Toward Implementing Draft CD ISO 19134

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Since 1994, Growth of internet users double every year.

Rapid Growth in Wireless communications (CP, PDA, Mobile PC, etc) and data service

Wireless communications such as CP, PDA, Mobile PC are major Information medium for daily activities and for data services in Korea.
I. Seoul Metropolitan Area: An Introduction
Multimodal Users: 29,375,000 persons per day
About 70% of daily travelers use public transit.
Characteristics of Multimodal Users: See below.
Public Transit System in Seoul

- 6 Types of Buses: Feeder (G), Inter-District (B), Inter-City (R), District Circular (Y), Airport and City Tour.
- Subway: 16 lines
- Korea Rail: 6 lines
- The system provides services to every corner in Seoul, albeit complex routes and transfers.

[Bus System]

[Subway System]
II. Metropolitan Public Transit User Information System: ALGOGA
To enable travelers to search the most convenient transit route(s) using PDA, Internet or Cell Phone
Provision of comprehensive transit information for the Seoul Metropolitan area

Provision of the “best” route(s) for users

Provision of parking availability at transit transfer locations.

Upgrade information frequently

Currently 6,000 users per day
ALGOGA

System Architecture

LBS Platform

Service Server

Routing & Navigation Module

Map Service Module

Searching Facility Module

Location Module

GateWay Server

• Connecting Client & Communication Service

Internet

Client

• Web Client

• Mobile Client

GMLC/MPC

Traffic DB

Map Data

POI DB

MLP: Mobile Location Protocol; GMLC/MPC: GeoMobility Location Center/Mobile Positioning Center
<table>
<thead>
<tr>
<th>Items</th>
<th>Route &amp; Station</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea Rail</td>
<td>• 6 railways, 81 stations</td>
<td>• Station location</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Service information</td>
</tr>
<tr>
<td>Subway</td>
<td>• 16 lines, 344 stations</td>
<td>• Station location and exit information by lines</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Services Information by station</td>
</tr>
<tr>
<td>Inter-District Bus</td>
<td>• Seoul 627 routes</td>
<td>• Bus stop location by routes</td>
</tr>
<tr>
<td></td>
<td>• In-cheon 111 routes</td>
<td>• Service Information by routes</td>
</tr>
<tr>
<td></td>
<td>• Local 1107 routes</td>
<td></td>
</tr>
<tr>
<td>Airport and Inter-City Bus</td>
<td>• Airport bus 44 routes</td>
<td>• Location of bus stops by routes</td>
</tr>
<tr>
<td></td>
<td>• Long-distance bus 373 routes</td>
<td>• Service Information by terminal and routes</td>
</tr>
<tr>
<td>Parking Facility</td>
<td>• 69 public parking places</td>
<td>• Location of public parking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Service Information</td>
</tr>
</tbody>
</table>
• Schedule by type for each route
• Arrival, departure and transfer information
• Station exits and connecting bus information
• Parking information for subway station
• Calculating the “best” route(s) including transfer(s) to Bus/Subway given origin and destination
The same information as the bus route information based on user’s current location

Searching POI: Locating Schools, Hospitals and other POIs located nearby from User’s current location
III. A Simulation
# Seoul Network Database

<table>
<thead>
<tr>
<th>Network Name</th>
<th>SEOUL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Nodes</td>
<td>52,915</td>
</tr>
<tr>
<td>Number of Arcs</td>
<td>77,339</td>
</tr>
<tr>
<td>Arc/Node Ratio</td>
<td>1.46</td>
</tr>
<tr>
<td>Maximum Arc Length</td>
<td>5,725(m)</td>
</tr>
<tr>
<td>Minimum Arc Length</td>
<td>1(m)</td>
</tr>
<tr>
<td>Average Arc Length</td>
<td>104.339(m)</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>149.900(m)</td>
</tr>
</tbody>
</table>
Transportation Network in Seoul
## POI Database

<table>
<thead>
<tr>
<th>POI Name</th>
<th>Number of POIs</th>
<th>Item Name</th>
<th>Unit</th>
<th>Price Range (5 classes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Station</td>
<td>348</td>
<td>Gasoline</td>
<td>Liter</td>
<td>1,000 ~ 1,500</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>350</td>
<td>Medicine</td>
<td>Bottle</td>
<td>10,000 ~ 25,000</td>
</tr>
<tr>
<td>Flower Shop</td>
<td>210</td>
<td>Roses</td>
<td>stick</td>
<td>1,000 ~ 1,500</td>
</tr>
<tr>
<td>Bakery</td>
<td>200</td>
<td>Cakes</td>
<td>box</td>
<td>10,000 ~ 15,000</td>
</tr>
<tr>
<td>Auto Repair Shop</td>
<td>140</td>
<td>Service</td>
<td>Service Fee</td>
<td>20,000 ~ 45,000</td>
</tr>
</tbody>
</table>
Location of POI’s

Gas Station  Pharmacy  Flower Shop

Bakery  Auto Repair Shop
Simulation for a Multimodal LBS – Service Request

Scenario: On the way from Office to Home

- Items and quantity for purchase
  - Gas Station – 30 liters of gasoline
  - Flower Shop – 12 roses
  - Bakery – 1 birthday cake

- Scenario 1: Private Car
  - Origin: Office at Gimpo Airport
  - Destination: Home at Sinlim-Dong

- Scenario 2: Bus and Subway
  - Origin: Office at Naksungdae
  - Destination: Home at Garak-Dong
Simulation Result for a Multimodal LBS: Scenario 1-Alternative 1

Flower Shop
Gas Station
Bakery

Solution Time

Route Alternatives
- Route 1: Total Cost 66346, DC 2225, TC 1119, PC 65000
- Route 2: Total Cost 66355, DC 2230, TC 1122, PC 65000
- Route 3: Total Cost 66357, DC 2243, TC 1129, PC 65000
Simulation Result for a Multimodal LBS: Scenario 1-Alternative 2
Simulation Result for a Multimodal LBS: Scenario 1-Alternative 3
Simulation Result for a Multimodal LBS: Scenario 2-Bus Alternative
Simulation Result for a Multimodal LBS: Scenario 2-Subway Alternative
IV. Future Work
Future Work

- Testing of the draft CD ISO 19134 Multimodal LBS for Routing and Navigation
ALGOGA

System Architecture

LBS Platform

Service Server

Routing & Navigation Module

Map Service Module

Searching Facility Module

Location Module

GMLC/MPC

Internet

Client

• Web Client

• Mobile Client

Route Determination Service + ISO 19134 Multimodal LBS for Routing & Navigation

Connecting Client & Communication Service

Map Service Request/response

Directory Service Request/response

Location Request/response

Location response (MLP)

Routing Request/response
Thank you!