Ontological Model of Multi-Source Smart Space Content for Use in Cultural Heritage Trip Planning

Kirill A. Kulakov, Oksana B. Petrina

Petrozavodsk State University
Department of Computer Science

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Introduction

- a various tourist applications for gathering required information before the trip or during the trip
- recommendation service as the source of required information
- Smart Space paradigm for tourist service development
- cultural trip planning service with using cultural heritage information
- common information space based on ontological model
- ontological model matching with external information services and behavioural models
Smart Space

- multi-agent knowledge base
- smart environment: ”agents” and ”hub”
- each agent is an autonomous knowledge processor (KP)
- the hub becomes a semantic information broker (SIB)
- maintain an RDF triplestore
- technological platform is Smart-M3
Related Work

- STAAR: is including tourist’s profile, description of tourist resources and service, not be used to create a schedule
- ICD: based touristic recommender and information retrieval system, not designed for the extract of historical information from external sources
- SAMAP: for planning tourist visits is a good description of the necessary aspects for tourists, ignores type of trip and type of road
- SigTur/E-Destination: suitable to provide users recommendation, not support schedule
- W3C Geo: the main RDF vocabulary for the description of latitude and longitude
- CIDOC CRM: only specially designed for the description of museum artifacts
Trip Planning Service


- approach for creating Smart Space-based Trip planning service
- includes high-level architecture of Smart Space based service
- use cases and possible data sources from existing third party services
- mathematical model for trip planning problem
Recommendation Service


- studies sources of historical information and its semantics in relation to POIs
- the smart spaces approach to constructing mobile services
- computation method for personal ranking of points of interest (POIs) based on historical information and its semantics

![Diagram showing the recommendation service process](image-url)
Service Architecture

- The service is based on Smart-M3 platform distributed architecture.
- The KP provides access to external information service and translates obtained information to the common space.
- The SIB is a semantic information sharing service.
Use Cases

- corresponding sequence diagram
- show data flows between KPs and SIB
- The parentheses describes links between class individes which are important in this data flow:
  A(B) means that class A has link to class B.
- The square brackets with asterisk presents a set of class individes and this set may be empty:
  A([B*]) means that individe of class A has a set of links to individes of class B.
Scenario 1: Schedule preparation using service core

- Creating trip schedule using service core.
- Tourist defines target points and smart space-based trip planning service creates schedule based on the route info.
Scenario 2: Gathering attractions and events

- Tourist prepares request parameters and performs a search query to external data sources.
- The user can clarify search request.
Scenario 3: Additional sources usage

Service creates schedule, but it uses additional sources to improve its accuracy.

- “All conditions was passed”
- “Movement condition are not passed”
Ontological Model

types of the tourist information:

- POIs description
- tourist events
- visit schedule
- weather data
- transport
- accommodation
- cultural information about POIs
- useful information
Route Planning

[Diagram showing the relationships between Schedule, Route, Point, Movement, and Road with properties such as hasRoute, hasPoint, hasMovement, isEndPoint, isStartPoint, startTime, endTime, and useRoad]
User Points
Points of Interest
Cultural Information

Diagram showing relationships between entities such as POI, CulturalInfo, Action, Person, and User, with properties like architectural Style, creationDate, hasAction, relatedWithPerson, startTime, endTime, description, name, hometown, DateOfBirth, profession, and author.
Search of Points

- User
  - useUserPreferences
  - useLocation
  - inRegion

- SearchRequest
  - useCulturalInfo
  - useLocation
  - inRegion

- CulturalInfo
- TripType
  - useTripType

- Location
- Region
Types of Road

- Movement
  - useRoad
  - Road
    - AirRoad
    - CarRoad
    - BusRoad
    - WalkRoad
    - RailRoad
Conclusion

- Presented ontological model provides structures and relationships for trip planning and cultural heritage information storage in Smart Space:
  - 30 classes,
  - 32 data properties,
  - 22 object properties.

- Proposed model describes generic ontology and can be easily extended by adding new classes and relations.

- The ontological model can be used to construct distributed Smart Space-based service from various modules.

Thank you for attention