Japan Vision
for Geo-spatial Information
Service Innovation and
(potential) Demand for Standardization

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Vision of New NSDI Act: towards Geospatially-enabled Society

Ubiquitous access at any time by anybody to all geospatial information

Geospatial Framework Information

- Rescue Facilities
- Aged Wooden Houses
- Single Senior Residents
- Blocked Roads

All geospatial information is supposed to be registered to the Geospatial Framework Information.
Next Generation GNSS

GPS
- Development launched in early 1970's
- System comprises 31 positioning satellites
- GPS modernization planning currently underway (Target date: 2016)

GLONASS
- Satellite positioning system operated by the Russian Defense Ministry
- Planning underway to revive satellite positioning system, including launch of improved GLONASS satellites (Target date: mid-2010's)

Galileo
- Launches initiated with objective of starting services in 2013 or later (Objectives of GPS backup and EU autonomy)
- 30 satellite launches planned
- India, China, Israel, ROK participating or have stated intentions to do so

Beidou(Compass)
- Positioning system to be formed of stationary and medium earth orbiting and quasi-zenith satellites (35 satellites in total) through five launches
- Independent split from Galileo project

QZSS
- Experimental development of “quasi-zenith” satellites. Deployment not finalized. International role complementary to GPS.
GPS only 2002/07/31/1500

Position can be determined (more than 4 satellites visible.)
Position can be determined (more than 4 satellites visible.)
Real-time Control and Guidance

It requires accurate and reliable positioning service

Next action can be controlled or suggested.
Real-time Vehicle Control

Precise and reliable positioning with a larger number of satellites.

( X,Y,Z,T )

Road
Emerging Applications: ITS-Next

ITS-Next:
Driver Assistance with Intelligent Vehicle and Infrastructure
⇒ Reliable/accurate positioning and 3D road model

Automated Driver Maneuver-Assist guided by
3D Road Model + Positioning and Sensing

Efforts to keep 3D road data current and accurate

3D Road Model (X,Y,Z,T)
Precise Position (X,Y,Z,T)

Smooth and Safe cornering
Accelerator ON Shift UP

+ Recognizing a corner ahead
+ Accelerator Off, Brake On
+ Shift DOWN

Warning!

ITS Japan: Next Generation Digital Road Map
ITS Europe: ActMap, FeedMap etc.
ITS America: EDMAP
Emerging Applications: Robots

construction, rescue, agriculture and house-keeping

Courtesy: JARA
お掃除ロボット

http://www.irobot-jp.com/

http://store.irobot.com/home/index.jsp
スプレーコントロール
地図表示・編集
薬剤散布制御
ヘッド詰まり監視
計画
施肥
種まき
水・薬品
収穫
生産
ガイダンス
アーム高制御
個体物散布
自動ステアリング
種まき・苗植え
全ての営農プロセスで活用が可能

IT農業
AGRICULTURE MACHINE CONTROL SYSTEM
New challenges of GPS technology
海外売上比率85%
Navitime: Supporting Pedestrian Navigation in the Real World
M. Arikawa, S. Konomi, K. Ohnishi, pp. 21-29

IEEE Pervasive Computing
Vol.6 No.3, 2007

Providing special route for users who hate getting wet in rain or climbing up staircases.

In case of Rain

Even when movement by train and on foot is mixed, roof covered route will be provided for walking section of the route.

When it’s rainy, you can choose “roof-covered” route
Above: Map showing the distribution of mobile-phone users (and hence people) around Rome’s Termini station.
Right: A large crowd assembles at Rome’s Olympic stadium for a Madonna concert.
Hot Spot Capturing

1 pm. on Sunday

1 pm. on Friday

Shopping Center

Business Area
Moving Object Data: commuting in Tokyo

800,000 people movement

Commuting in Tokyo
More effective activity support services can be realized by combining GNSS and 4D geospatial information.
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Satellite-Based Positioning

Geospatial Framework Information

Courtesy: H.Murakami
Short History of NSDI Act

- Initial submission of the bill during the June 2006 Diet Session: Basic Act for the Advancement of Utilizing Geospatial Information (NSDI Act).
- Resubmitted by MPs from two ruling and one opposition parties in May 2007 during the last Diet Session and enacted by all parties except one opposition party.
- Was put into effect on 29 August 2007.
The next Google

Ten years ago this month, Google’s first employee turned up at the garage where the search engine was originally housed. What technology at a similar early stage today will have changed our world as much by 2018? Nature asked some researchers and business people to speculate—or lay out their wares. Their responses are wide ranging, but one common theme emerges: the integration of the worlds of matter and information, whether it be by the blurring of boundaries between online and real environments, touchy-feely feedback from a phone or chromosomes tucked away on databases.

Integration of the worlds of matter and information!
Future Geo-spatial Information Services

• Real-time and Context-aware service in mobile environment
  – To support activity of;
  – not only Human users but Machines
  – (intelligent vehicle, robot, navigation agent etc.)

Requiring……..

• Improvement of semantic interoperability of heterogeneous data
• Higher level of balance between personal information protection and the effective uses
• Very “fresh” information on real world.
  – Users not only use information but collect and submit the real world, as part of their activities.
  • Sensor data, “month-to-mouth information”, blog information.
  – How can we use or integrate the heterogeneous information to know or estimate what is really happening?
  – Data assimilation?

Focus a variety of representation on location or place.

Need to develop a guideline on personal information management.
End

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全ての営農プロセスで活用が可能

- 地図表示・編集
- 薬剤散布制御
- 施肥
- 収穫
- 種まき
- 生産
- IT

精密農業
Challenges for Global Change
Challenges for Global Change

GEOSS
(Global Earth Observation System of Systems)

Contribution to societal benefit areas
Privacy Preservation is IMPORTANT.

Benetton was considering putting RFID tracking chips in their clothing that can be read from a distance and used to monitor the people wearing them. Read CASPIAN’s initial response and call for a worldwide boycott.

What is RFID?

Radio Frequency ID chips embedded in clothing to track inventory. These tiny tags, predicted by some to cost less than $1 cent each by 2004, are "somewhere between the size of a grain of sand and a speck of dust." They are to be built directly into food, clothes, drops, or auto parts during the manufacturing process. Did you know they remain active after you leave the store?

Learn more about RFID.
However, in such cases as disaster, part of YOUR privacy information have to be disclosed to a rescue team to let them find YOU.
Gathered personal information is anonymized and used as marketing data!

* Study of system issues for personal information protection in line with this technology is also in progress in parallel.
Personal Information Anonymization

Gathered personal information is anonymized and used as marketing data!

User (subject providing personal information)

Company A (Service provider)

Gathering

Anonymization

Company B

Promote use of accumulated data through anonymization

Customer DB

Anonymized data

Attribute data (Schools attended, etc.)

Location data (movement record, etc.)

Sensitive data (medical, health-care history, etc.)

Marketing DB

Attribute data (Schools attended, etc.)

Location data (movement record, etc.)

Sensitive data (medical, health-care history, etc.)
Each user record, collect and manage his/her own personal information by him/herself and for him/herself.

Self-information Management

Through developing a sophisticated user model of myself.

Companies can purchase personal information as complete set of personal activity history data

Support myself with self-generated context aware service using my own activity history data

Mobile devices
- sensors
- Digital money
- Mobile Phone
- GPS

Collect digital activity log data from personal apparatus

Schedule data

Self-Information Platform
- Manage self-information
- Use a user model on Myself for better services. The model is developed by User data

Request services based on a user model on myself.

Certain Service Provider

Standard Interface

Purchase records
Service DB
Self info DB
User model on Me
Purchase record
IC ticket
digital receipt

Standard interface disclosure

Certain Service Provider

USER

• Manage self-information
• Use a user model on Myself for better services. The model is developed by User data
We use many kinds of identifiers to describe various places. Collectively, we call these Place Identifiers (PIs).
RFP example of Robotic Service

I am Cam2, I see 3 entities
- table: ID=23, pos=(10,20)
- table: ID=73, pos=(-23,72)
- robot: ID=12, pos=(-53,56)

I am Cam1, I see 3 entities
- person: ID=14, (34,21)
- robot: ID=25, (58,55)
- sofa: ID=134, (93, 42)

I am Robot 32, my Laser
detected 3 entities:
- table: d=32, α = 40
- table: d=67, α = 123
- robot: d=99, α = 187

Where is my Phone?
Robot 21, bring it to me!

I am RFID reader1 on a
table, I feel the phone
ID=823 is within my range

I am RFID reader2 on a
table, I feel the phone
ID=123 is within my range

?!!?!?
Treat various types of location-related information in a uniform manner.
Among PIs, there should be “association” among them, because a PI is usually defined referring to an existing one. For example, corresponding location of postal address may be defined by map coordinates.
RFP example of Robotic Service

I am Cam2, I see 3 entities
- table: ID=23, pos=(10,20)
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- robot: ID=12, pos=(-53,56)

I am Cam1, I see 3 entities
- person: ID=14, (34,21)
- robot: ID=21, (58,55)
- sofa: ID=134, (95,47)

I am Robot 21, my Laser detected 3 entities:
- table: d=32, α = 30
- table: d=67, α = 12
- robot: d=99, α = 187

Where is my Phone? Robot 21, bring it to me!

?!!?!!

Room coordinate system

2007/12/10
JARA Initial submission

Courtesy: JARA
To convert a place representation to an appropriate one, we need to follow “Associations”.