Intelligent Services for Context-Oriented Tourists Support in Karelia Region

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Some Major Touristic Problems in Karelia

- Information
  - Tourist greetings (e.g., police and ambulance phones)
  - Country laws and regulations
  - Region specific information (e.g., how to use public transport in Russia)
  - Tourist safety
  - Etc…

- Transportation
  - Public transport
  - Taxi
  - Ridesharing possibilities

- Intelligent guides
  - Information about places of interests
  - Navigation in museums
  - Planning the best excursion for the tourist at the moment
Architecture of Intelligent Tourist Support System

Cyber-Physical Space

Smart Space

Places of interest database

Acting Services

Excursion Planning Service

Context Acquiring Service

Ridesharing Service

Information Services

Places of interests

Drivers
Intelligent Tourist Support System Scenario

**Before the trip**
- Preliminary excursion plan
- Information about safety, country laws and regulations
- Cultural norms

**In the trip**
- Greetings, Information about safety, country laws and regulations
- Cultural norms
- Region-specific information

- Current situation
- Tourist profile
- Ridesharing
- Places of interest

- Tourist corrects the excursion plan

- Ridesharing found?
  - Yes: Go to place in according to excursion plan
  - No: Call a taxi (acting service) or suggest tourist to use the public transport

- Actual excursion plan

- Provides to the tourist information about the place exhibition

- Translation service

**After the trip**
- Feedback
- Commenting trip in social networks
Architecture of Ridesharing Service

Smart Space

- Museum 1
- Museum n
- Driver 1
- Driver n
- Tiurist 1
- Tourist m
- Information Broker
- GIS

SSAP – Smart Space Access Protocol
The Algorithm of Finding a Matching Path Between the Driver and the Passenger (1/2)

A is the start point of the pedestrian's path
B is the end point of the pedestrian's path.
C is the start point of the driver's path
D is the end point of the driver's path.
CD is the shortest driver's path, which is found with the help of GIS.

Which path will be better: CABD or CEFD?
The Algorithm of Finding a Matching Path Between the Driver and the Passenger (2/2)

- Start & end points of passenger’s path
- Possible meeting points
  - Driver’s path to the fellow-traveller

Driver’s path points

1, ..., 6 – distances calculated for each pair of the start and the end points of the way.
Complexity Estimation of the Algorithm

Complexity depends on the amount of start meeting points - \( N_{\text{MPS}} \) and the amount of end meeting points - \( N_{\text{MPE}} \)

\[
T_{\text{work}} = N_{\text{MPS}} \times N_{\text{MPE}} \times N_{\text{counts}} \times t_{\text{one counting}}
\]
Proposed Heuristics for Reducing Algorithm Complexity

**First heuristic.** Selecting points of the sector from which the driver starts

\[ \theta = \arctg \left( \frac{C^y - A^y}{C^x - A^x} \right) \]

**Second heuristic.** Selecting points in the intersections of the circles around the passenger’s start and end points with the circles around the points of the driver’s path.

A is the point of the pedestrian's path
C,F is the point of the driver's path
B,D,K,L,M,N is the possible meeting points
Assumptions for Using Proposed Heuristics

- A lot of drivers. Heuristics have strong limitations and filter out a lot of points. If there are no many drivers, then the use of the heuristics will rarely get positive result.
- A small value of DDetour. Heuristics will not be helpful with a large value of DDetour.
- Uniform distribution of roads on the map. The uneven distribution of roads (rivers, lakes, etc) leads to a lack of roads in some sectors, which could lead to the loss of possible meeting points due to the need to detour around the obstacles and to pick up the pedestrian on the other side.
System Working Scenario

Drivers

List of possible passengers

mobile device

Transferring information about the routes of the users

Smart Space

List of possible drivers

The interaction via the GUI

Passengers
Case Study: User Profile Configuration (1/2)

- User’s type in the system
- User’s vehicle type
- How many peoples and items this user can get on board
- How long user can wait for the another user and how fair he can move to the meeting point
- Coordinates of user’s home and work locations
Case Study: User Path Configuration

- **Start point properties**
  - Set coordinates of work location as start point
- **End point properties**
  - Set coordinates of home location as start point
- **Send information to the Smart Space**
- **Shows path of the user when he goes alone**
- **Shows merging path and information about fellow-travellers**

The diagram illustrates how to configure the path by setting coordinates for start and end points, and options to send information to the Smart Space.
Case Study: System in Work

Driver

Passenger

Match was found!
Case study. Excursion Plan Service

- Kunstkamera
- The Hermitage
- Museum of Karl May
- Gymnasium History
- St. Isaac Cathedral
- Dostoevsky Museum

Next slide
Conclusion

- Some major touristic problems in Karelia region have been considered.
- The architecture of the system for context-oriented tourists support in Karelia region has been proposed. The system consists of set of services which interact in smart space.
- Possible scenario for using this system has been proposed.
- Detailed description of ridesharing service has been presented.
- At the end the case study has been presented.
Thank you for Attention
Questions are Welcome

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