modelling using Google SketchUp



Visualizing Planning Measures

- Visual Panels (Signboard) are prepared for explanation of planning regulations of SDCPB



Visualizing Planning Measures

Current townscape	Illegal parts based on general BSA	Rebuilding based on general BSA	Planning measure I	Planning measure II
				

Separated parcels

Planning Solution: All parcels are united as one parcel

Current Situation

Buildable Form in Yellow
Color based on oblique line

Find out the illegal parts based on BSA

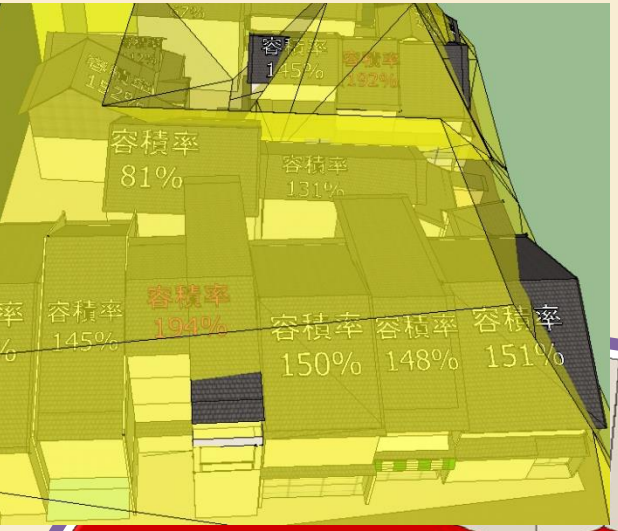
Buildable form based on set-back requirement from the front roads

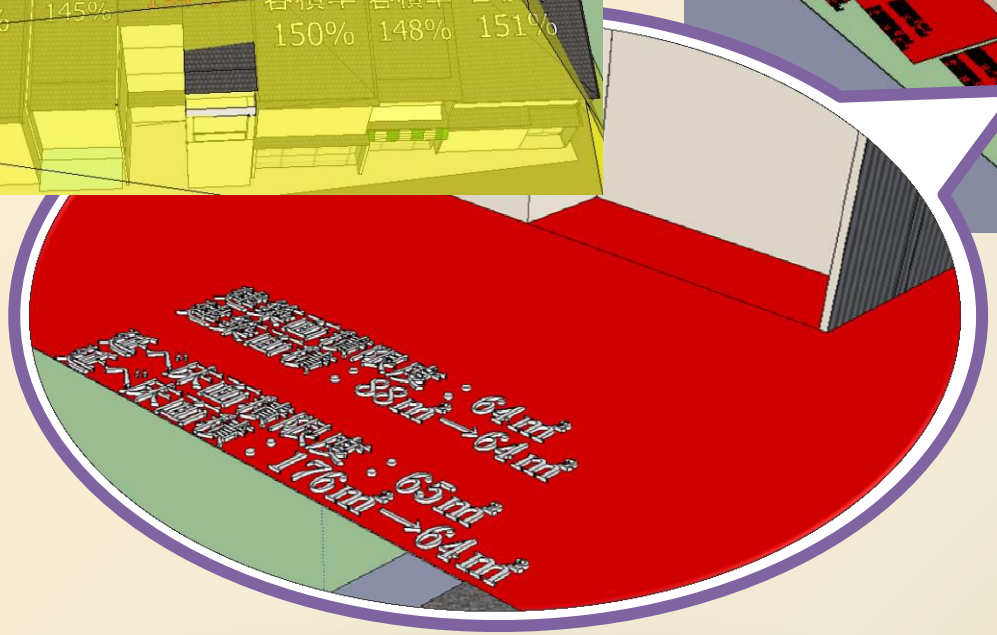
Not change the site layout

Change the site layout

Possible to rebuild based Special design code (e.g. oblique line can be withdrawn)

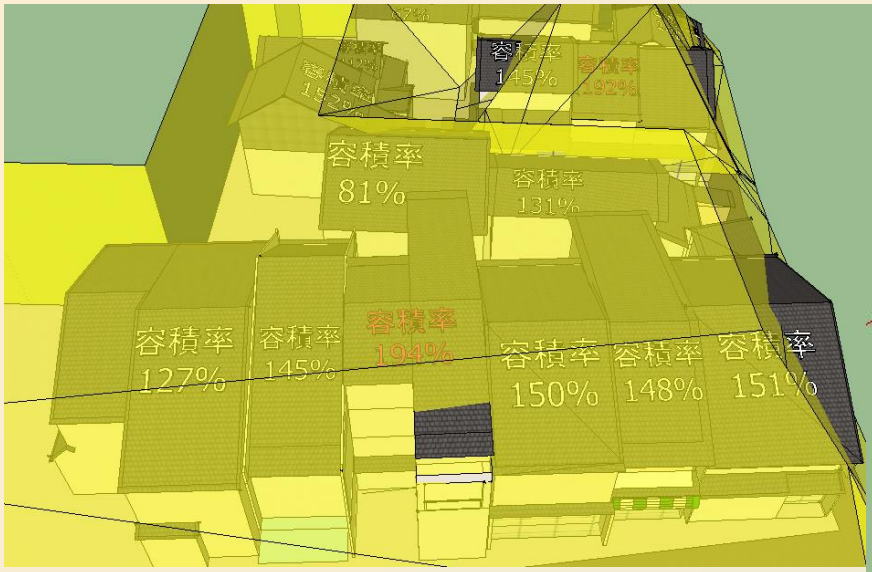
Visualizing planning regulation – setback, FAR and BCR

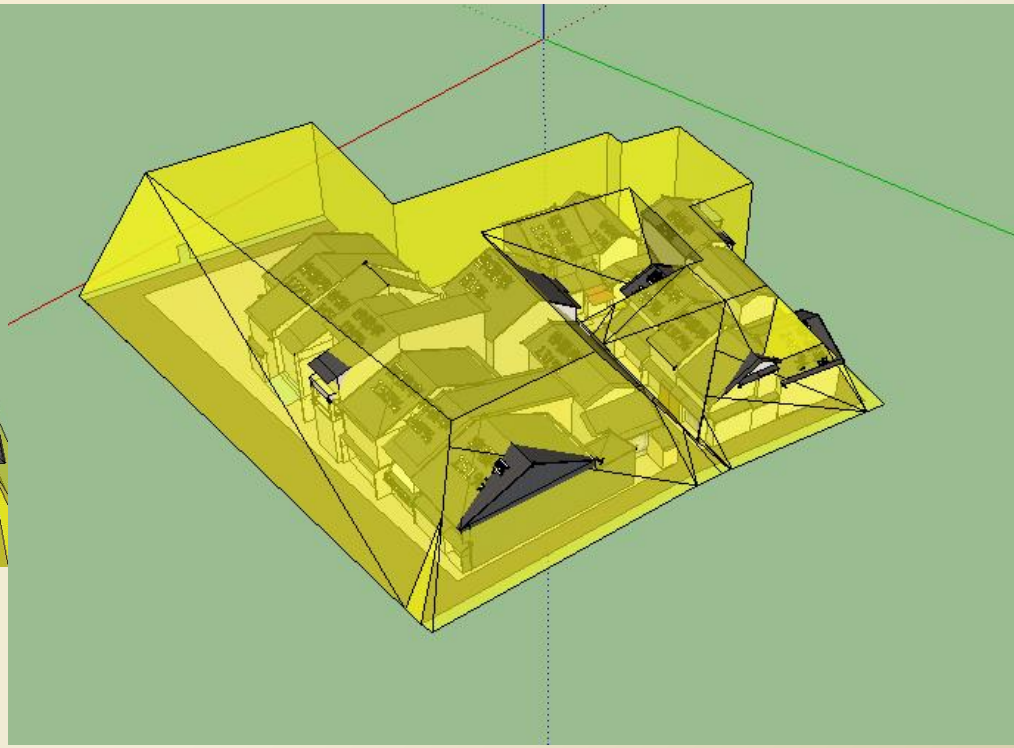




The building form are changed from their current forms to match the set-back requirement of BSA. Setback from road is necessary but FAR, BCR can be calculated based on the united parcel

Visualizing planning measures



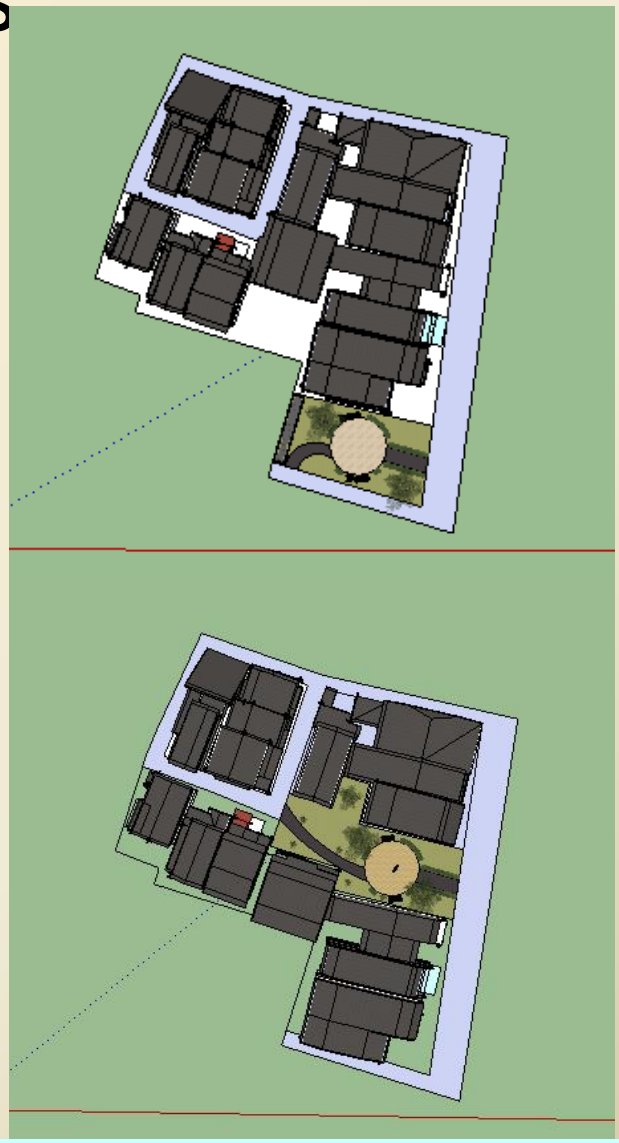


Yellow is the buildable form based on oblique line defined in BSA. (buildings are in their current forms.)

Visualizing planning regulation – road issues

- Connection to front road
- Two direction for evacuation (erase the dead-end street)

* Open space for evacuation
  - ❖ Not change layout
  - ❖ Change layout for move the street park

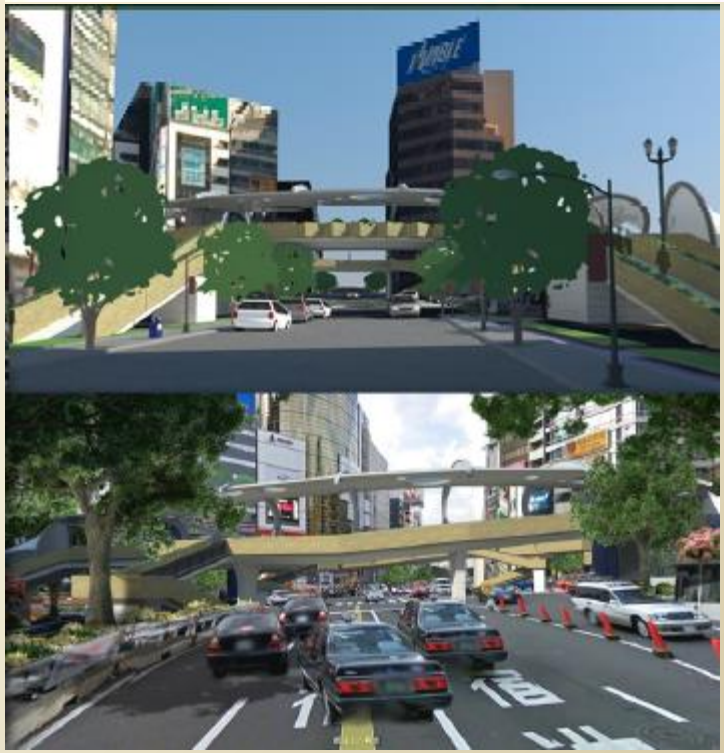


Discussion and future work

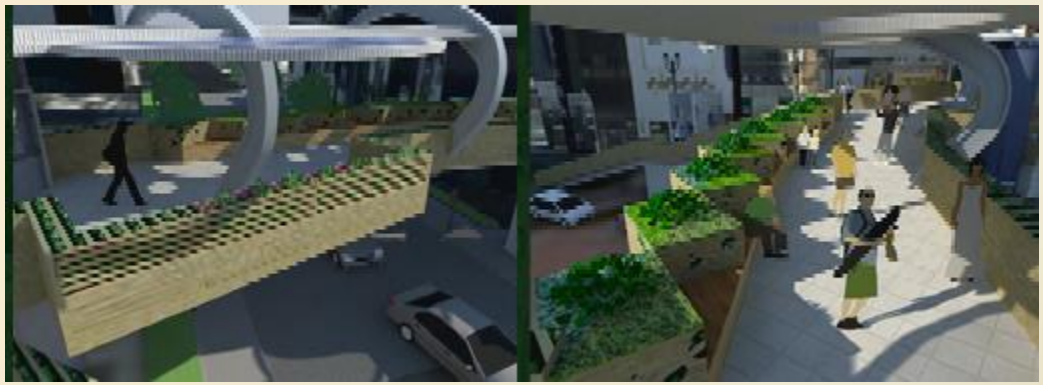
- VR Cloud platform 3DVIA is utilized for visualizing the special design code in densely built-up area for planning learning.
- Using 3DVIA, users can register an account for organizing different planning alternatives as different digital assets and communicate via the Internet.
- E-book can be generated for mobile device as planning documents, which is not discussed in the presentation.
- Comparing with conventional VRML and Online game, multi-user environment is easy to be established for sharing planning alternatives and conducting discussion via the Internet.
- Comparing with Google Earth, digital assets are limited and there is not a virtual globe for sharing data with other users.

Discussion and future work

- Comparing with VR-Cloud/Road Win, 3DVIA is not easy to customize a tool for user to experience the entire VR world and share the same viewpoint.



driving simulation



Walk simulation

計畫支援研究與實踐

総体規劃的部門戦略規劃研究

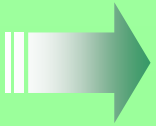
- 投資総量的分配(GA＋GIS)
- 中心区居住人口戦略(MAS)
- 高齢者養護施設的戦略(MAS)
- 商業環境形成戦略･相関公共交通政策(MAS)
- 都市開発/土地重劃(CA)

都市設計(VR)

- 公共空間･公園
- 重点地区･街道景観
- 歴史街區的保護

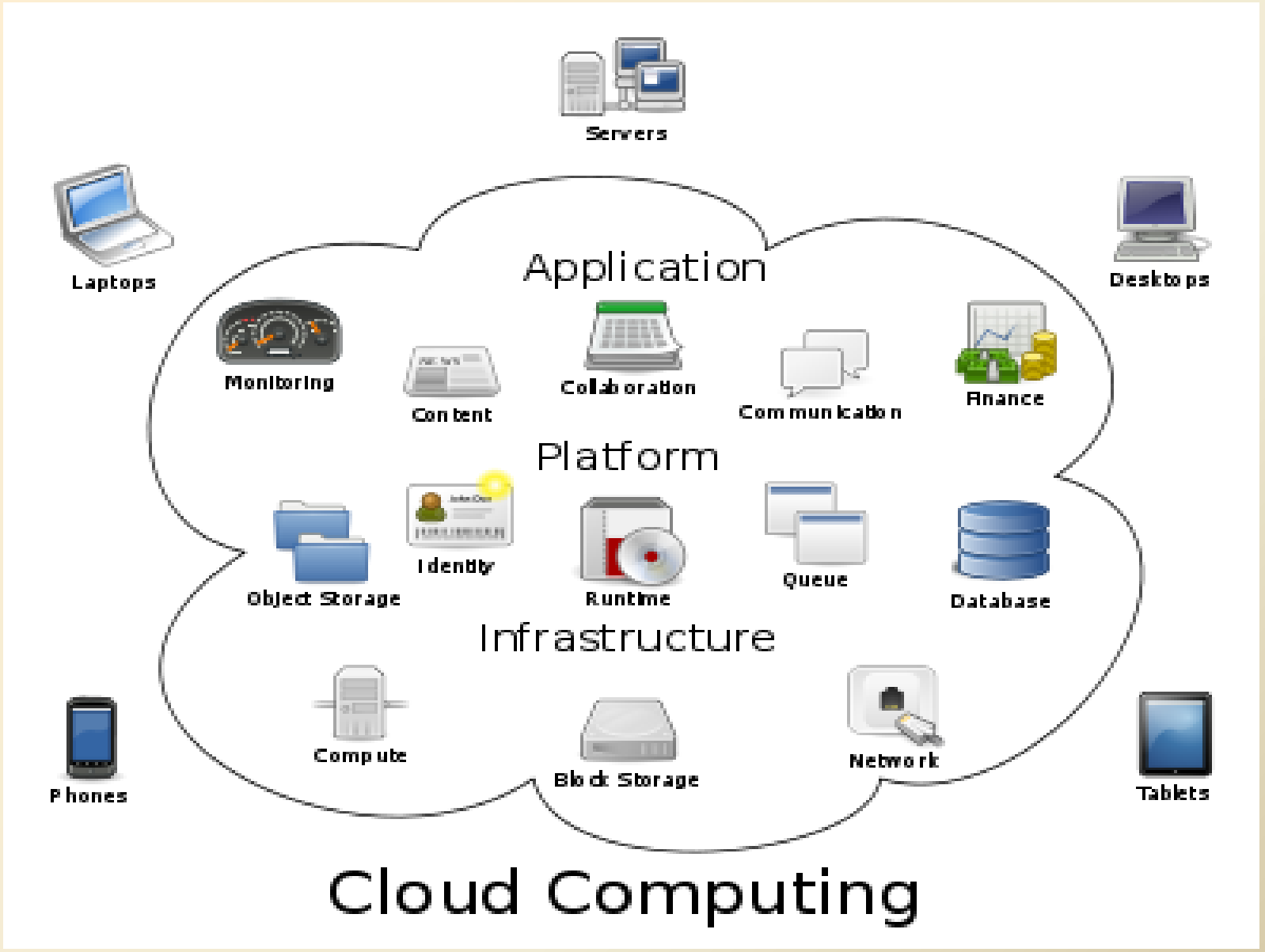
規劃支持的将来

- CA+MAS+GIS＋VR＋Internet



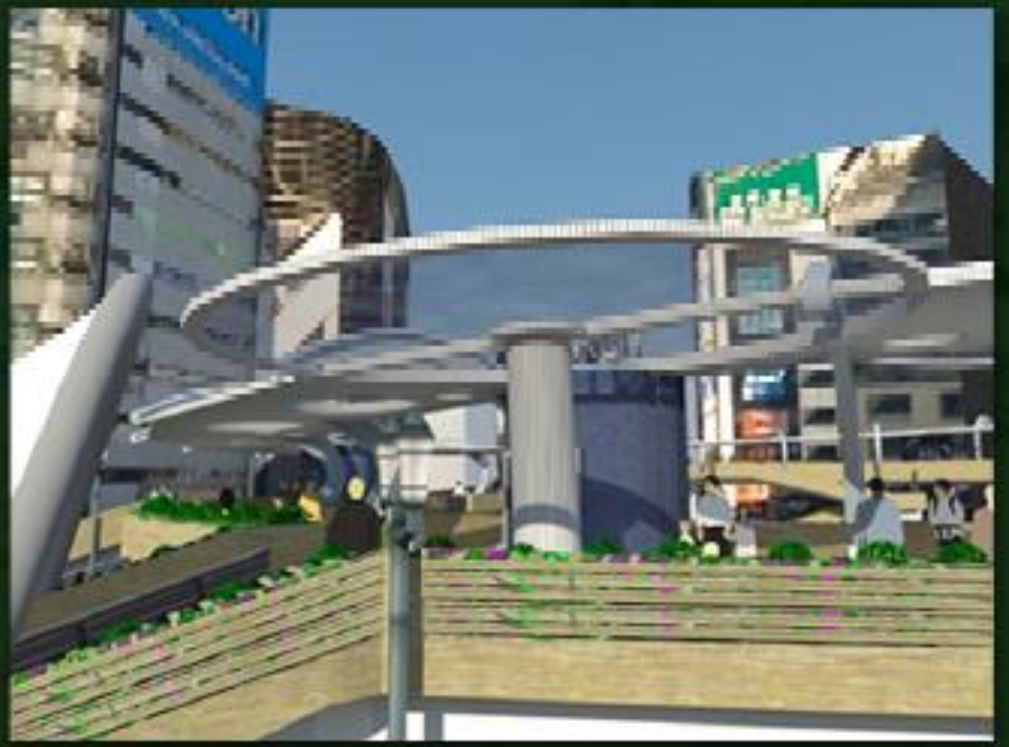
政策＋計画＋設計

規劃策略研究—Planning Support



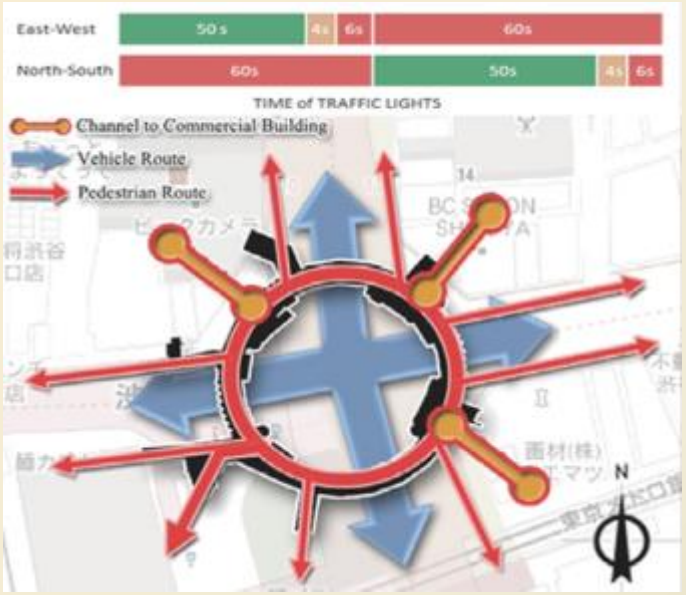
Future work and cloud-computing

Virtual Design World Cup Award (Zhenhan, LEI in KU)

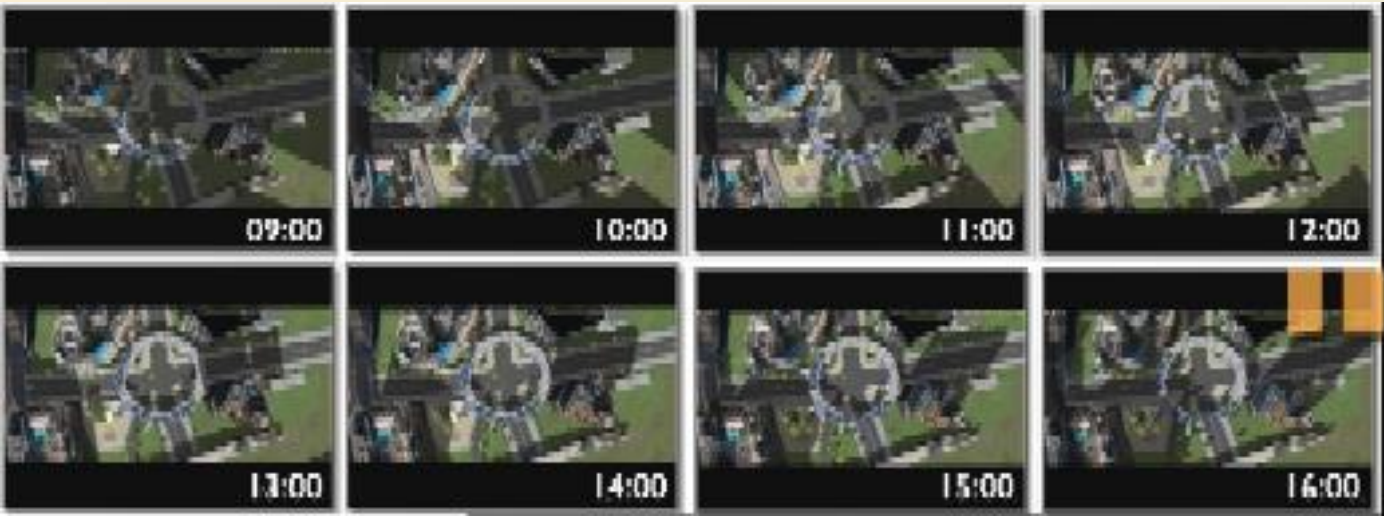


Future work and cloud-computing

◆A simulating tool using VR and simulation models (Forum8)



Virtual Design World Cup Award (Zhenhan, LEI)



Future work and cloud-computing

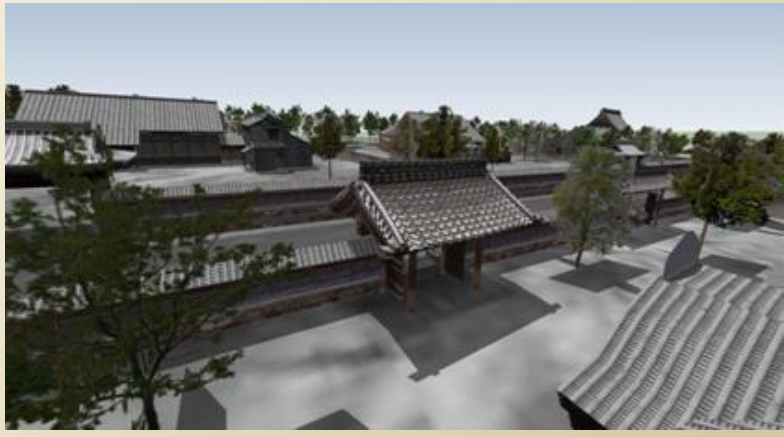
Planning support system in future

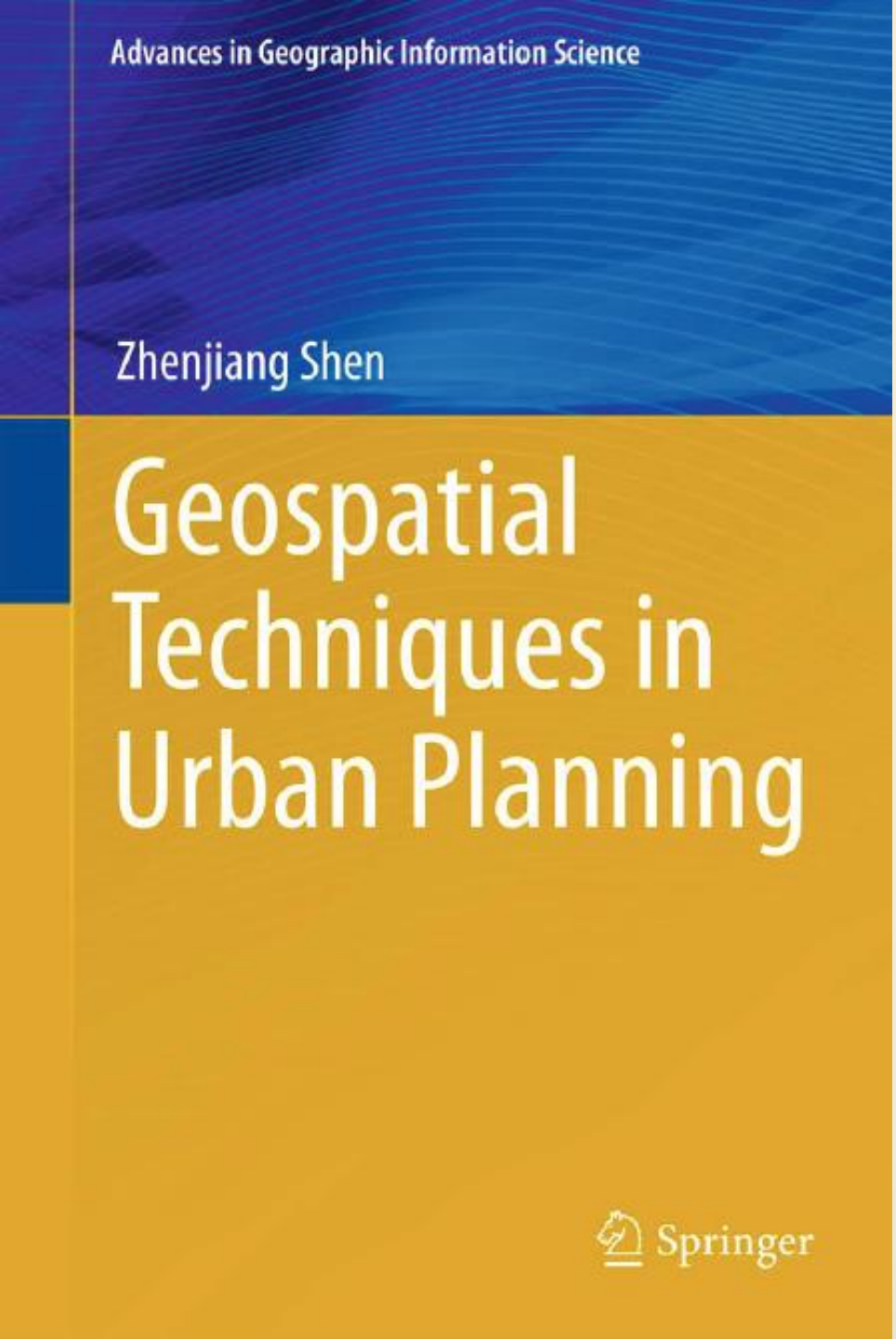
Traffic

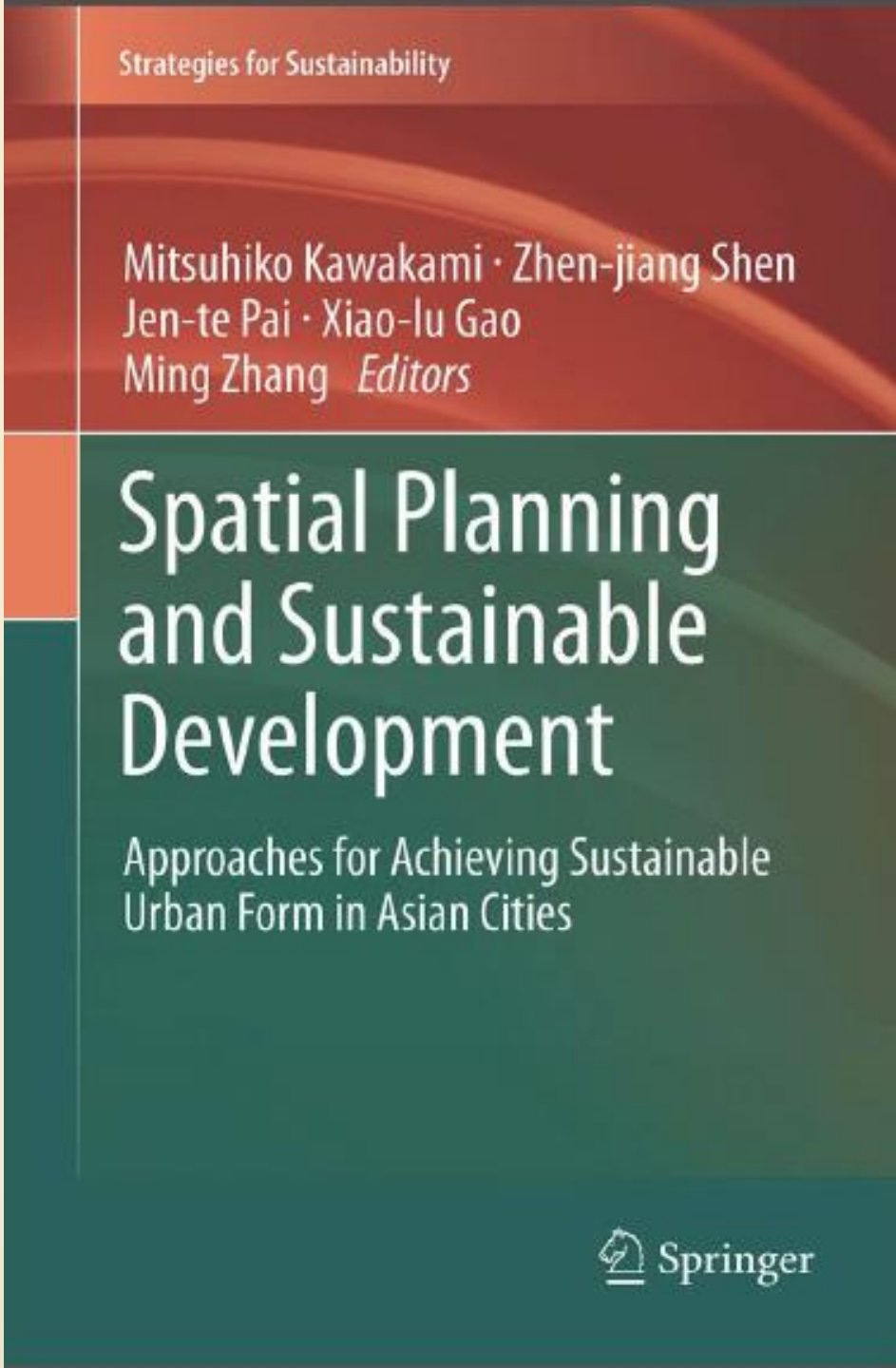
Land use

Policy-making + Planning + Design

Urban design




Advances in Geographic Information Science
Zhenjiang Shen
Geospatial Techniques in Urban Planning
Springer


Strategies for Sustainability
Mitsuhiko Kawakami · Zhen-jiang Shen
Jen-te Pai · Xiao-lu Gao
Ming Zhang Editors
Spatial Planning and Sustainable Development
Approaches for Achieving Sustainable Urban Form in Asian Cities
Springer

計畫支援之思考方式

- 経済需要＞産業･土地開発＞資源負荷＞人口変容
  ＞住宅地的開発＞商業施設＞文教施設＞交通施設
  ＞環境影響
- 都市設計
  共有･学習･討議･合意＞審査･建設

- 専家的参加和市民的参加
- 規劃支持　GIS+VR＋Internet　（Cloud-based PSS）

感謝您的聆聽