GIS in Seoul Metropolitan Government: Overview

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- Cyber GIS educational system
I. Introduction of GIS in SMG

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About Seoul

GIS works in SMG

1. Creates, updates and maintains GIS data and Digital topographic map
2. Trains and promotes GIS to public officials
3. Develop the GIS system
4. Participates in joint utilization and coordination of underground facilities map
5. Deals with production of thematic map
6. Distributes and manages geographic information system and data
7. Manages security of GIS system and data
GIS work in SDI

Research and support to develop the GIS in SMG

1. Establishes strategic and implementation plans for GIS systems
2. Support to developing GIS applied system for urban planning, environment, river, underground facility and disaster prevention
3. Developing plans for standardization and maintenance of GIS data and digital topographic map.
4. Research for database design for urban infrastructures.
5. Spatial datawarehous and Enterprise GIS

GIS in Administration

- GIS systems in SMG support many administration works by integrating spatial and attribute data related spatial features

- District
- Zone
- Catastral Parcel
- Street Network
- Urban Plan
- Topology
- Attribute data

Geographic Information System
- Underground Facility System: sewer, water supply
- Road Information System
- Urban Planning Information System
- Spatial Datawarehouse (SDW)
- Land administration system
Application Field

Local living Information
Culture, Sightseeing Guidance
Health and Welfare
Tax Administration
Disaster Management
Transportation
Industry and Finance
Underground Facility management
Road Facility, digging work
Urban planning
Land management
Environmental Management
Nature hazard
House

History of GIS development in SMG

- GIS Strategic Plan 1 step : 1995
- Digital Topographic Map revision : 2001 - 2003
- Air-photo imagery Map : 2000 - 2003
- GIS Strategic Plan 2 step : 2002
- Spatial Datawarehouse : 2001 - 2005
- Urban Planning Information System (UPIS) : 1999 - 2004
- Road Management System (RIS) : 1999 - 2003
- Sewer Information System : 2000 - 2003
- Supply water information system : 2000 - 2003
- Cyber GIS Educational System : 2003 - 2004
II. GIS Data

- Digital Topographical Map (Base Map)
- Air-photo Image Map
- Statistics and attribute DB

Digital Topographic Map (Base Map)

- Scale: 1/1,000
  - Areas, number of map: 524.5 km², 2,303 maps
  - Production Period: 1996 – 2003
  - Revision: Per 2 years
  - Layers: 150 features (have attribute)
  - Data format: dxf, dwg, shape
  - Total amount: about 12 million dollars

- Scale: 1/5,000
  - Areas, number of map: 605.5 km², 133 maps
  - Production Periods: 1996(120 maps), 2001(13 maps)
  - Layers: 250 features (have not attribute)
  - Data format: dxf, dwg, shape
Since 1971, Air-photo has been taken. This air-photo was digitalized in image and support the various work for administration. Especially, monitoring the unadmitted house.

<table>
<thead>
<tr>
<th>사업년도</th>
<th>제작량</th>
<th>비고</th>
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<tr>
<td>2000년</td>
<td>6,705매</td>
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<td>2003년</td>
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</tr>
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<td>합계</td>
<td>44,133매</td>
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</table>
Statistics and Attribute Data

Various administrative statistics are connected with GIS through data mart

- Administrative management: budget, financial
- Industry: Number of business
- Environmental: Air pollution, ozone
- Transportation: Transportation capacity in main streets

Social and Welfare: Welfare facility distribution
- Culture/Sightseeing
- House/Building: land price

These data are serviced to public officers and citizen through GIS portal.
III. GIS Application

- Application System
  - Unified underground Facility Management System (UUIS)
- Data share and Integration System
  - Spatial Datawarehouse (SDW)
- GIS Portal
- Cyber GIS educational system

Unified underground information system (UUIS)

- Water supply, sewer, electricity, telecommunication, energy and gas data are integrated
- Prevention of accidents by digging at absent of any information
  - We had big 3 gas accidents in 1994, 1995, 2000
- Lack of management of underground facility


- 1995. 4. Gas explosion at subway in Daegu

- 2000. 2. Fire at common facility cavity in Yeouido
Spatial Datawarehouse (SDW)

- For data share and common use in each GIS application system
  - Map viewer system
    - Data connect, search, find
    - Data extraction/printing
    - Map generation according to different scale
  - Metadata management system
    - Management module
    - System module
    - Metadata management module
  - System management
    - System management
    - Data consistency
    - Korea language management
    - Application system management
  - GIS Guide Web Site
    - GIS information service
    - Related Site connection
    - National clearing house connection

SDW: data extraction, consistency (transformation), transmission

- Edited data extraction in each unit work
- Data consistency in SDW
- Needed data transmission from SDW

Spatial data warehouse in Seoul

Spatial data warehouse (SDW)

- SDW: data extraction, consistency (transformation), transmission
- Edited data extraction in each unit work
- Data consistency in SDW
- Needed data transmission from SDW

Spatial data warehouse in Seoul

- Modified data search
- Edited data extraction

Spatial data warehouse in Seoul

- Integrated SDW server
- Common spatial data
  - building, cadastral, road central, road pave, district, boundary, watersupply, sewer
- Common attribute data (MIS)

Spatial data warehouse in Seoul

- Meta-data
- Data location, data quality information

Spatial data warehouse in Seoul

- Spatial data warehouse
- Information connect
- Internet
- Firewall
- Citizen
- GIS Portal

Spatial data warehouse in Seoul

- ETT Server
- Spatial data Consistence module

Spatial data warehouse in Seoul

- Data transformation
- Edit data reflection
- History data store

Spatial data warehouse in Seoul
Main functions in SDW

- Develop the GIS work through GIS system and MIS system connection
- Embody the integrated data and the system under C/S and Web environment
- Directly re-search data on the other GIS DB server

Search, find, list the buildings which are over 2000 years
GIS Portal (http://gis.seoul.go.kr)

There were many GIS homepages at each department in SMG. These homepages are integrated within a unique GIS portal and are serviced to public officials and citizens.

### Discrimination of Private Sector
- By the law related with GIS, SMG have to open the GIS data to citizens.
- GIS data which have advantages at public characteristics are provided.

### Promote the User Efficiency
- Easy to handle map search and edit by standardization of user interface.
- Provide interactive information between system and user.

### Provide the High Level Service
- The newest data by rapidly editing the geographic features.
- Imaged thematic maps which are already designed by experts.
- Various GIS educational contents.

GIS Portal System

- Provide the data which are not serviced in private sectors.
- GIS portal is connected with various GIS systems operated in SMG.

**GIS System in Internet**
- Transportation information (capacity, bus route guide)
- Culture map, toilet Map
- Local gov. living GIS Inform
- Han-river park information

**Spatial Data Warehouse**
- Common data yield
- Creation of thematic map
- Statistical data in each analysis field
- Connection of GIS and MIS

**GIS System in C/S**
- Road, new address
- Water supply, sewer, Topographic
- Urban plan
- Unified underground facility
- Land administration, air-photo

**Seoul GIS Portal**
- GIS clearing house
- Map information service
- Creation of thematic map
- Statistical GIS service
- Educational GIS data

**Related System with GIS**
- Seoul statistical information
- Annual report for Seoul
- Resident registration
- Population and house
- Business number
- Various work data

**GIS Needer**
- E-pay (PKI certification)

**GIS Service**
- Custom-related
- School
- Home
- Company
- Internet
- Education GIS database
- Spatial data warehouse
- GIS System in Internet
- GIS System in C/S
- Related system with GIS
Initial homepage

Map searching in Seoul area
Creation of thematic map

My map making
Creation of statistical map

Access Seoul GIS portal (http://gis.seoul.go.kr)

To buy GIS data (http://seoul.ngic.go.kr)

Affiliation

Search and select map (map kind, scale)

Check by credit card

Download

GIS data supply
Purpose

- Give the chance to learn the GIS without the limitation of time and place
- Magnify the capacity of public officials for GIS

Present condition

- Contents: GIS educational text and movies, practical use
- Educational courses: general(9), expert(5), application system (8)- theory and practice
- Access: internet or intranet
  - civil internet class: cyberedu.seoul.go.kr
  - educational e-public office: elearning.seoul.go.kr
  - Seoul GIS portal: gis.seoul.go.kr

IV. Pending problems and implementation plans

- Data maintenance
- Data accuracy
- Data standardization and share
Data maintenance

- confronted pending problem
  - Digital Topographic Map
    - Use air-photo picture photographed in last year
    - Takes 2 years to make DTM
    - Difficult to obtain national finance support
      - Old geographic features effected DTM
      - Therefore, difficult to obtain newest data
  - Thematic map
    - Insufficiency of organization system for revision about map and attribute
    - Duality works are happen (official work and GIS editing work)
      - lack of effectiveness for systematic maintenance and operation

Implementation plan

- Improve the work system for revision of GIS data
  - As the feature are changed, digital map have to be edited immediately
  - When the construction work are finished, survey results are given to SMG
  - Law : Public survey results have to be given under an obligation

<table>
<thead>
<tr>
<th>Feature</th>
<th>SOW manager</th>
<th>GIS system manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Features are changed</td>
<td>Digital map (DXF, Shape)</td>
<td>Work</td>
</tr>
<tr>
<td>Integration and modification</td>
<td>Editing topo. map</td>
<td>Each layer integration</td>
</tr>
<tr>
<td>Examination of D.T.M</td>
<td>Examine the topographic map consistency</td>
<td>Correct, Uncorrect</td>
</tr>
<tr>
<td>Integration and Share</td>
<td>Sharing modified digital topographic map information</td>
<td>SDW DB, sewer DB, other DB</td>
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</table>
Data Accuracy

- **Confronted pending problem**
  - Discrepancy of reference points in digital topographical map
    - Digital topographical map used old reference point until new reference point are made
    - There are some areas with mixed reference point (old and new)
    - Survey, input, edit errors produce local distortion
      - Therefore, various thematic maps based on digital topographical map also produced the location errors
  - Discrepancy of underground facility layers
    - Location accuracy are different in each underground facility management organizations because they have individual accuracy level
    - Each GIS data are developed without standard guidance

- **Implementation plan**
  - Usage of urban reference point and continuous management
    - Reorganization of various reference points in Seoul area
    - Prevention of loss and damage for reference point
  - Improvement of data accuracy for thematic map and attribute
    - Some errors are founded in SDW and each GIS systems, so consistent editing work system is needed through a singular window
  - Improvement of locational accuracy for underground facility
    - After appraising the each underground facility management organization, recommend the standard guidance
DB standardization and share system

**Confronted pending problem**
- Data development guide is not present
  - Standardization for DB and layer design is not presented
  - Cooperation between departments is insufficient due to the lack of standardization for exchanging data
    - Duplication of similarity data
    - Difficulty of data connection and compatibility
- SDW is now starting
  - Difficult for identification and definiteness of data source
    - Restriction of data share and usage
    - Occurrence of data duplication

**Implementation plan**
- Provide data standardization
  - Analyses design for existed data -> integration of similarity map and attribute data
  - Offer the standardization for new data -> prevent data duality
- Provide technical standardization model
  - Operate the technical reference model/standardization profile (TRM/SP)
  - Present the technical guide considering Seoul GIS structure
- Improvement of data share system
  - Make and manage the DB based on integrated data model
  - revise and distribute the GIS data through SDW
Thank you!