

TourRDF: Representing, Enriching, and Publishing Curated Tours Based on Linked Data

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Abstract. Current mobile tourist guide systems are developed and used in separate data silos: each system and vendor tends to use its own proprietary, closed formats for representing tours and point of interest (POI) content. As a result, tour data cannot be enriched from other providers' tour and POI repositories, or from other external data sources — even when such data were publicly available by, e.g., cities willing to promote tourism. This paper argues, that an open shared RDF-based tour vocabulary is needed to address these problems, and introduces such a model, TourRDF, extending the earlier TourML schema into the era of Linked Data. As a test and an evaluation of the approach, a case study based on data about the Unesco World Heritage site Suomenlinna fortress is presented.

1 Problem: Linked Data Standards for Curated Tours

Context-aware mobile tourist guides have been an obvious application for mobile phones as soon as GPS enabled mobile phones went mainstream in 2007. They use recorded or automatically generated spoken commentary (audio guides), maps and multimedia content to inform and guide the user along the tour. Tours are essentially sequences of POIs, either outdoors in nature (e.g., a walking tour in the old town of a city) or indoors in buildings (e.g., a museum tour). POIs associate tangible and intangible cultural assets (e.g., data about a building or information about a historical event) with a place. The main purpose of a (self- or professionally) guided tour is to help the user in finding POIs, and then to provide her with contextualized information about them. Such information about cultural sights, historical persons, places, events, museum objects etc. typically form complex interlinked networks of heterogeneous, distributed data, making Cultural Heritage (CH) a promising application case for Linked Data [2].

Today, a large number of geospatially referenced CH data is openly available in RDF-format via SPARQL endpoints, and systems such as DBpedia Mobile [1] already utilize them. However, there are no standards for representing tours and POIs as Linked Data. As a result, data about tours and POIs is incompatible in different systems, and the data is difficult to share and enrich with related data. There is also the risk that the content, created by one vendor, is incompatible with new generations of devices and platforms, or becomes obsolete due to bankruptcy. The CH content providers, publishers, and end users would therefore benefit from a standard way of representing tours, and specifications for this, most notably TourML, have already been proposed [6,5]. However, these specifications do not take into account the potential of Linked Data.

This paper presents a solution approach to these issues by introducing an RDF-based vocabulary, TourRDF, for representing curated tours. We first present the model and demonstrate its usage by a tour visualization demo and a map widget for browsing georeferenced data from different sources. Finally, we also show how the Linked Data in our system can be accessed and re-used from the outside as a SPARQL service.

2 TourRDF for Representing Curated Tours

TourRDF vocabulary¹ is based on TourML [6] extending it with the Linked Data dimension. The primary goal of the existing TourML specification is to make sure that the tours created by a museum are compatible with different mobile devices and software systems, but it doesn't offer effective methods for the content providers to link and enrich the content of the tour with external data sources. By offering an easy access to CH data sources via SPARQL endpoints, the Linked Data extension makes it possible for the content provider to produce richer and more contextualized background information on the tour destinations.

The structure of a tour is similar to TourML: the basic building blocks of a tour are *stops* and *connections* between them. Amongst other things, a tour stop has coordinates, and a trigger zone to start the audio description, when the user approaches the stop. There are two kinds of stops: navigational stops, that are used to guide the user along the route, and actual stops that include *assets* to be exposed to the end user. The connections have a source and a destination stop, and they can also contain information about the distance or accessibility restrictions between the stops. Modeling the actual path that the user has to follow to get to the next stop is left for the application utilizing TourRDF.

Linked Data annotations are included in the assets. A tour stop can contain references to, e.g., historical persons, events, places, or objects. TourRDF describes only the structure of the tour, and the different assets are modeled using separate schemas. For example, for the POIs we used the POI schema developed in TravelSampo [4], and for historical events CIDOC CRM was used, as in [3].

3 Case Suomenlinna: Enriching Tours with Linked Data

To test TourRDF, we annotated and georeferenced data about 250 buildings in the Suomenlinna maritime fortress, a Unesco World Heritage Site, located off the coast of Helsinki. The primary data source was the History of Buildings map of Suomenlinna². In addition to basic information, such as coordinates and textual descriptions, 50 POI types, 15 persons, 23 historical events, and 158 keyword IRIs were linked to the buildings. The resulting RDF dataset was published in the Linked Data Finland (LDF) data service³.

A tour visualization demo⁴ was implemented with Google Maps API on top of the LDF SPARQL endpoint. The idea of the demo is to visualize how different linked data

¹ Cf. <http://vocab.at/page/71qi> for documentation how TourRDF is used with example tour data.

² <http://herba.suomenlinna.fi/map/>

³ Cf. <http://www.ldf.fi/dataset/poi/> for dataset documentation and the SPARQL endpoint.

⁴ <http://www.ldf.fi/dev/tour-demo/>

sources can be combined to enrich and add more content to tours, not to act as an actual mobile guide. The example tour shown on the Figure 1 is the main tourist route in Suomenlinna, the Blue Route.⁵ The tour consists of 42 stops, and each stop consists of one Suomenlinna building (POI). When a map marker is clicked, an info window with a short description, POI type, and keywords (if available) pops out. The *Read more* button there generates a stop info page with links to additional contextual background data. The background data is generated by SPARQL queries to several datasets published in the LDF data service, such as the Finnish History Ontology, Semantic National Biography, and MuseumFinland collections of artifacts.



Fig. 1. Suomenlinna Blue Route represented with TourRDF, with a tour stop selected.

4 Browsing Georeferenced Linked Data

To foster reuse of linked tour data, we implemented an annotation tool POI Finder⁶. It is targeted for finding assets for tours represented using TourRDF, but it can also be used with other web-based tour authoring applications, such as IZI.travel⁷ or My Tours⁸. There are two main usage scenarios for finding IRIs: 1) browsing and selecting POIs for a tour annotation in an external application, and 2) enriching existing tour content with related IRI references. POI Finder is a map widget, which gathers georeferenced RDF data from different openly available sources (SPARQL endpoints) and visualizes the data using Google Maps API. Currently RDF data is queried from five sources: Linked Geo Data, DBPedia, RKY (cultural-historically significant milieu in Finland), Tarinoiden Helsinki (literature data relating to places) and Suomenlinna dataset.

Fig. 2 shows POI Finder in action. POIs inside the draggable bounding circle are rendered on the map. When a map marker is clicked, an info window with a short description and POI type (if available) pops out. By clicking the *Read more* button, the

⁵ <http://www.suomenlinna.fi/en/visitor/plan-your-visit/blue-route/>

⁶ <http://www.ldf.fi/dev/poi-finder/>

⁷ <http://izi.travel/>

⁸ <http://www.mytoursapp.com/>

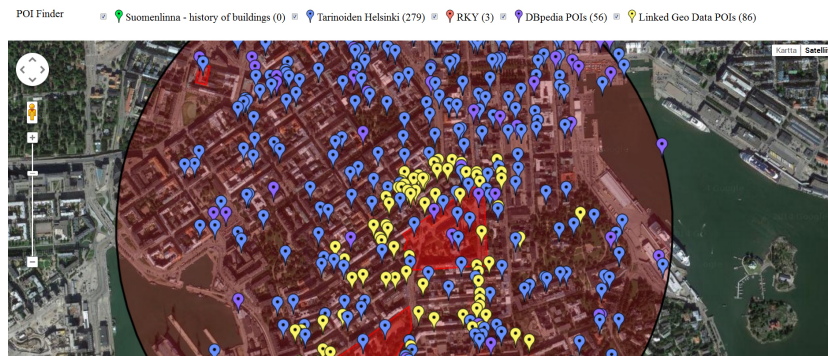


Fig. 2. POI Finder, 424 POIs near Helsinki city center.

POI properties are provided either in HTML and JSON formats (about the POIs published in the LDF data service) or via dereferenceable URIs (about other POI sources).

5 Discussion

TourRDF is to our knowledge the first attempt to represent curated tours as Linked Data. Its goal is to foster interoperability, data reuse, and data enrichment between content providers. In this way, more useful applications for end users can be created with less costs. Future work includes incorporating more georeferenced data sources and also information on the relationship between a tour stop and its linked data annotations.

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