

Smart Data Collection and Real-time Digital Cartography

Yuji Murayama and Ko Ko Lwin
Division of Spatial Information Science
Faculty of Life and Environmental Sciences
University of Tsukuba

IGU 2013

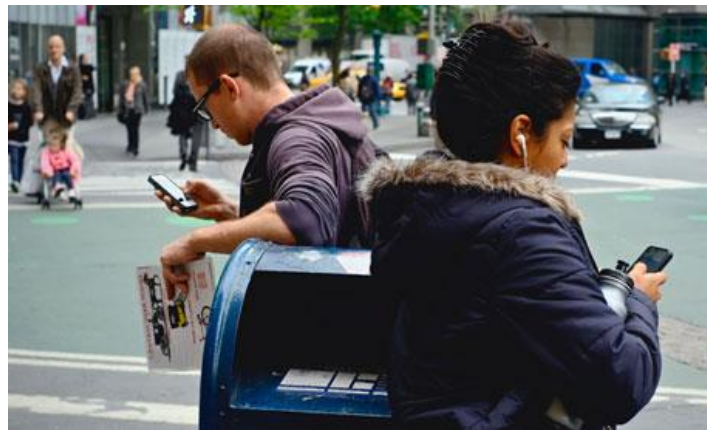
Field Data Collection

The development of the Global Navigation System and wireless networking technologies have changed the way:

- We live
- Communicate
- Share information and
- Even the **collection of geospatial data** in the field



More Accessable
Wi-Fi/WiMax



More Flexible
Laptop/Tablet/iPad



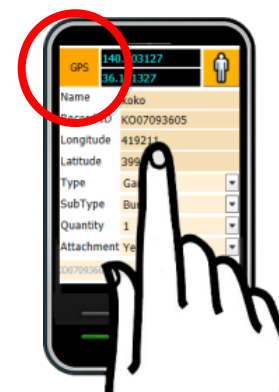
More Collectable
field data with user
friendly Web-GIS




Positioning in the Field

Getting co-ordinates from the field is no more magical work

Either Wi-Fi access point or

Cellular Internet Access



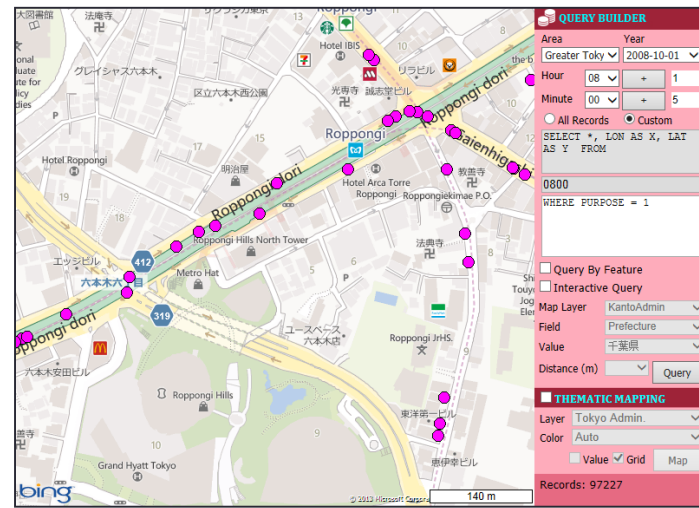
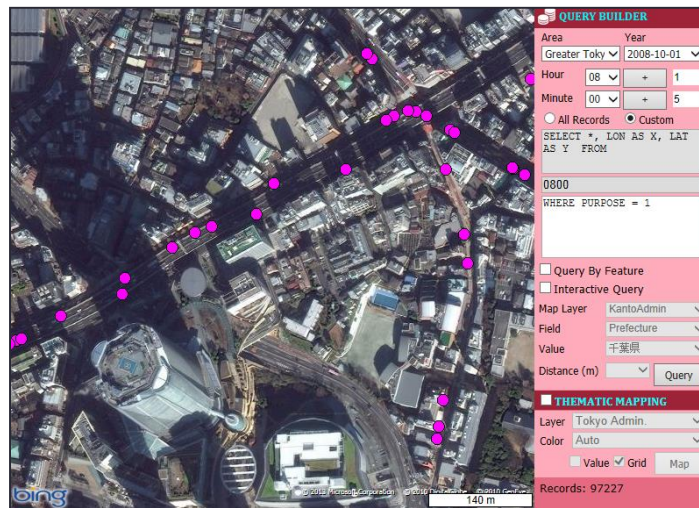
-  Actual position
-  Position reading from WiMax (Tower)
-  Position reading from campus Wi-Fi

Actual position can be acquired by high resolution basemap



Web Services

Harmonization between **wireless networking and Web-GIS/Web services** allows mobile GIS users to stream large amounts of geo-information as a basemap, which dramatically **eliminates the cost and data processing times** for field data collection.



Google Earth / Microsoft Bing Maps

*Improve visibility
Enhance spatial analysis results
Reduce cost and time*

Bringing all modern advantages into field data collection
“Smart Data Collection and Real-time Digital Cartography”

Research purpose

- To develop the **Spatial Data Collection System** using GIS, and then to examine the availability of this system for fieldwork survey through an empirical study in Tsukuba, Japan.



PROCEDURE AND OBJECTIVE

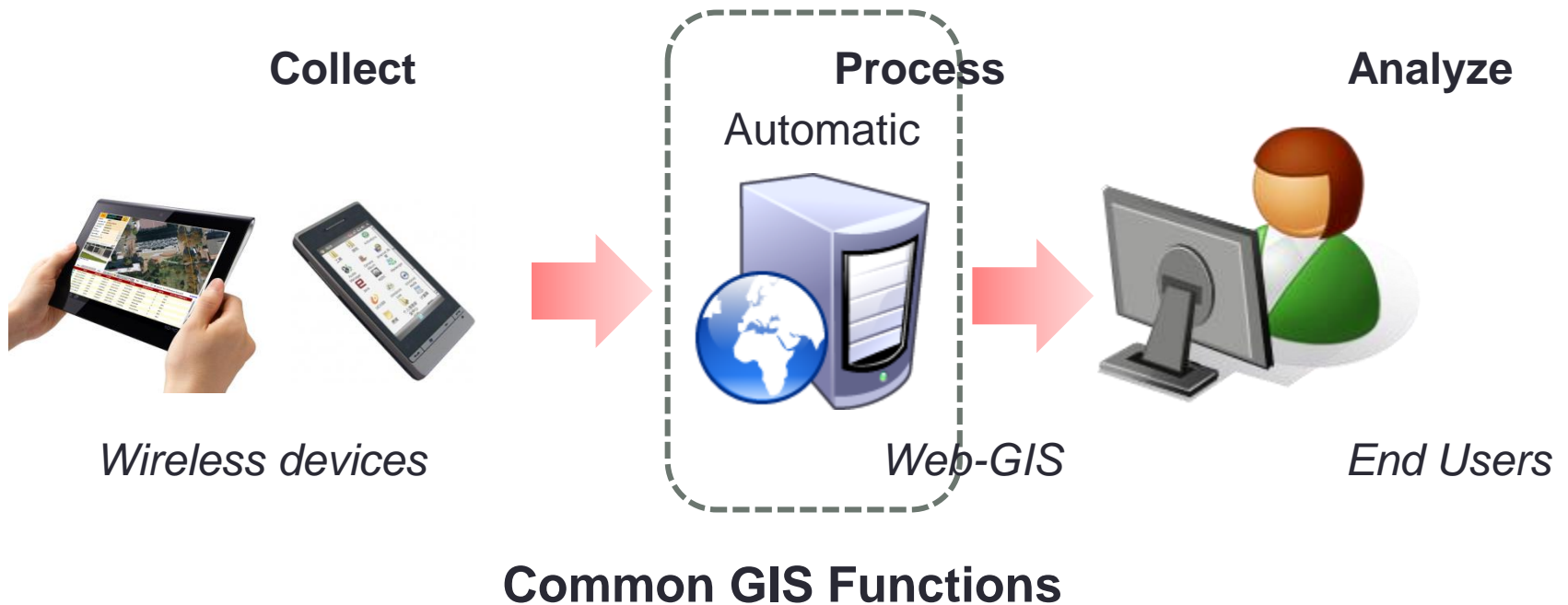
To practice real-time field data collection

To visualize and analyze collected field data

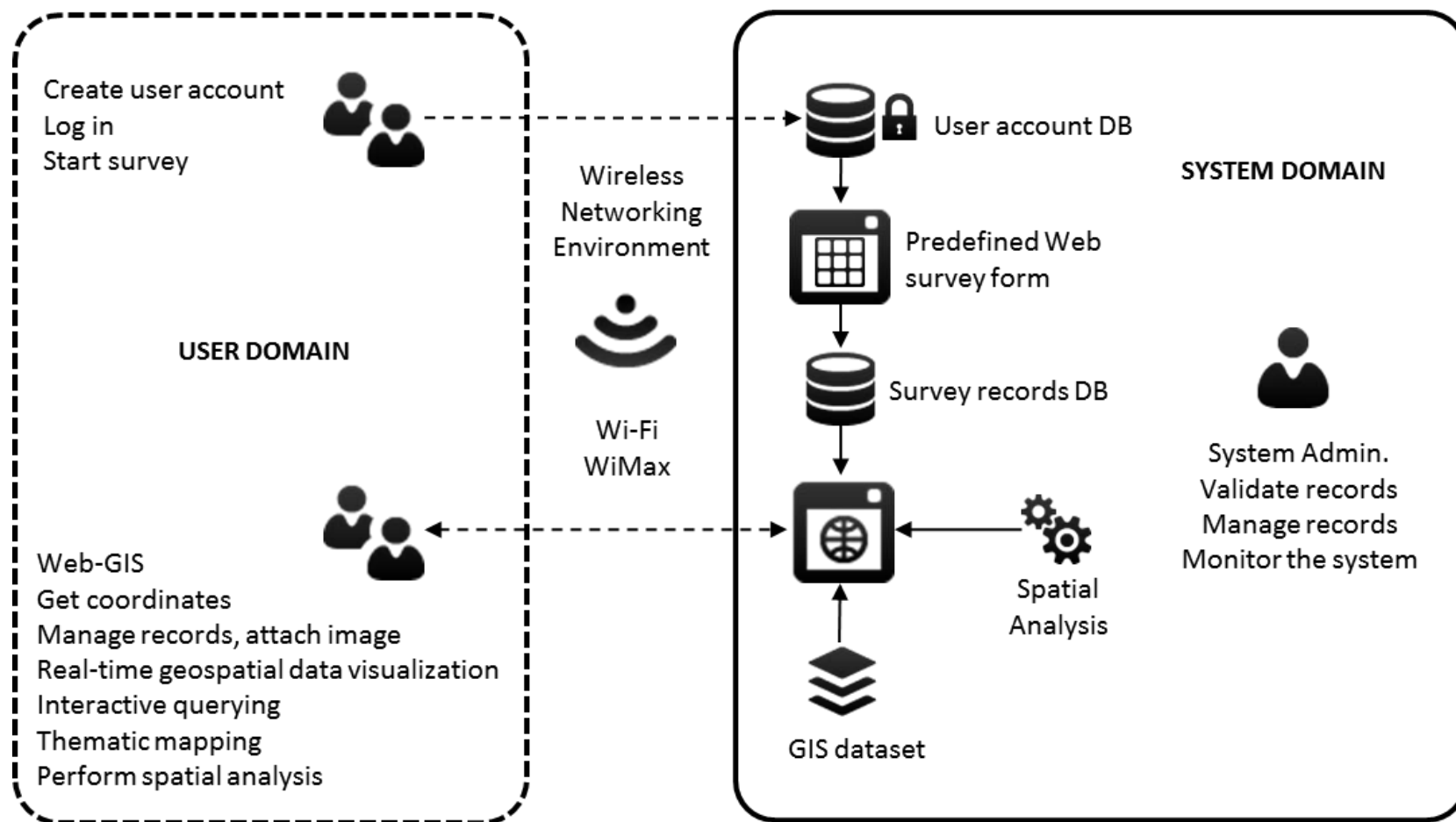
To demonstrate common GIS functions

Web-GIS will carry out all required data processing steps

Database creation, data injection, zoning, joining tables, intersecting features, etc....



Overview of Smart Data Collection and Real-time Digital Cartography



USER ACCOUNT CREATION

URL: <http://land.geo.tsukuba.ac.jp/testbed1>

- 1 Click on “**Create Account**” Tab
- 2 Type user name (minimum 3 digits)
- 3 Set passwords (minimum 3 digits)
- 4 Retype passwords
- 5 After finished, click “**Continue**”
- 6 Type user name and Log-In

Mobile Field GIS Log-In and User Account Creation

Log In **Create Account** 1

User Name: john 2

Password: ... 3

Confirm Password: ... 4

Create User

Mobile Field GIS Log-In and User Account Creation

Log In **Create Account**

Complete

Your account has been successfully created.

Continue 5

Mobile Field GIS Log-In and User Account Creation

Log In **Create Account**

User Name: john 6

Password: ...

☐ Remember me next time.

Log In

SURVEY ITEMS FOR THE FIELDWORK

- To enhance living environment on our campus, we investigate the spatial distribution of unfavorable items and phenomena including:

Type1: Garbage

SubType1: burnable

big or small

SubType2: unburnable

big or small

Type2: Illegal parking

SubType1: cars

SubType2: bicycle

SubType3: motorbike

etc.

GETTING COORDINATES

2

GPS 140.10112
36.11234

3

Name sophia

Record ID

Longitude 419100

Latitude 3996783

Type Garbage

SubType Burnable

Quantity 1

Attachment No

NA

Browse...

Total Records:
0

1

4

New Update Delete Add

500 RID Zoom To Selected Record Logout

Create a New Record

1 Click “New” to create a new record

Get the coordinates from 3 sources

2 Build in GPS

3 Locate GPS positions in a map and
Get from Garmin GPS (Manually enter)

4 Read from a Map

CREATE A NEW RECORD

GPS: 140.10112, 36.11234

Name: sophia

Record ID: SO23022158

Longitude: 419078

Latitude: 3996789

Type: Parking

SubType: Bicycle

Quantity: 3

Attachment: Yes

SO23022158.jpg

6 Browse...

7

8

New Update Delete Add

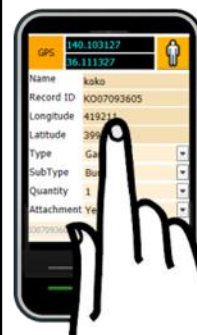
500 RID Zoom To Selected Record Logout

- 2 Select **Type**
- 3 Select **Subtype**
- 4 Select **Quantity**
- 5 Set up attachment category
- 6 Click a **Browse** for file attachment
- 7 Click  to upload (Attach)
- 8 Click **"Add"** to add a new record

User Domain GUI



During the field survey

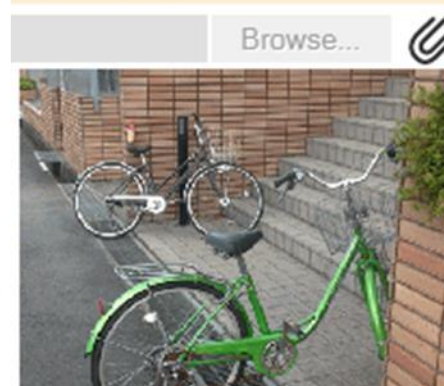


Smart phone



Tablet PC

GPS	140.103062 36.111249		Coordinates Reading
Name	koko		Appear login name
Record ID	KO09105515		Automatically assign Record ID
Longitude	419081		Longitude
Latitude	3996793		Latitude
Type	Parking	<input type="button" value="v"/>	Select Type
SubType	Bicycle	<input type="button" value="v"/>	Select Subtype
Quantity	2	<input type="button" value="v"/>	Select Quantity
Attachment	Yes	<input type="button" value="v"/>	Select "Yes" to attach image
KO09105515.jpg			Attachment file name



Browse image for attachment

Image viewer

UPDATING AND DELETING A RECORD

2

GPS

Name

Record ID

Longitude

Latitude

Type

SubType

Quantity

Attachment No

NA

Browse...

You have selected record:
3 of 19

3 **4** **5**

New

Update

Delete

Cancel

500

SUBT

Zoom To Selected Record

Logout

	RID	PNAME	LON	LAT	TYPE	SUBTYPE	QTY	ATTACHMENT
	J023123605	john	418914	3997244	Garbage	Burnable	1	NA
	J023123600	john	419121	3997224	Parking	Motorbike	5	NA
	J023123557	john	418851	3997394	Garbage	Burnable	1	NA
	J023123549	john	418854	3997634	Garbage	Burnable	1	NA
	J023123441	john	418393	3997738	Parking	Bicycle	1	NA
	J023123438	john	418427	3997255	Parking	Bicycle	1	NA
	J023123434	john	418607	3997209	Parking	Motorbike	1	NA
	J023123430	john	418387	3997122	Garbage	Burnable	1	NA
	J023123426	john	418312	3997314	Parking	Bicycle	1	NA

- 1 Select a row to update or delete
- 2 Edit/modify Attribute
- 3 Click **Update** to update the selected record
- 4 Click **Delete** to delete the selected record
- 5 Click **Cancel** to return a new record creation

TO SEE WHAT OTHER PEOPLE ARE COLLECTING

New	Update	Delete	Cancel						500	SUBT		Zoom To Selected Record	Logout
RID	PNAME	LON	LAT	TYPE	SUBTYPE	QTY	ATTACHMENT						
JO23123605	john	418914	3997244	Garbage	Burnable	1	NA						
JO23123600	john	419121	3997224	Parking	Motorbike	5	NA						
JO23123557	john	418851											
JO23123549	john	418854											
JO23123441	john	418393											
JO23123438	john	418427											
JO23123434	john	418607											
JO23123430	john	418387											
JO23123426	john	418313											

Real-Time Field **1** Browser and Analyzer

Click link to see what other people are collecting

Log-Out to end the survey

[Logout](#)



2

☒ Field Data TYPE 14 Select Field ...
☒ Admin. Zones Type ● Garbage
☐ Buildings ● Parking
☐ Roads
☒ Aerial Image
☐ Admin Name
☐ Bldg. Name

Query
 *
 =
 Add Clear
 Select Logic
 Run

☒ Ignore Zero Report Clear

Generate a Summary Report

☒ Ignore Zero

Report Clear

REPORT OF FIELD DATA 2012
DATE: 11/23/2012 3:17:51 PM
SUMMARY BY ITEMS

TOTAL RECORDS: 74

Sum of Garbage: 50 (48)

Burnable: 34 (34)
Unburnable: 16 (14)

Sum of Parking: 149 (26)

Bicycle: 54 (12)
Motorbike: 54 (9)
Car: 41 (5)
End

SUMMARY BY ADMINISTRATION ZONES

Total Records By Zones

4	Hirasuna Residence Area
3	Art and Physical Education Area
15	Agri. and Fores. Research Center Area
4	Administration Center Area
5	Kasuga Area
4	Ichinoya Residence Area
6	Research Center Area
3	Area 3
5	Area 2
3	Area 1
6	University Hall

1 Generate a summary report to see:

1. Sum of all records
2. Sum of records by administration Zones

REPORT OF FIELD DATA 2012
 DATE: 11/23/2012 3:17:51 PM
 SUMMARY BY ITEMS

TOTAL RECORDS: 74

Sum of Garbage: 50 (48)

Burnable: 34 (34)

Unburnable: 16 (14)

Sum of Parking: 149 (26)

Bicycle: 54 (12)

Motorbike: 54 (9)

Car: 41 (5)

End

SUMMARY BY ADMINISTRATION ZONES

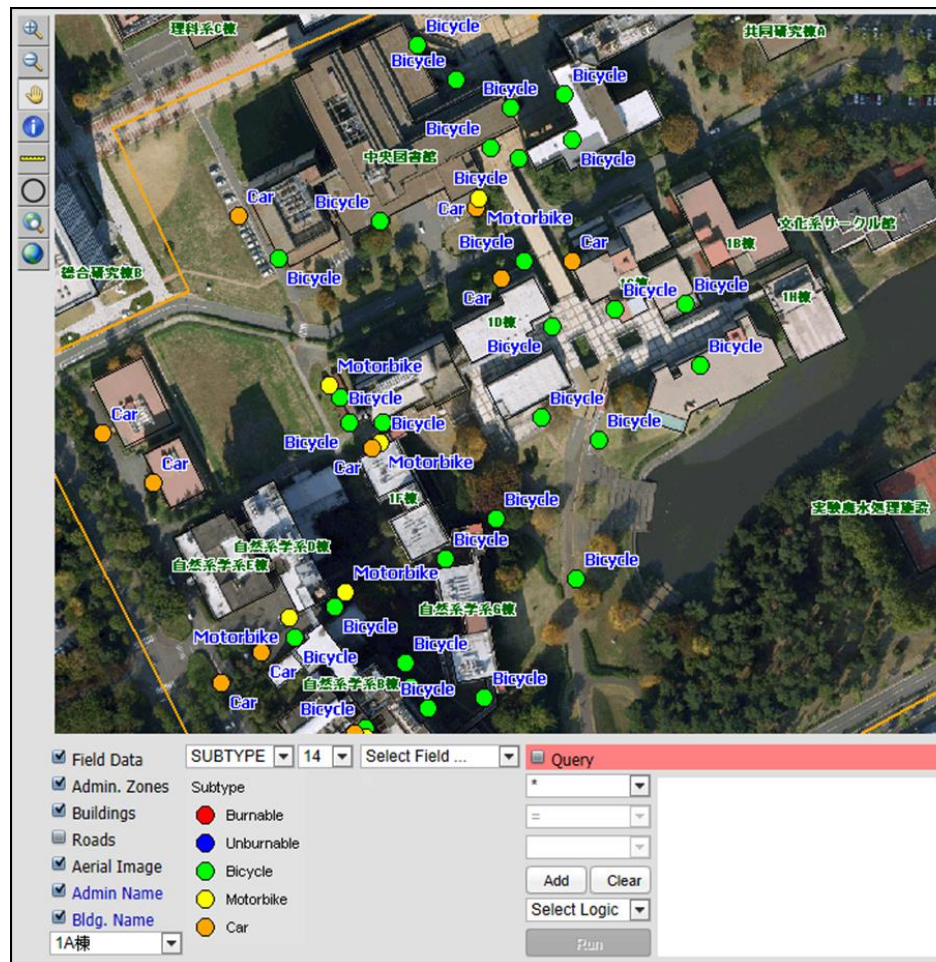
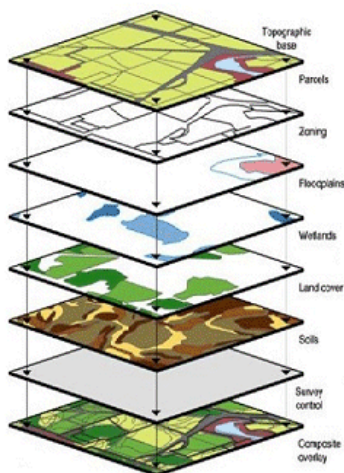
Total Records By Zones

4	Hirasuna Residence Area
3	Art and Physical Education Area
15	Agri. and Fores. Research Center Area
4	Administration Center Area
5	Kasuga Area
4	Ichinoya Residence Area
6	Research Center Area
3	Area 3
5	Area 2
3	Area 1
6	University Hall

Online Digital Cartography

Modern GIS is based on traditional cartography
But more analytical functions

- Feature Query
- Spatial Query
- Interactive Query
- etc.



Symbolization

- Symbol size
- Symbol color
- Symbol Field

Labeling

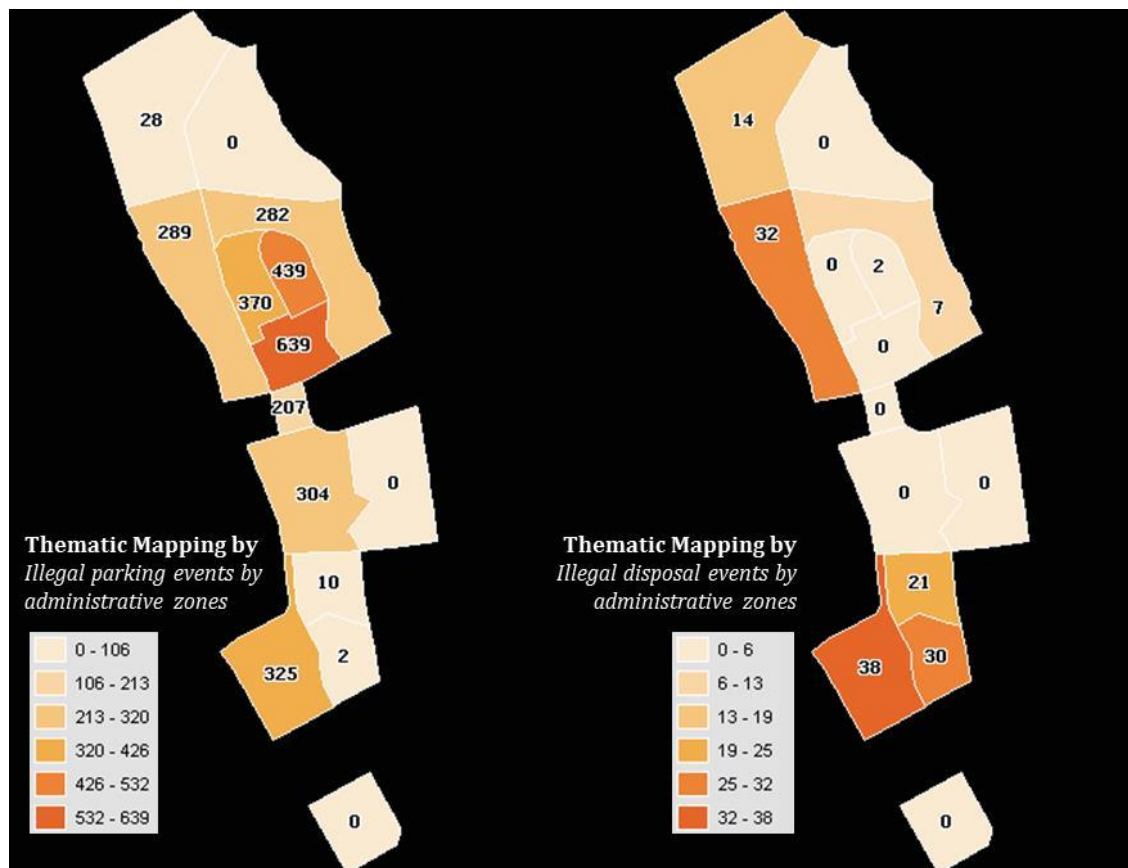
- By Name
- By Quantity

<http://land.geo.tsukuba.ac.jp/fieldgis2012/analyzer.aspx>

Online Digital Cartography



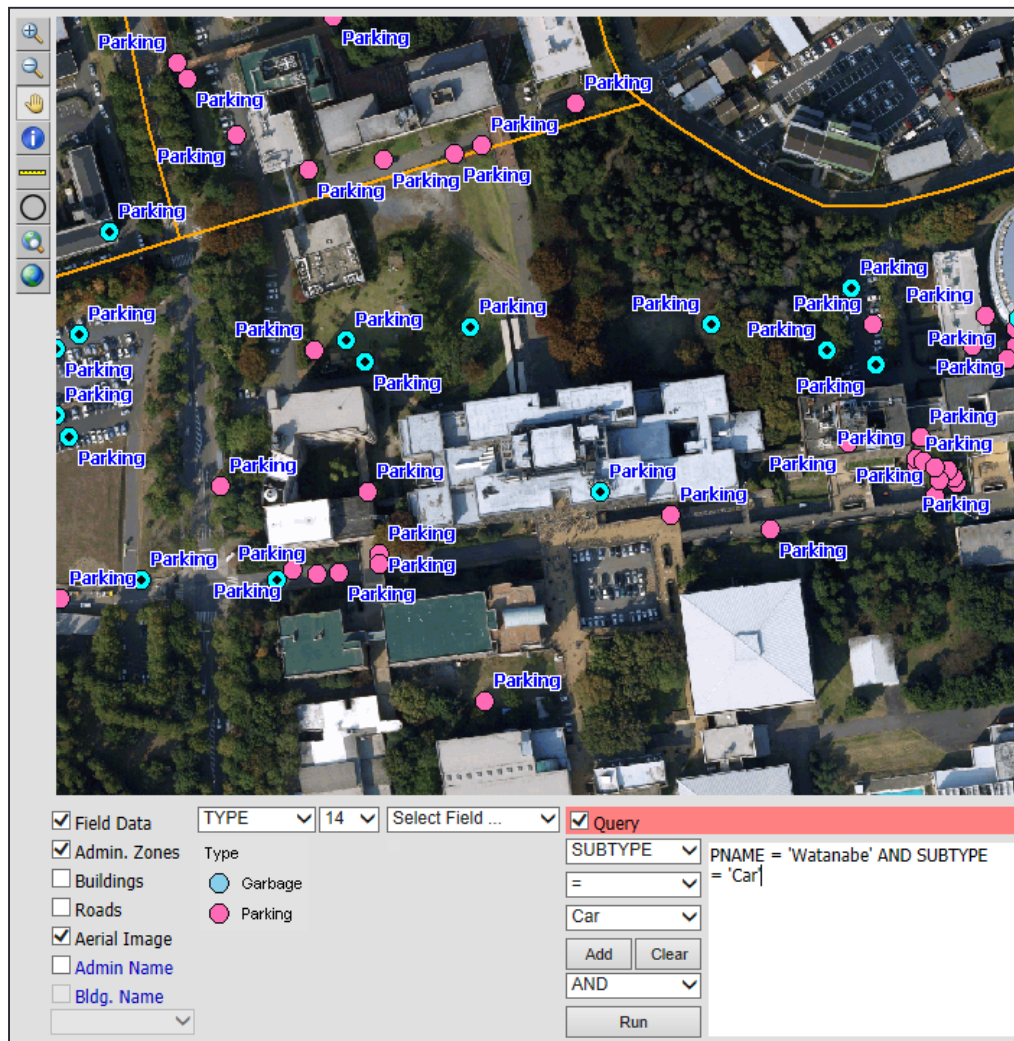
Real-time



Thematic Mapping

- *By value*
- *By category*

Feature Query

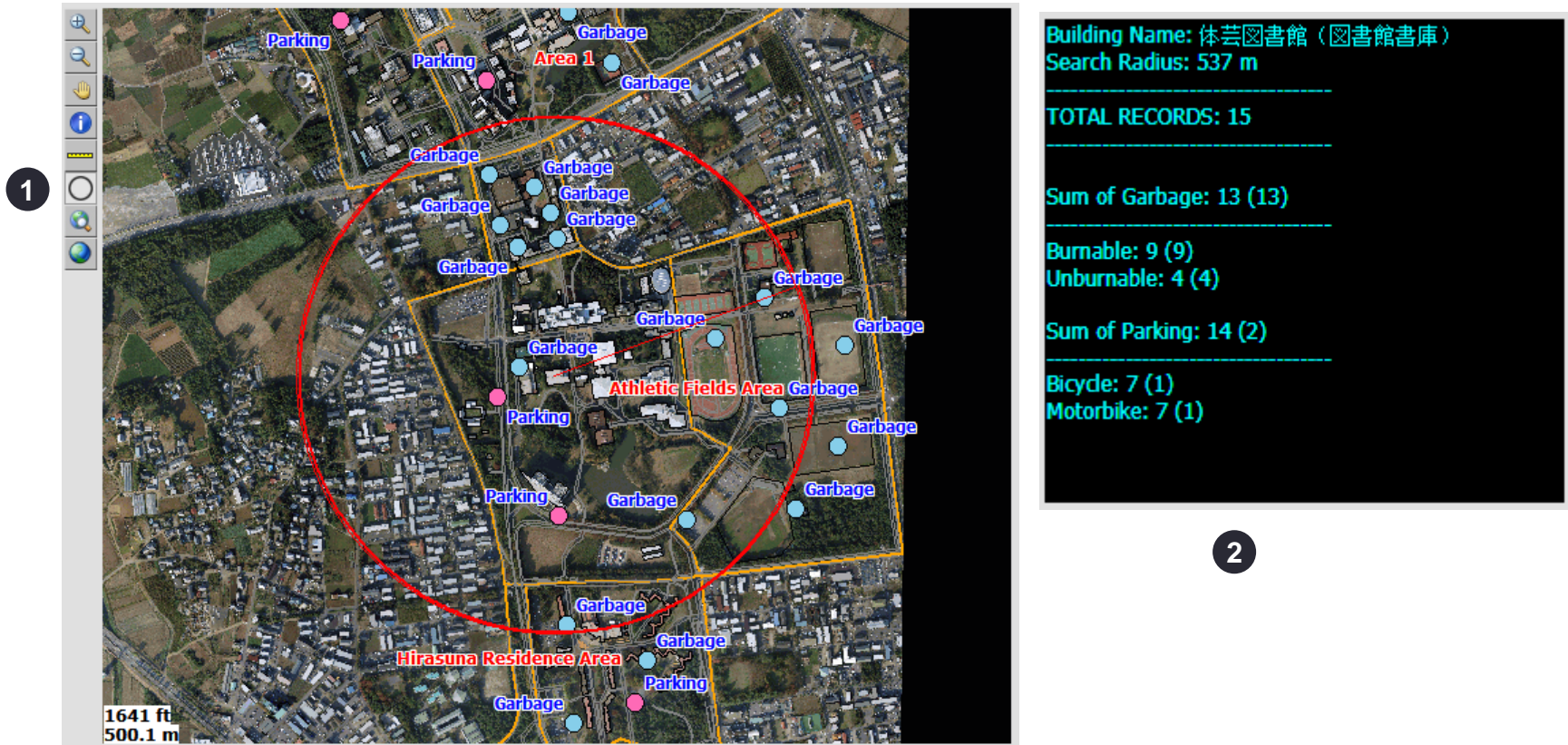



Feature Query

Using common SQL language to query the attribute value

PNAME = 'Watanabe'
AND SUBTYPE = 'Car'

Spatial Query



- 1 Click  Circle tool to draw a circle and find the records inside the circle
- 2 Search result will be shown in a text box

DISCUSSION



University of Tsukuba CampusGIS

DIVISION OF SPATIAL INFORMATION SCIENCE
GRADUATE SCHOOL OF LIFE & ENVIRONMENTAL SCIENCES
UNIVERSITY OF TSUKUBA



© 2011, Division of Spatial Information Science, University of Tsukuba

<http://land.geo.tsukuba.ac.jp/campusgis/CampusGIS.aspx>

SUMMARY

- The construction of Web-GIS provides a pre-defined user-friendly Web-based survey form and coordinate information from mobile devices, which dramatically improved the finding of locations and entering of data during the field work.
- The Web-GIS collects, integrates and processes all field data entered, which eliminates data handling tasks after the field survey. Due to the real-time information approach, the results can be viewed, queried and analyzed instantly, based on up-to-date information.
- This is ideal for use in disaster and emergency response systems and in meteorological data collection. The system itself is reusable and updatable for various field data collection purposes.

Project Report on

“Systematization of fieldwork methodology: A study on capture, management, analysis and circulation of geographical data”

More information about this project, please visit....

http://giswin.geo.tsukuba.ac.jp/sis/project/fieldgis/home_e.htm

Development of Centralized Field Data Collection, Processing and Analyzing System for Spatial Information Users

Grants-in-Aid for Scientific Research A (Project leader: Prof. Yuji Murayama)

[日本語](#)

[Outline](#)

[Activities](#)

[Students Field Works](#)



© 2010

Division of

[Spatial Information](#)

[Science](#)

University of Tsukuba

Outline

Field data collection is a first step requirement for any spatial information users especially for human geographers, physical geographers, geologists, crop scientists, ecologists, etc. Human geographers may want to collect public opinions and social activities, in order to understand social behaviors change over space and time. Geologists or physical geographers may want to collect in-situ data, in order to understand overall regional geological formations and structures. This research/project aims to explore extensively in field data collection and analysis methods integrate with various geo-information sources (i.e., GPS, satellite images, Digital Elevation Model, etc.) and multimedia (i.e., videos and digital images, etc.). Based on extensive feasibility studies, this project also aims to construct centralized field data collection, processing and analyzing system which can integrate, store, share, retrieve and analyze the collected field data by utilizing modern spatial web technologies.



Plan



Collect



Survey

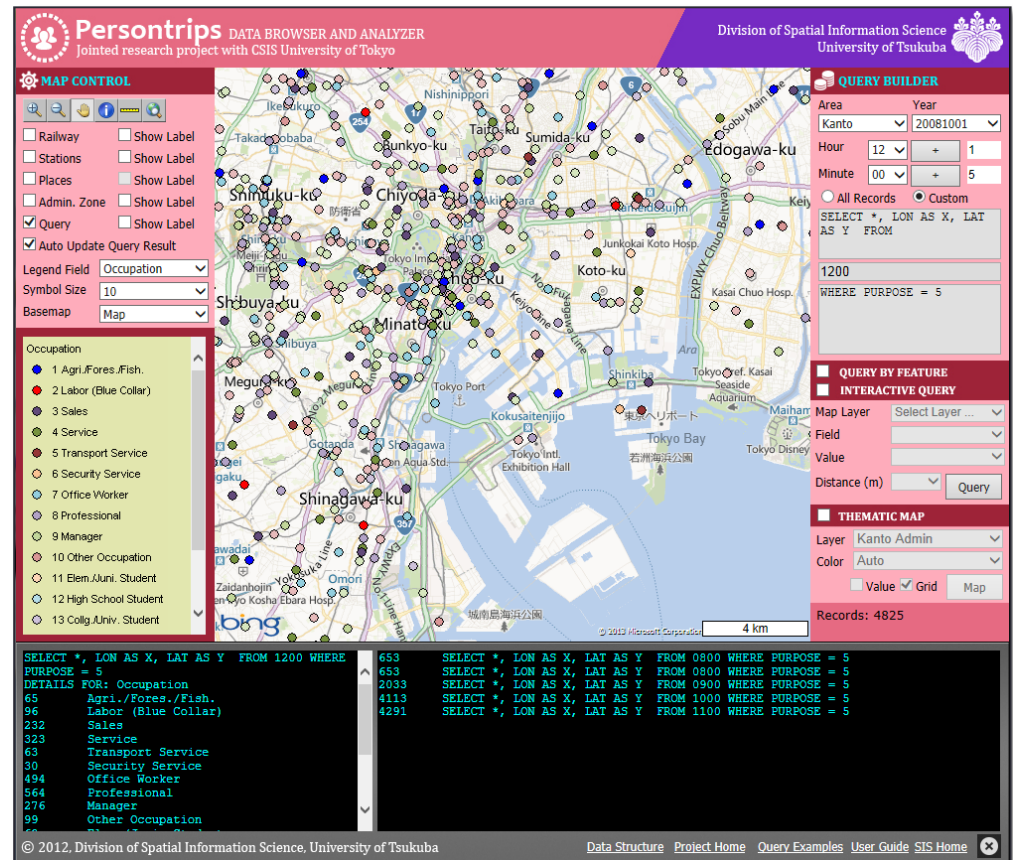
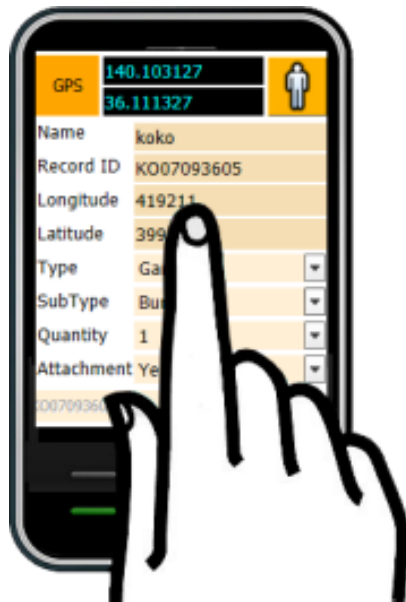


Analyze

Further Development

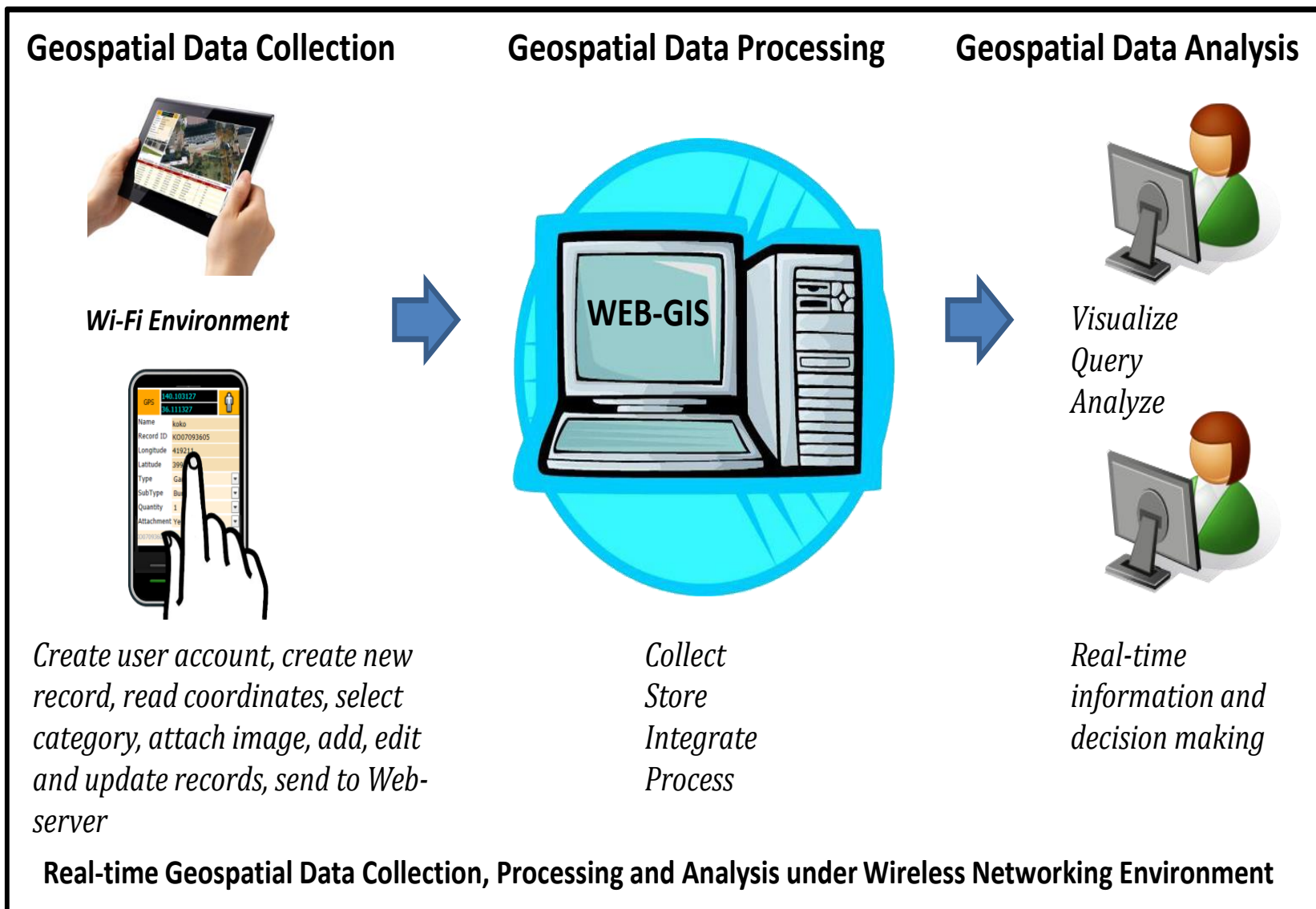
System integration between Field Data Collection and Persontrip Survey Data Browser and Analyzer based on –

Public Participatory GIS (PPGIS)
Voluntary GIS Framework

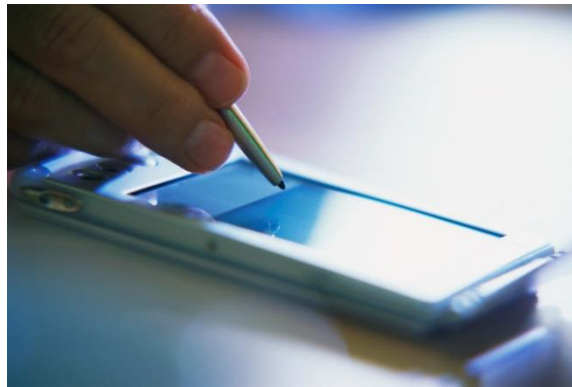


<http://land.geo.tsukuba.ac.jp/persontrips/>

Real time Web-GIS



Thank You



Inquiry:

mura@geoenv.tsukuba.ac.jp

(Yuji Murayama)