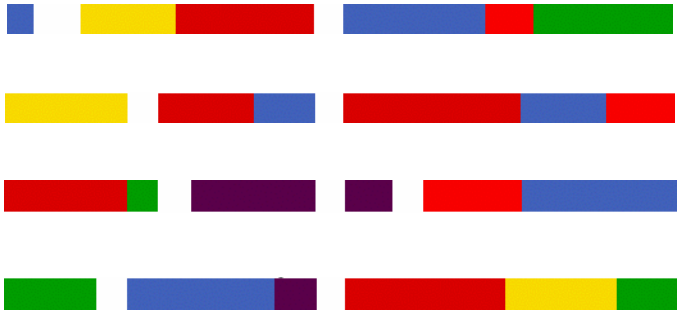
2002/02/14

A Study On Measurement System For Modeling of Migration Activities Of Shoppers



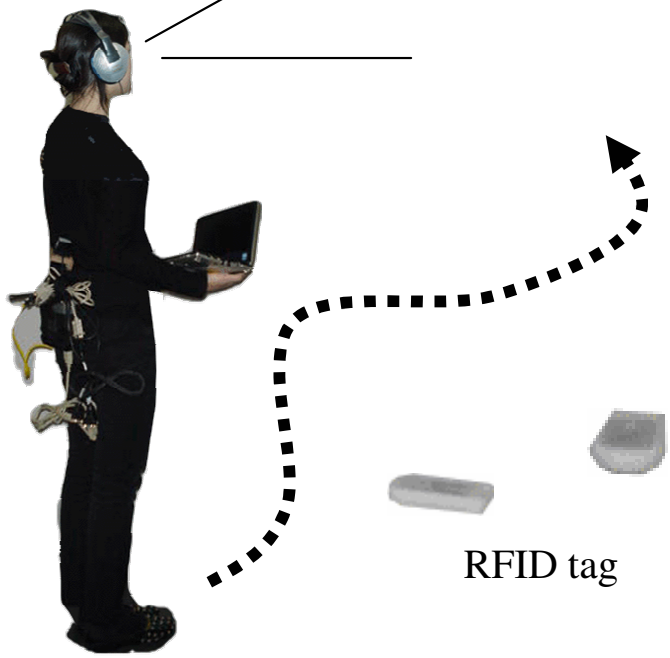
Shibasaki lab. D1 **Kay Kitazawa**

Measurement system

■Track of each shoppers

■Field of vision

How shoppers move in shopping districts ?
What makes them to move around ?



Map Matching

Gyro sensor

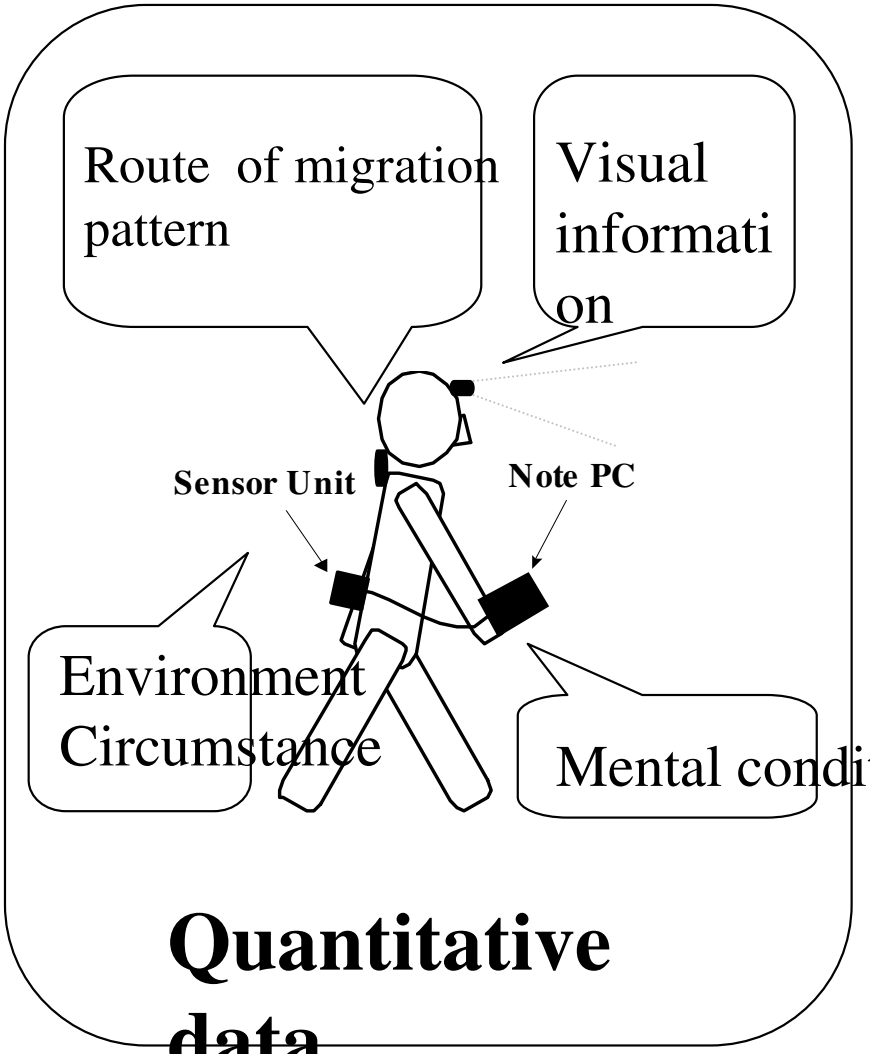
RFID tag system

Eye camera

What is this system for?

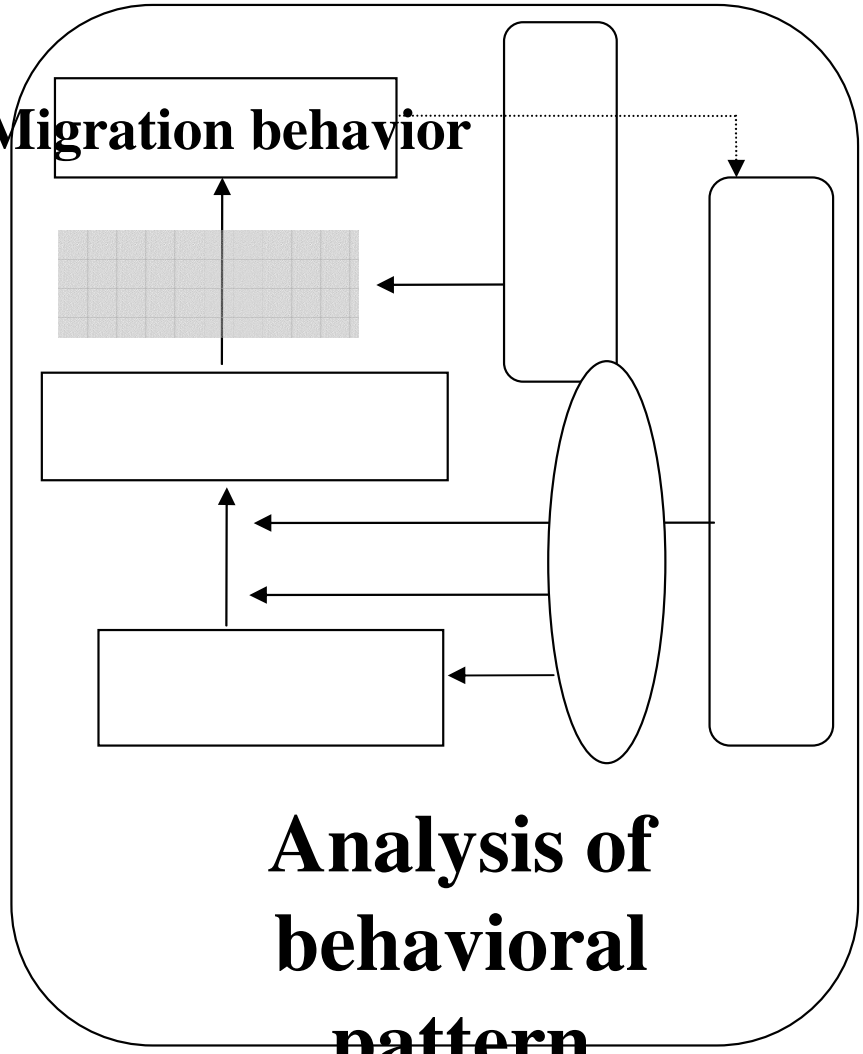
$$P_{ij} = (\alpha_j K_j M_j / D_{ij} T_{ij} \lambda) / \Sigma (\alpha_{Kj} \cdots$$

Measurement system



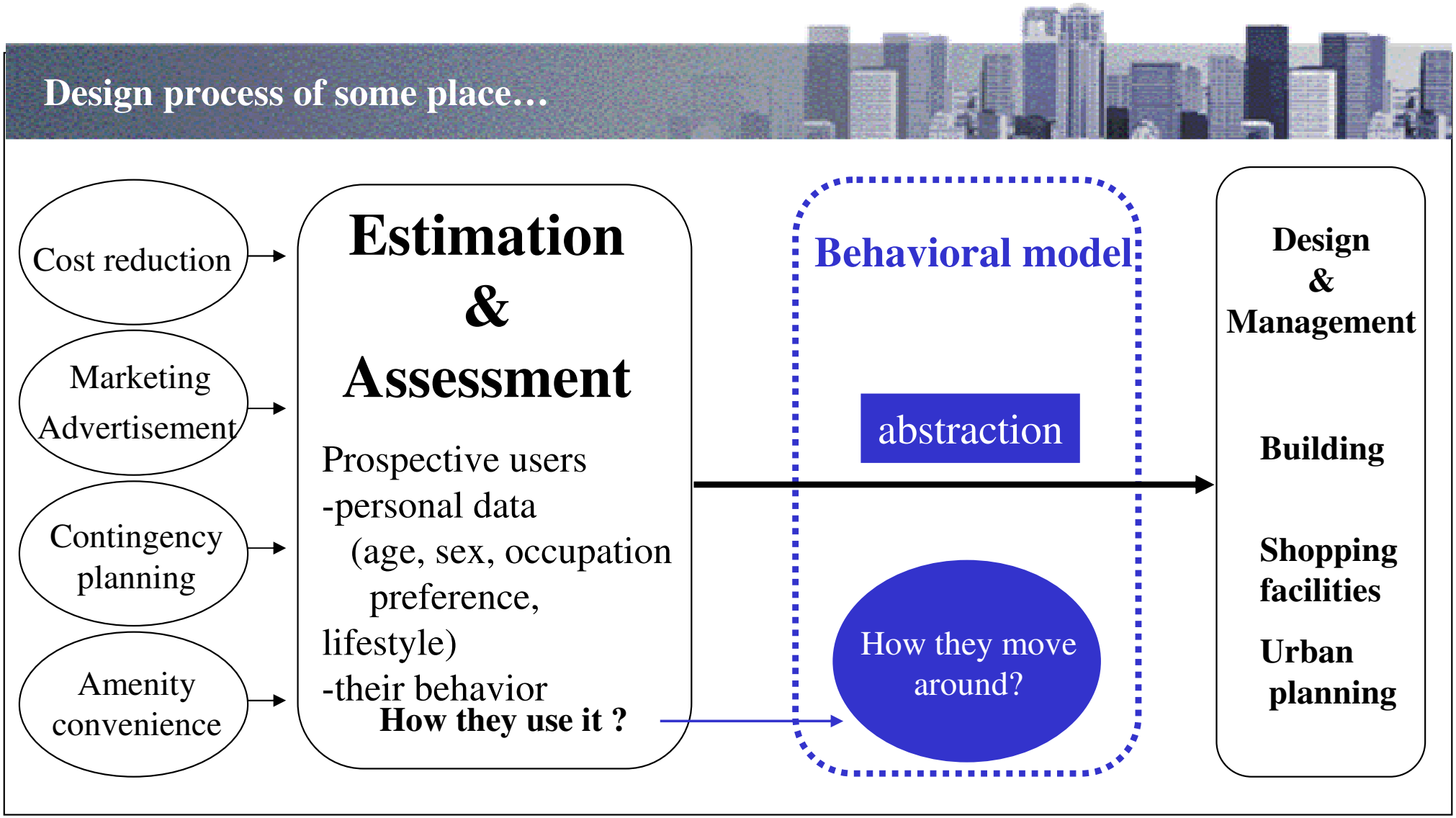
Quantitative data

Modeling



Analysis of behavioral pattern

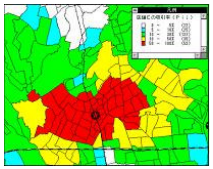
Needs for behavioral models



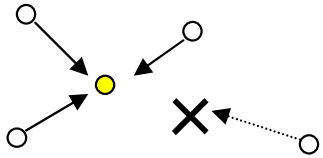
Current spatial model

Marketing **Traffic management**

Huff model
Disaggrigate logit model



Location planning

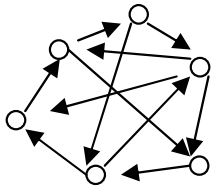


Probability of choice

Marcov chain model
Poisson regression model

Several destinations

Probability of transition



Single task **Choices are always rational** **Based on "Points"**

One objective?

No error? Perfect?

Between points?

Combination and switch of several objectives

Limited-rationality based on lack of information

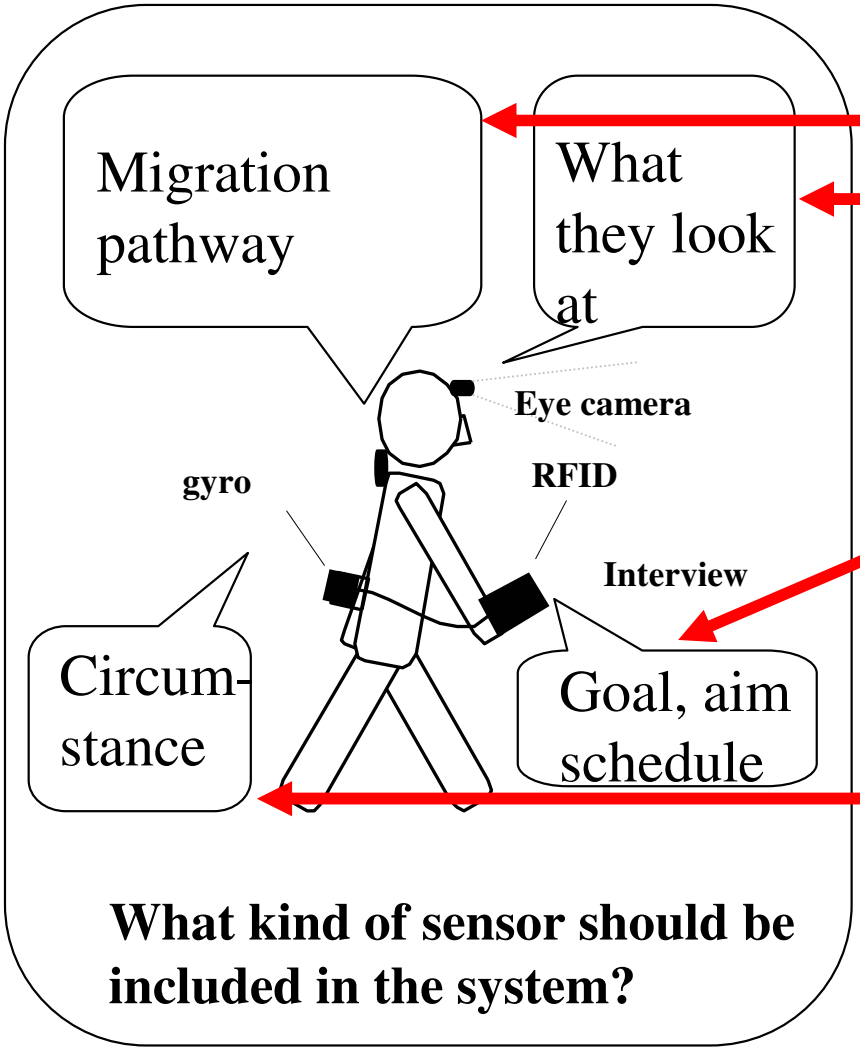
Focus on migration

New behavioral model

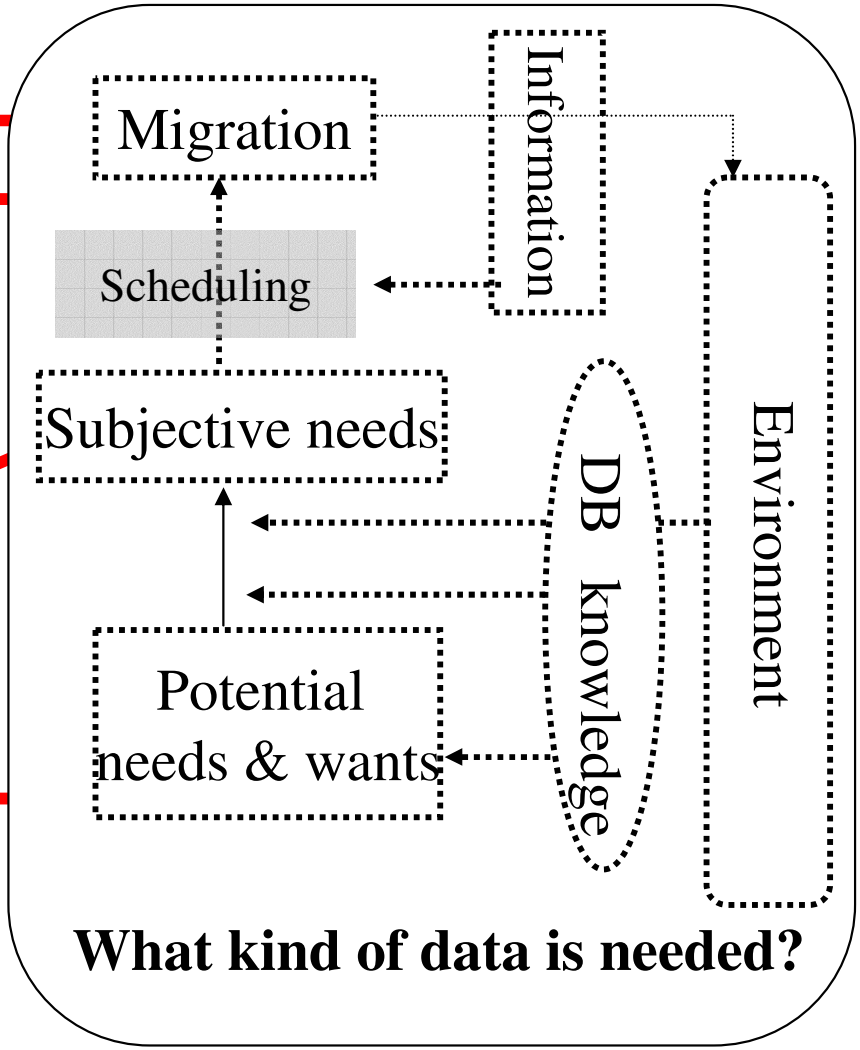
Framework of the model

Brief model

Construction of measurement system



Framework (simplified structure)



Measurement system

■Track of each shoppers

■Field of vision

How shoppers move in shopping districts ?
What makes them to move around ?

ID:SBKCBSG
Coordinate
(-1368.9,3770.6,39.8)

ID-location table

RFID tag

Map Matching

Gyro sensor

RFID tag system

Eye camera

RFID tag system

Newly recognized or lost from the sensor

Tag ID

Time

0	V		0	60
49	N	CEKGSOV	1	1692
371	N	MUUFFKZ	2	12427
463	L	CEKGSOV	1	15492
1790	L	MUUFFKZ	0	59735
2192	N	BMOMZRU	1	73145
2220	N	KUISVXN	2	74056
2638	L	KUISVXN	1	87986
2973	N	MIDPDVW	2	99142
3275	L	BMOMZRU	1	109227
3331	N	BCYXALG	2	111079
3407	N	BQPBFFU	3	113643
3438	N	IESHXFG	4	114674
3753	N	MXDRBMC	5	125170
3759	L	IESHXFG	4	125360
3778	L	BQPBFFU	3	125991
3804	L	MIDPDVW	2	126852
3864	L	BCYXALG	1	128855
4141	L	MXDRBMC	0	138108
4967	N	DQCUJCI	1	165638
5074	N	MACXHVY	2	169193

Data obtained from the system

Spatial coordinate（x,y,z）

CHFXKPN	−13838.2	−37620.7	40.3	正門
IWWXEVK	−13822.3	−37728.6	40.3	時計台
KIKDPEA	−13794.8	−37730.5	40.3	角1
CHYGMCW	−13778.2	−37886.8	40.3	角2
CEKGSOV	−13766.0	−37882.8	40.3	Cエレベータホール（1F）
MUUFFKZ	−13762.3	−37871.9	40.3	CDエレベータ（1F）
KUISVXN	−13762.3	−37871.9	52.3	CDエレベータ（5F）
BMOMZRU	−13759.6	−37874.2	52.3	CD−W
HTKKJUF	−13741.1	−37871.9	52.3	CD−E
ICQQMWJ	−13737.1	−37912.8	52.3	BC−E
HULFUJQ	−13755.7	−37915.1	52.3	BC−W
MIDPDVW	−13757.3	−37906.3	52.3	LAB−B
BCYXALG	−13758.4	−37894.5	52.3	LAB−C
MXDRBMC	−13733.2	−37953.7	52.3	B−E
FMHZIWT	−13751.9	−37953.1	52.3	B−W
DQCUJCI	−13753.9	−37955.8	52.3	Bエレベータ（5F）
MNOFBOV	−13753.9	−37955.8	40.3	Bエレベータ（1F）
GAEXGGN	−13759.0	−37946.4	40.3	Bエレベータホール（1F）
ALCWERP	−13770.8	−37947.5	40.3	角3
MACXHVY	−13768.5	−37969.6	40.3	角4
MDJMYSE	−13770.6	−37991.2	40.3	角5
AVNUSMO	−13835.6	−37996.2	40.3	角6
HNQXYEV	−13845.3	−37910.6	40.3	角7
ILRPAEM	−13853.5	−37840.0	40.3	角8
IYMQWFP	−13914.2	−37847.2	40.3	角9
BQPBFFU	−13918.8	−37789.4	40.3	角10
IAFQJXZ	−13948.7	−37790.4	40.3	西門

ID-installation location table

Approximate location

Measurement system

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ID-location table

RFID tag

Map Matching

Gyro sensor

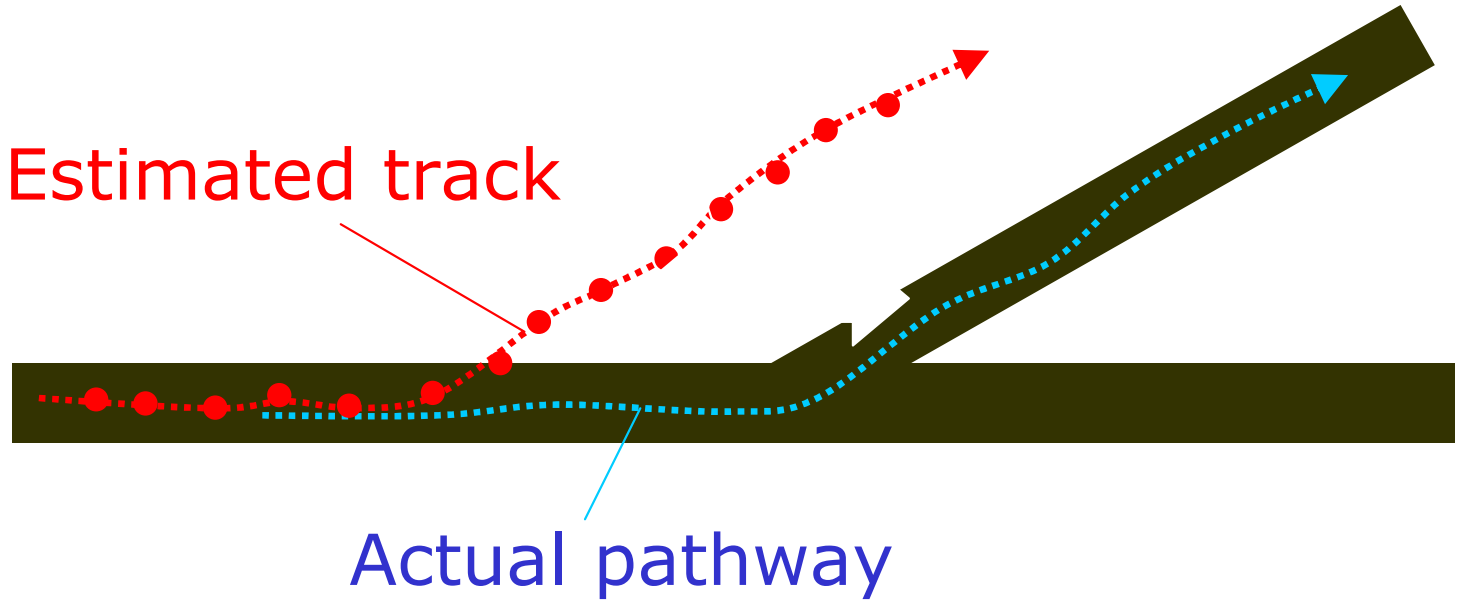
RFID tag system

Eye camera

Map matching

■ **Gyro sensor**

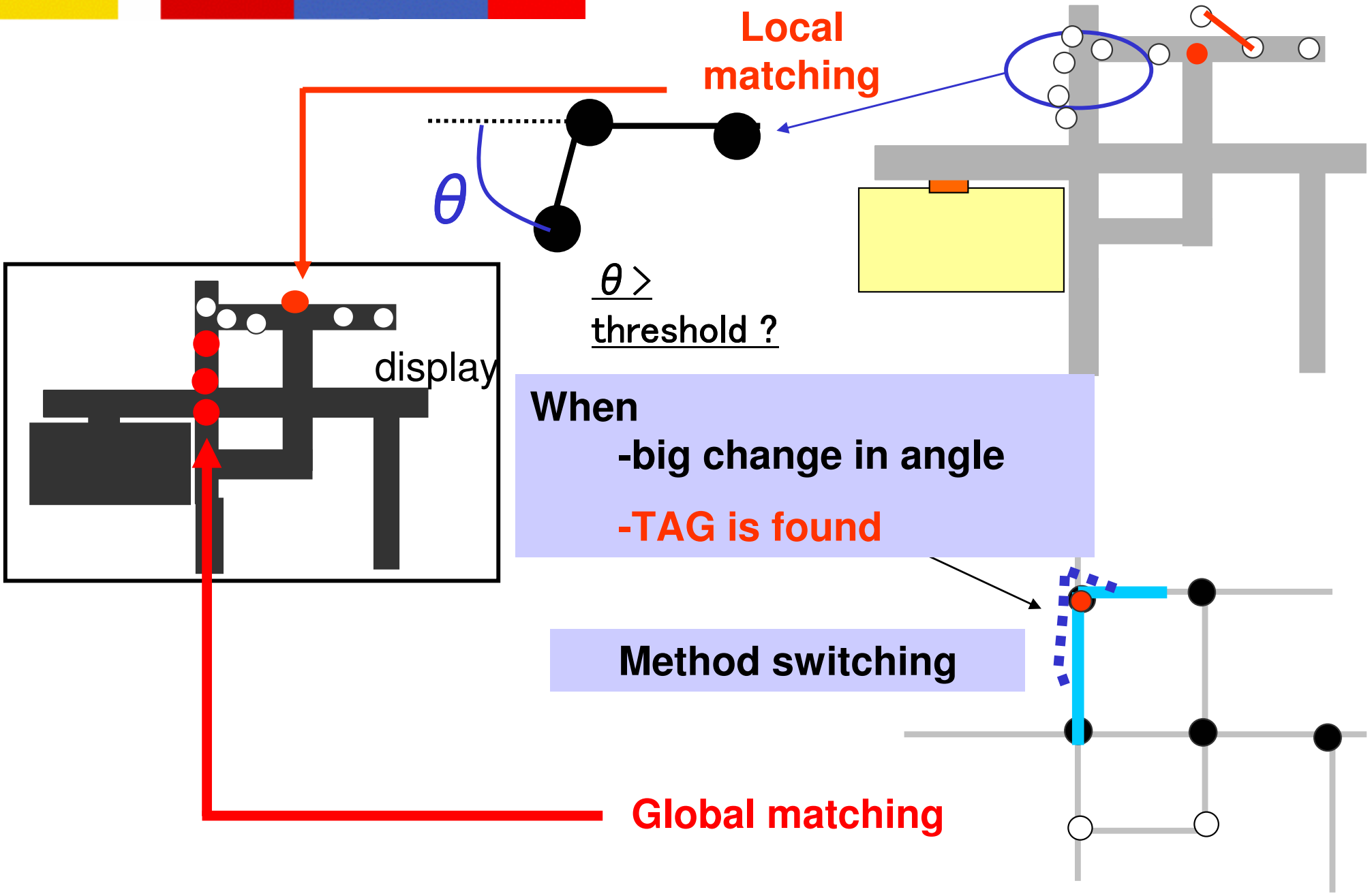
Accumulation of errors



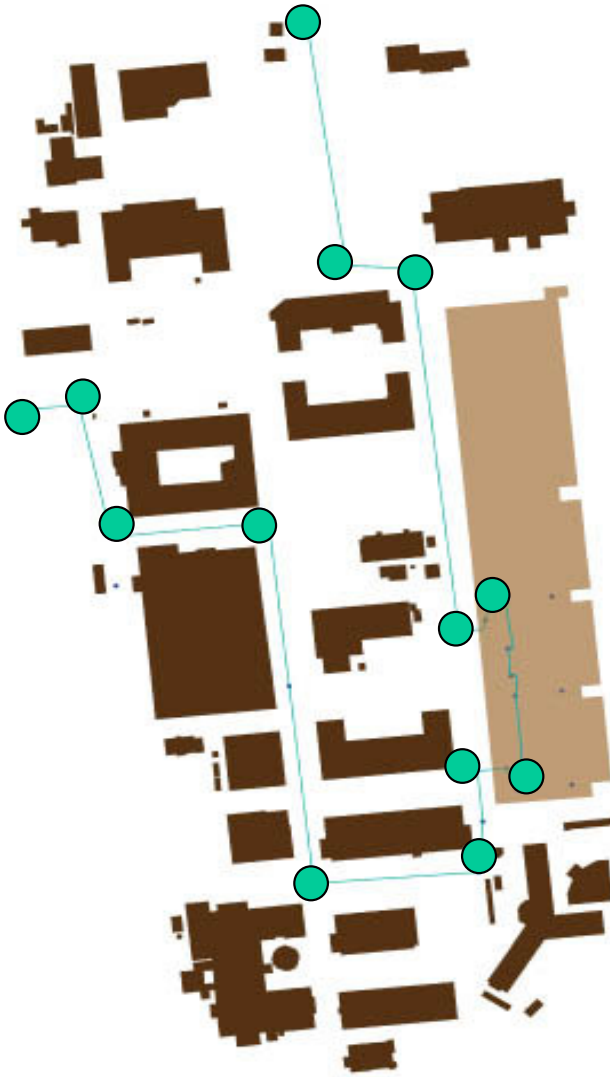
Length compensation

Correction of directio

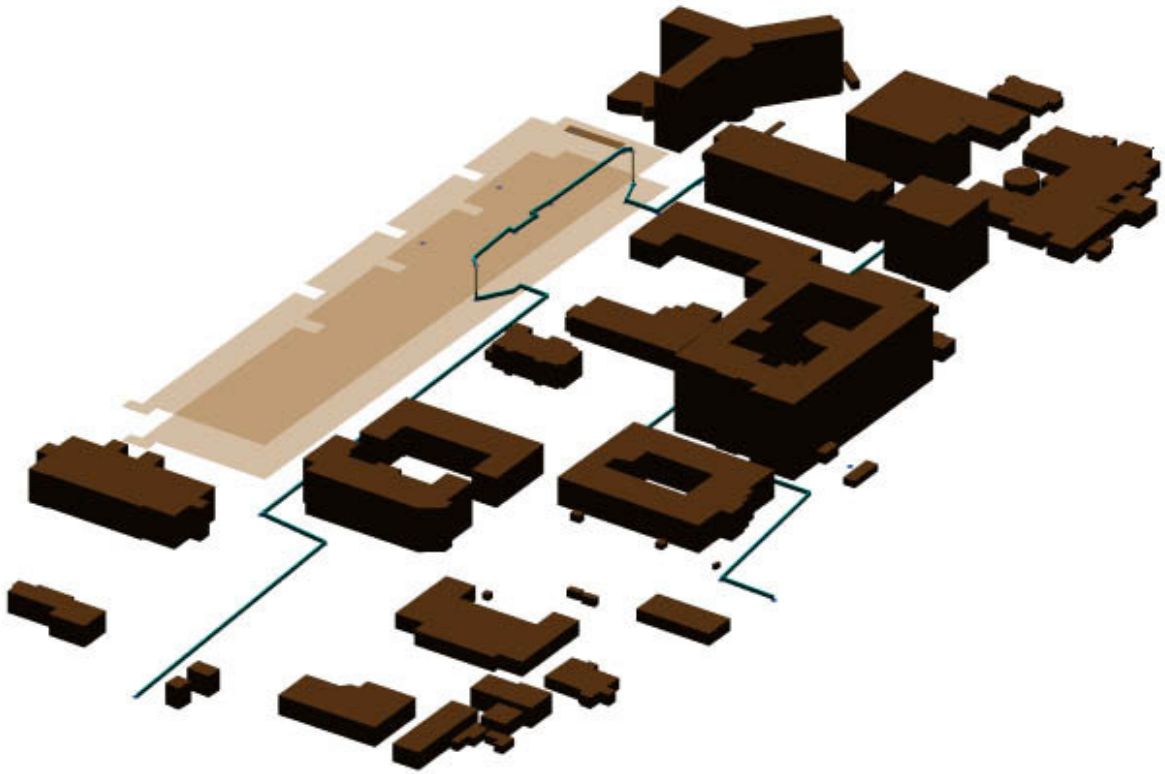
A method of Map matching (2001)



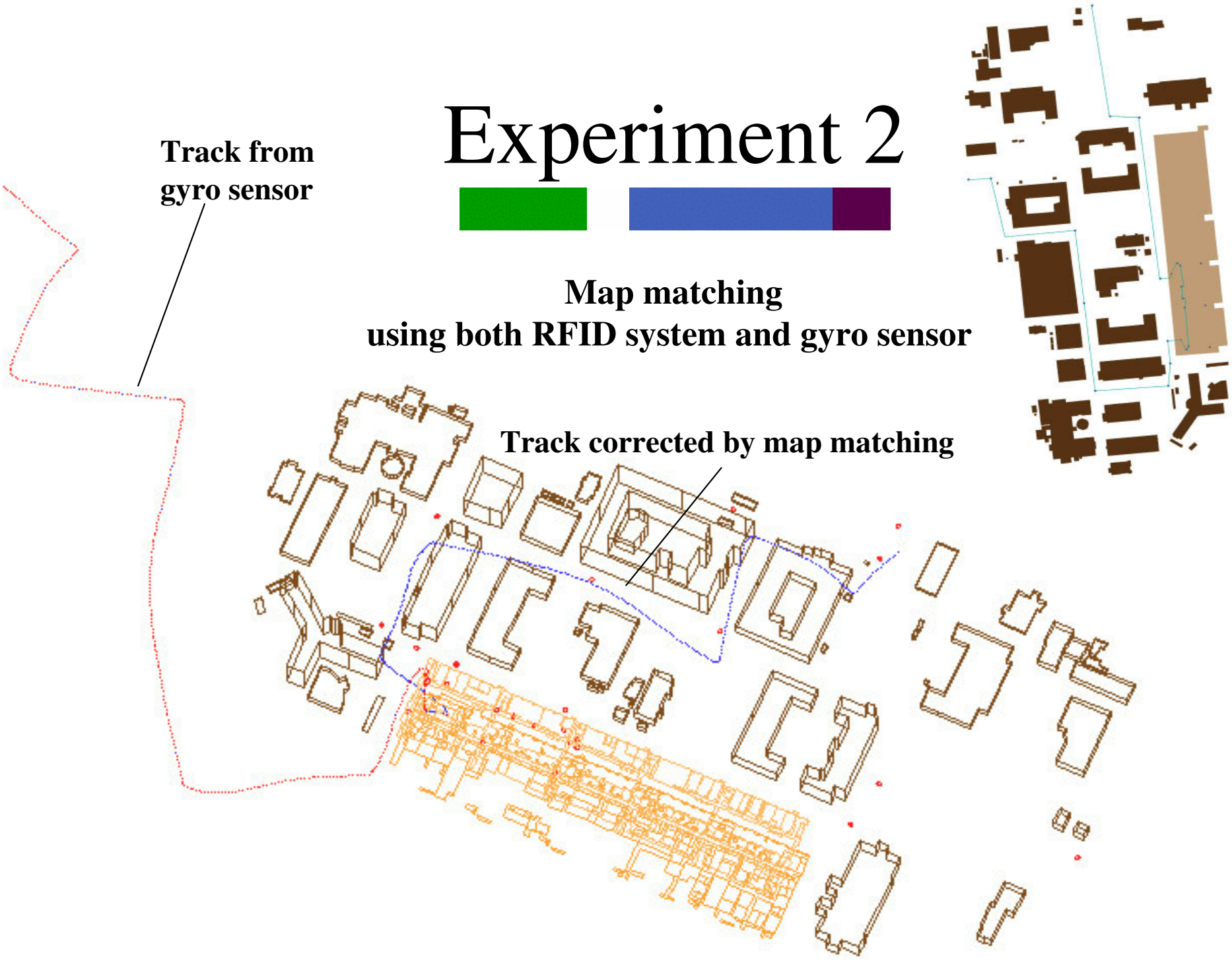
Experiment 1



Tracking by RFID system



Experiment 2



Measurement system

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ID-location table

RFID tag

Map Matching

Gyro sensor

RFID tag system

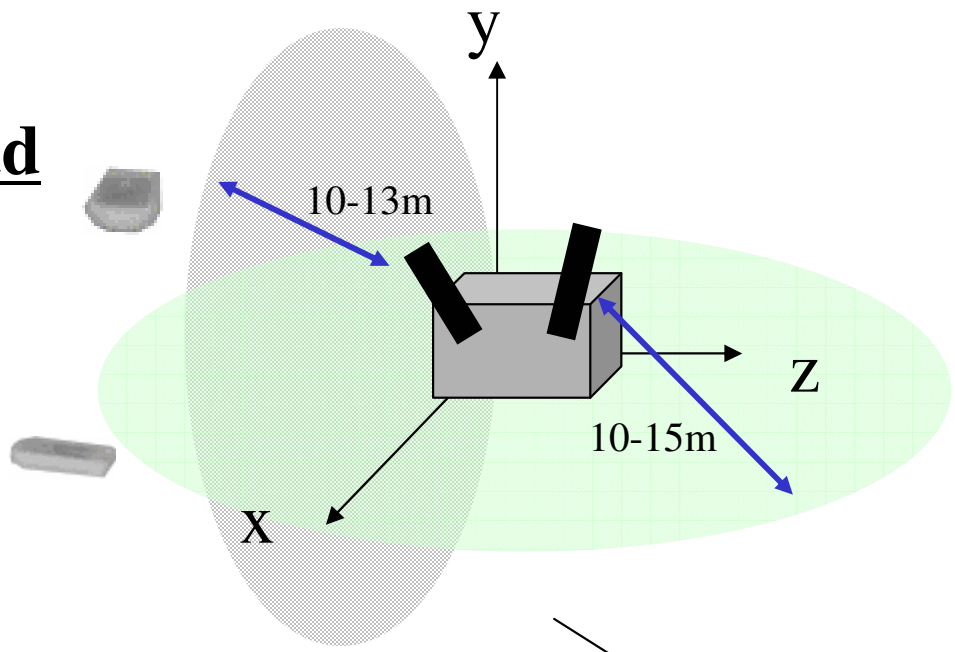
Eye camera


DoukiApplet5
Master Player
00:00:03.53 / 00:00:13.06
アイカメラ画像
渋谷Q-Front周辺
ハチ公

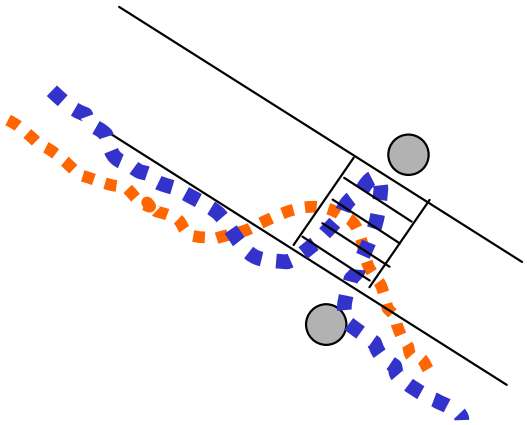
Problem with this system

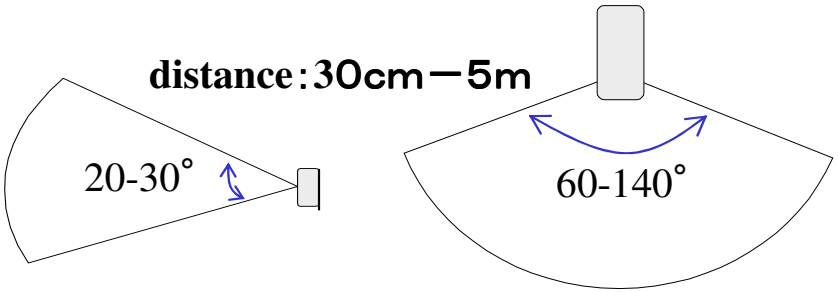
Beam spread

-antenna
-tag



■angle
■vertical interval
■distance





RFID

How to catch all pin-point data without fail ?

-Condition
-Directional characteristics

Algorithm of Matching

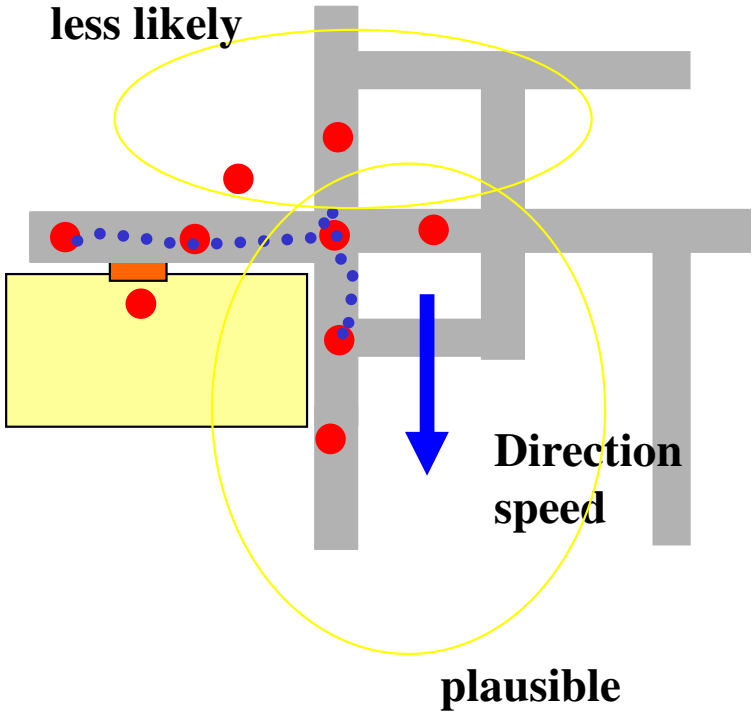
How to combine
Tag data & gyro data

Eye camera

Image quality
instability of the camera
view point = attention

A method of Map matching (2002)

When several tags are found…



Sensitivity of the antenna → MAX

Delay of recognition

How to estimate current position from several point data ?

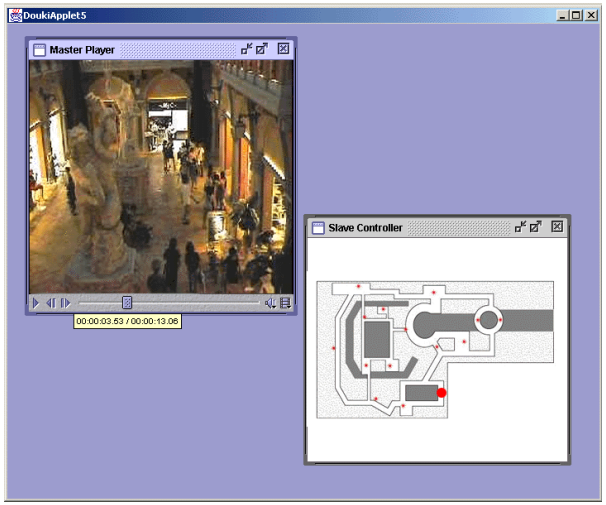
■Calculate the center of gravity

-weighting each points certain value

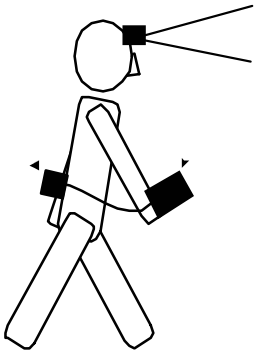
Add greater value to plausible points

Making use of
- **previous track**
- **current direction and speed**

Perspective



■improve the mesurement system



Classification of information source

-attention

- time

Accuracy of positional data

Quantification of experience and knowledge

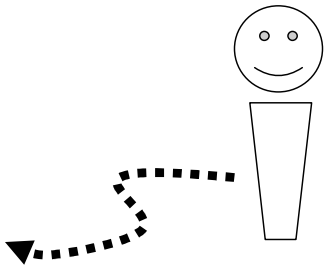
renewal

Experiments in large scale
(number of subjects, space)

Elaboration of the model

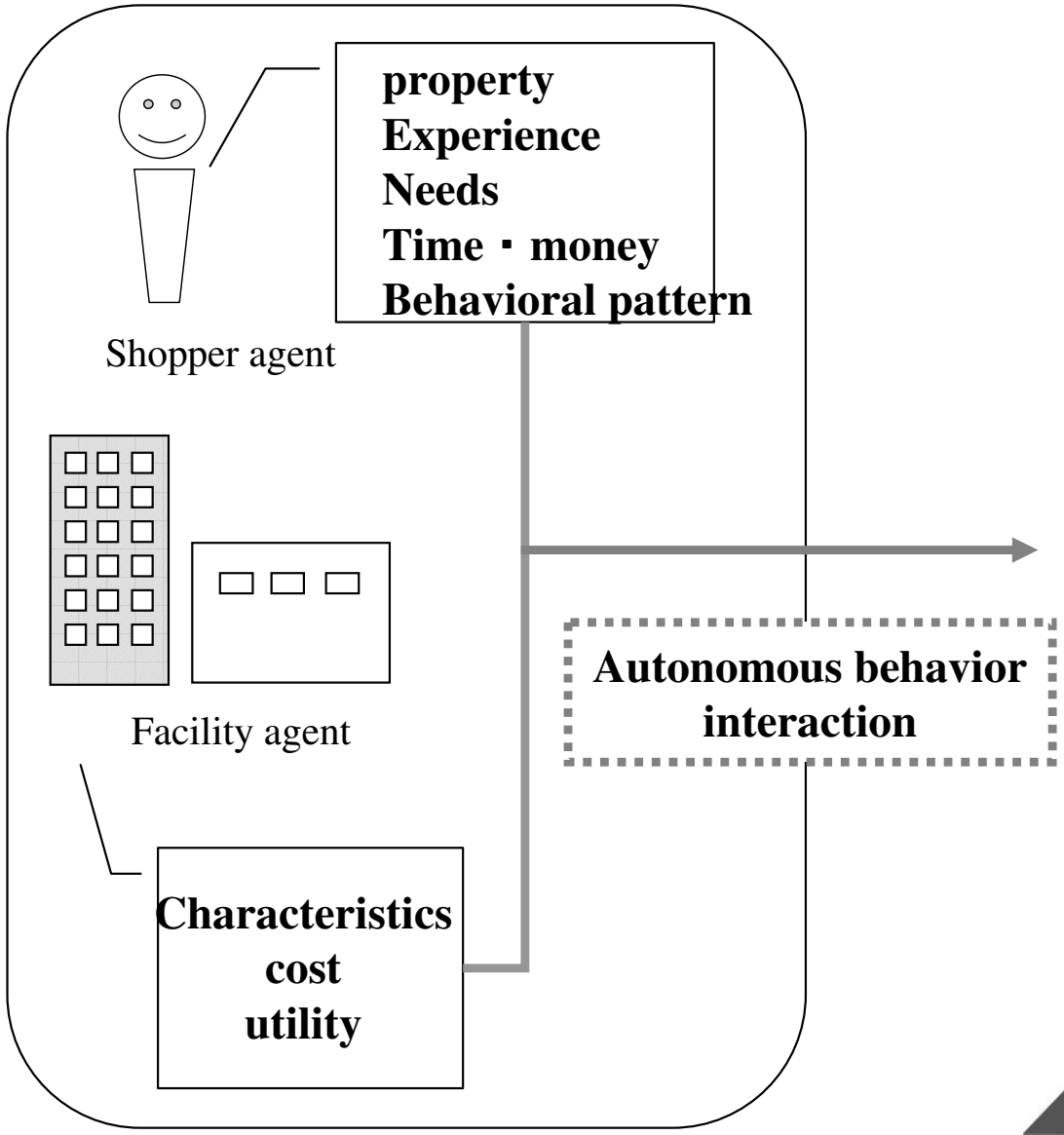
Empirical rule

- marquee
- image strategy
- marketing

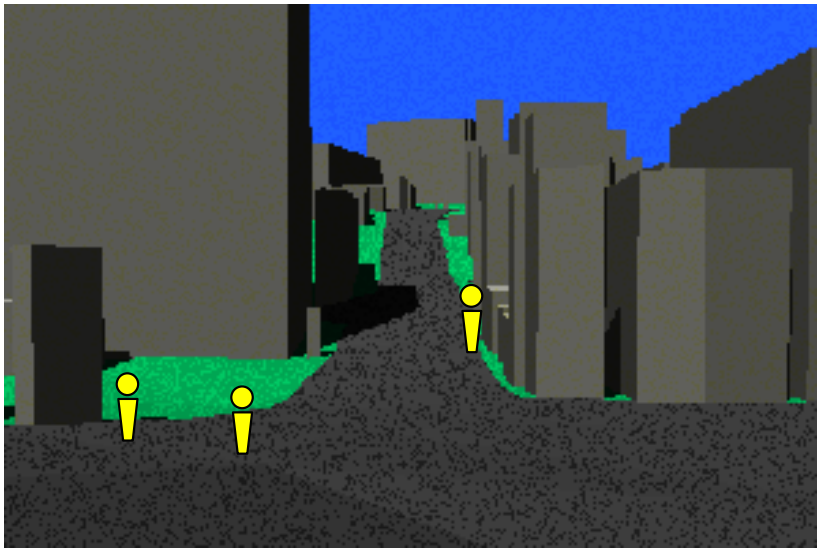


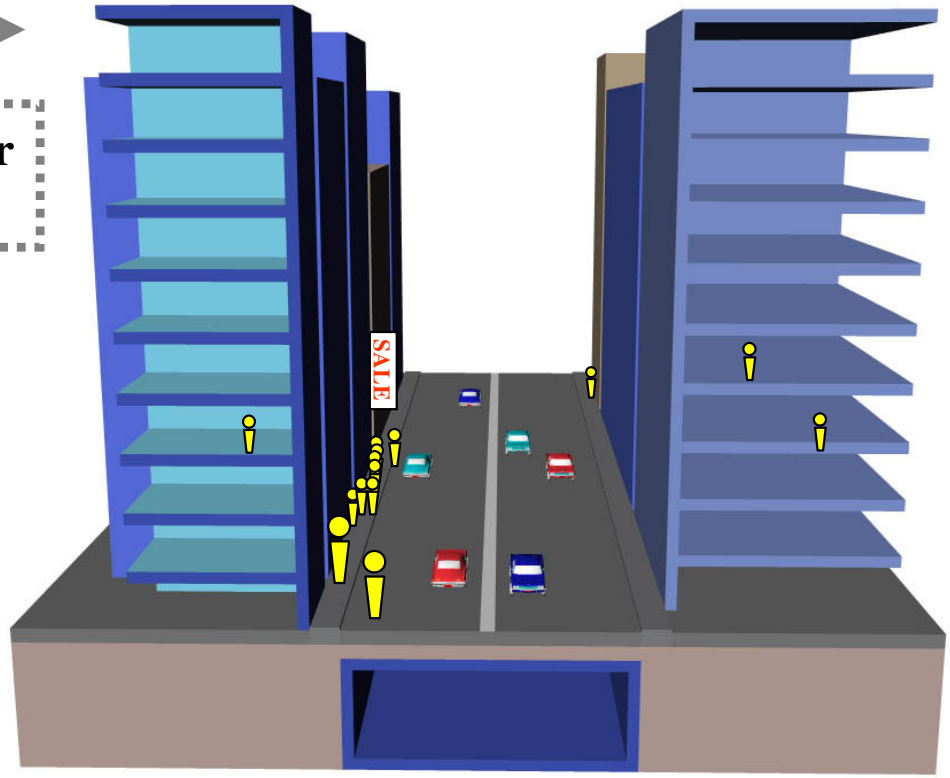
Migration behavioral model

Multi-agents simulation



model





Thank you