

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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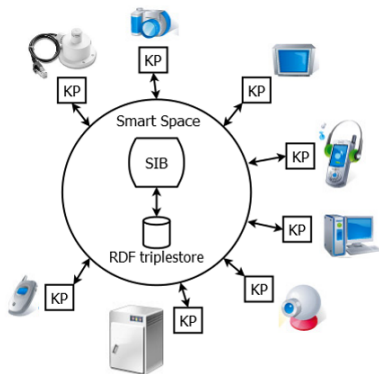
Introduction

- a various tourist applications for gathering required information before the trip or during the trip
- recommendation service as the source of requited 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



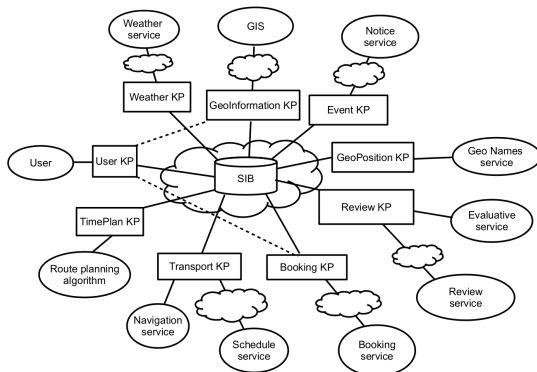
Related Work

- 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

K. Kulakov and A. Shabaev, An approach for creation smart spacebased trip planning service, in Proc. 16th Conf. of Open Innovations Association FRUCT, Oct. 2014, pp. 3844.

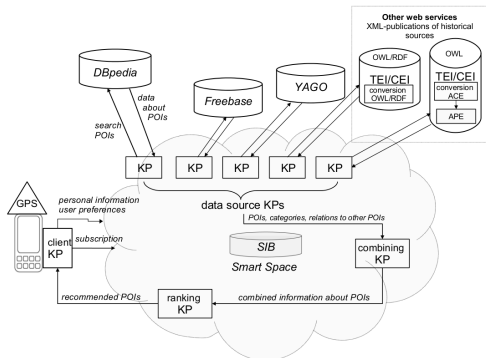
- approach for creating Smart Space-based Trip planning service
- includes high-level architecture of Smart Space based service
- use cases and possible data sources from existing third party services
- mathematical model for trip planning problem



Recommendation Service

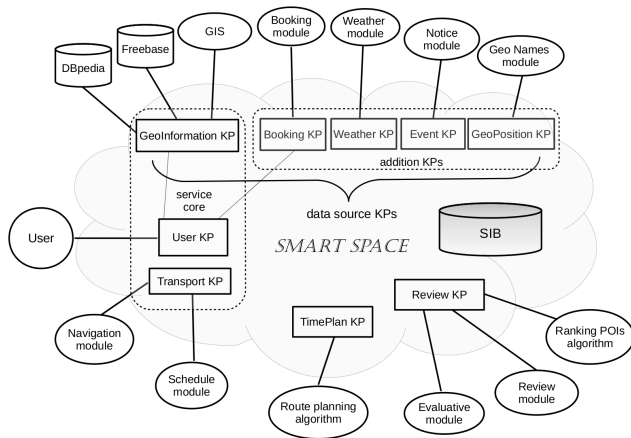
A. Varfolomeyev, D. Korzun, A. Ivanovs, and O. Petrina, Smart personal assistant for historical tourism, in Recent Advances in Environmental Sciences and Financial Development. Proc. 2nd Intl Conf. on Environment, Energy, Ecosystems and Development (EEEAD 2014), C. Arapatsakos, M. Razeghi, and V. Gekas, Eds., Nov. 2014, pp. 915.

- 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



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.

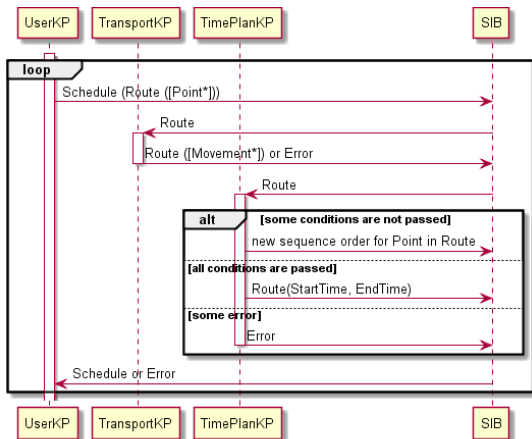


Use Cases

- 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

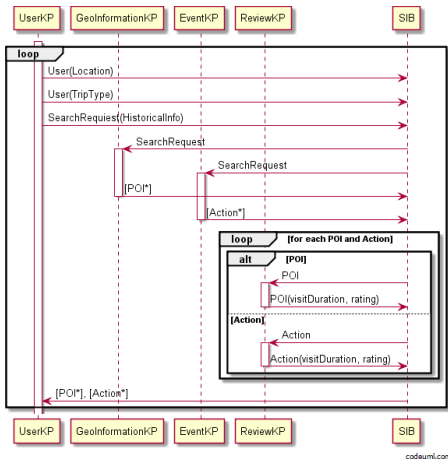
- Creating trip schedule using service core.
- Tourist defines target points and smart space-based trip planning service creates schedule based on the route info.



codeuml.com

Scenario 2: Gathering attractions and events

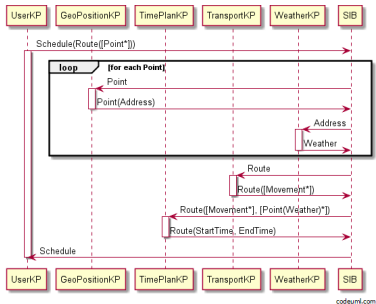
- Tourist prepares request parameters and performs a search query to external data sources.
- The user can clarify search request.



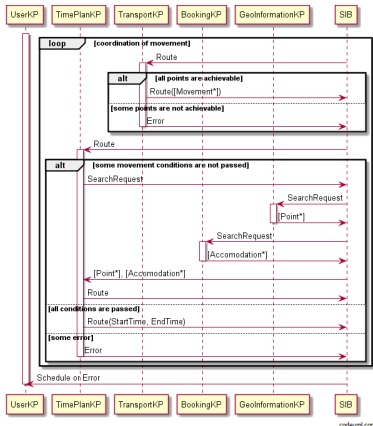
Scenario 3: Additional sources usage

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

■ “All conditions was passed”



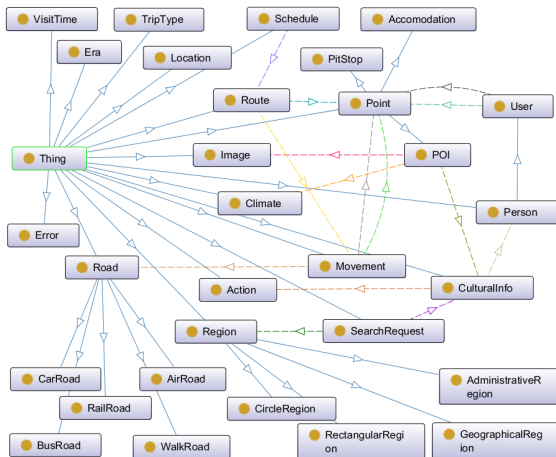
■ “Movement condition are not passed”



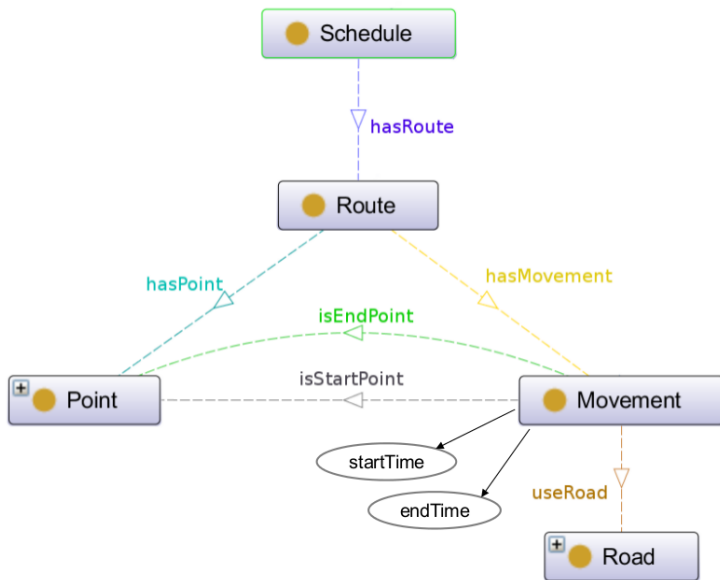
Ontological Model

types of the tourist information:

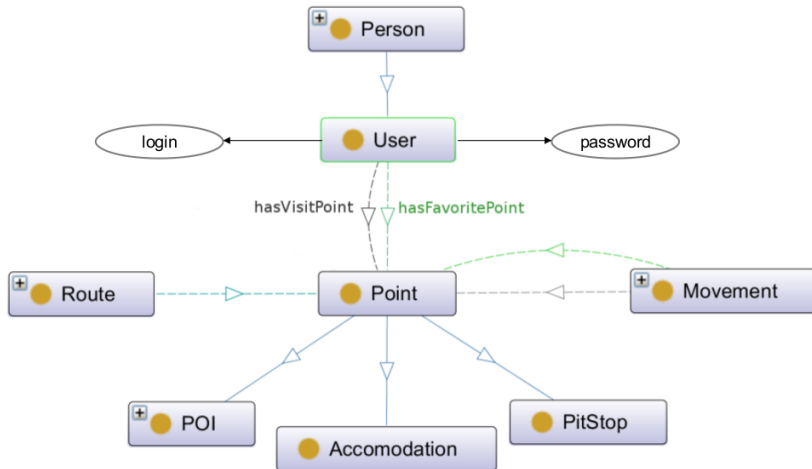
- POIs description
- tourist events
- visit schedule
- weather data
- transport
- accommodation
- cultural information about POIs
- useful information



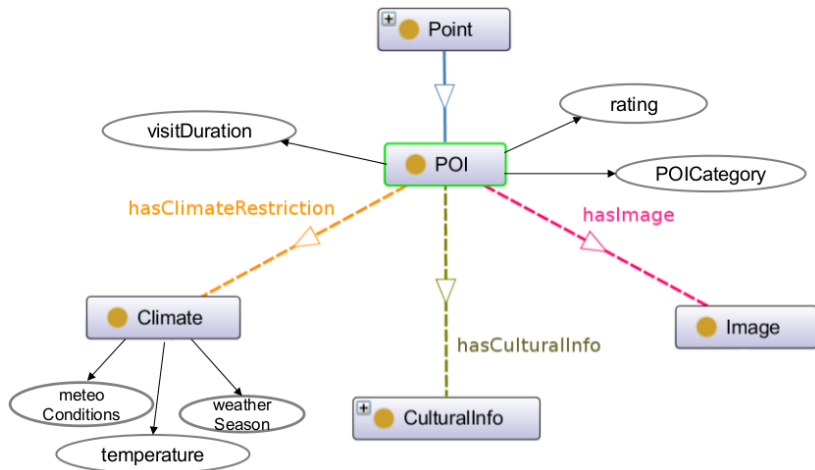
Route Planning



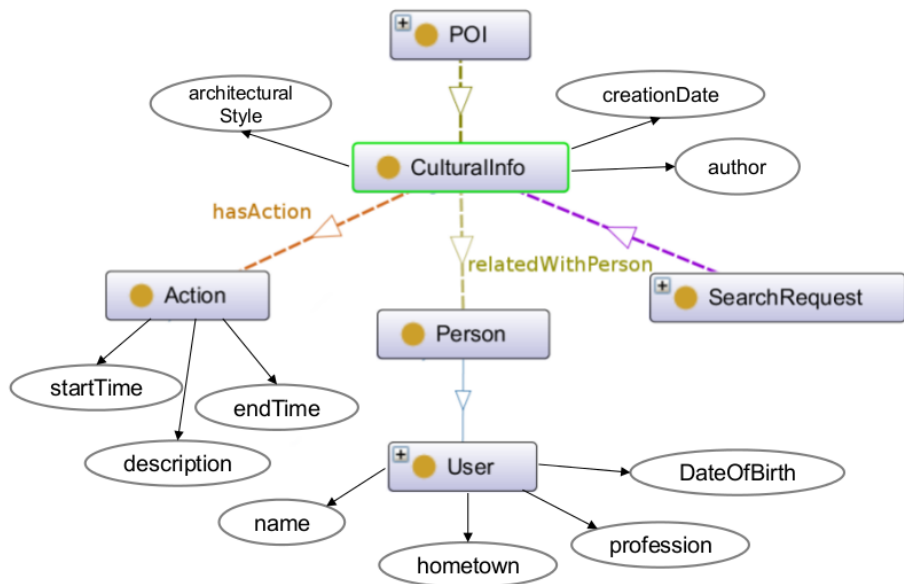
User Points



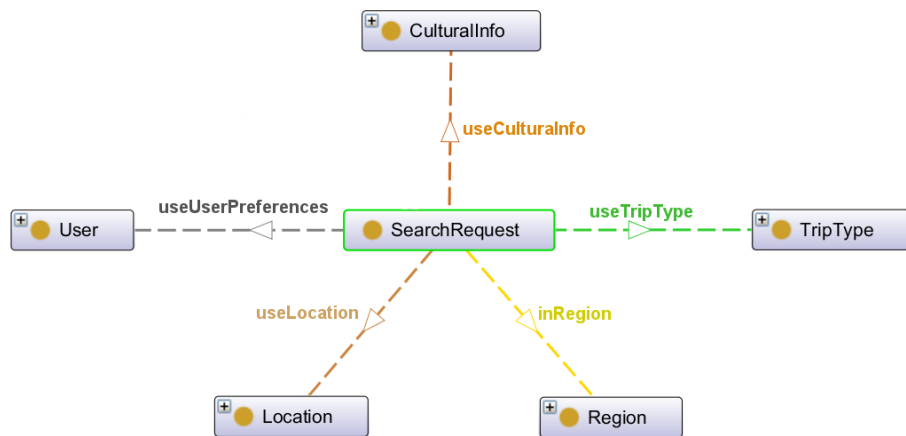
Points of Interest



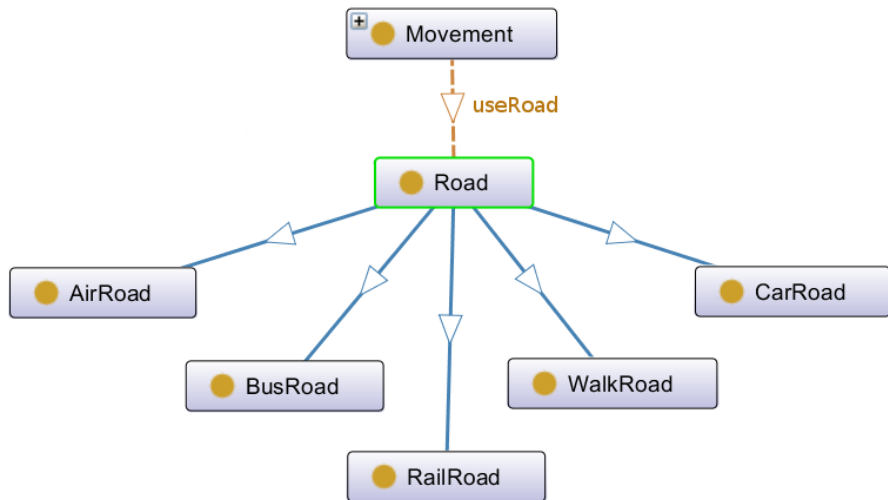
Cultural Information



Search of Points



Types of Road



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