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Semantic Fusion of Heterogeneous Data Sources for Decision Making and Decision-Support Systems

EOPEN

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Overview

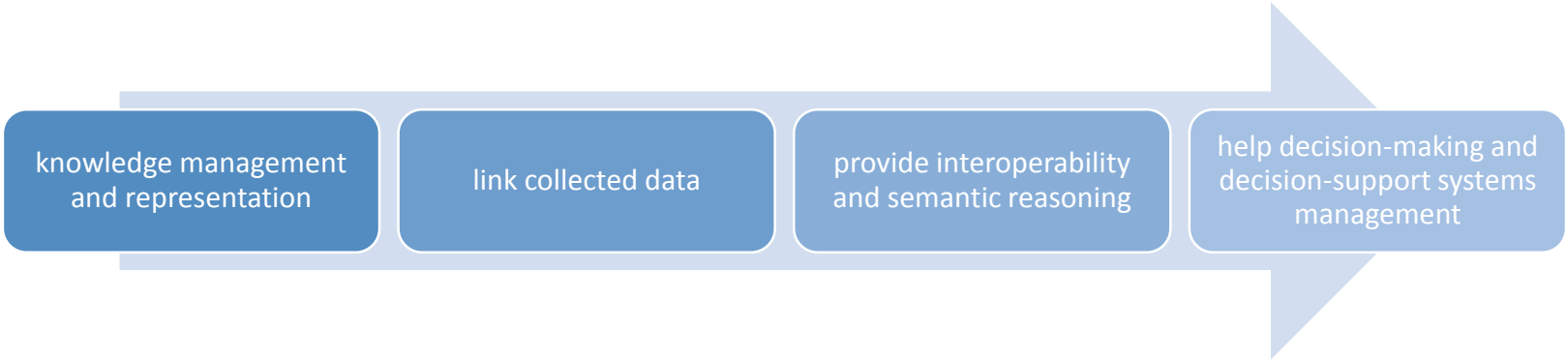
- Introduction
- Mapping mechanism
- Reasoning framework
- Localisation module
- Results

Introduction

▷ Problem

Connection among heterogeneous data from several sources (e.g. social media, sources that contain meteorological or climate information)

▷ Goals



▷ Solution

Metadata representation using existing ontologies and vocabularies, interlinking and analysis using reasoning mechanisms

Mapping mechanism: non-geospatial data

- The procedure that we followed for mapping non-geospatial data consists of:

Usage of existing standards, vocabularies, ontologies and methodologies

- e.g. the W3C standard, Web ontology language, Web Annotation Data Model, "Ontology development 101" methodology

Formulation of EOPEN ontology

- Reusing and extending the above mentioned structures

Development of mapping mechanism

- Implementing mapping algorithms and interfaces

Saving in Knowledge Base (KB)

- Results saving in RDF format

Mapping mechanism: geospatial data

- Usage of GeoTriples tool to convert geospatial structured data from various formats into Linked Data.

- Input

ESRI Shapefiles, XML, GML, KML, JSON, GeoJSON and CSV documents or spatially-enabled relational databases (e.g. PostGIS and MonetDB).

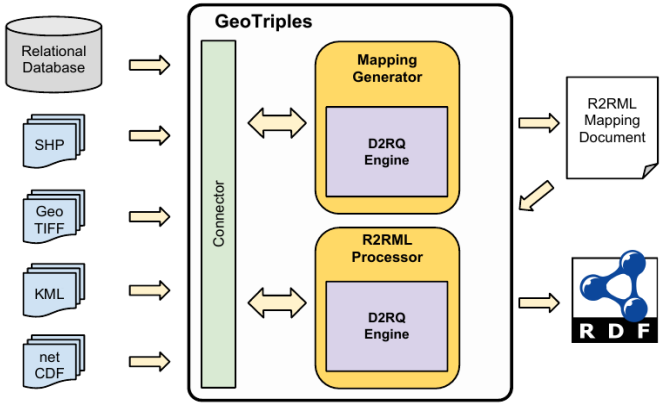
- Procedure

(1) creation of RML/R2RML mapping rules related to the input data.

(2) generation of RDF file based on the input data and the mapping rules.

- Output

RDF



Reasoning framework

- The reasoning framework is implemented using native OWL 2 RL reasoning and SPIN rules.
- Detecting semantically relevant terms

A connection among Babelfy API, BabelNet Linked data interface and WordNet interface is achieved for detecting semantically relevant terms in tweets topics.

Input example

```
[
   {
      "id":"1",
      "labels":[
         {
            "text":"area",
            "score":1.1073852024257E-7
         }
      ],
      "location":{
         "latitude":45.5455,
         "longitude":11.5354
      },
      "tweets":[
         "1001376987271778310"
       ],
      "top_ranked_tweets":[
         "1001376987271778310",
       ]
   }
]
```

Output example

```
[
   {
      "Id":"1",
      "Wordnet":[
         {
            "Level 1":"05130681-n",
            "Level 3":"04923519-n",
            "Level 2":"05097645-n",
            "Term": "area"
         }
      ]
   }
]
```

Definition

(n) extent *the distance or area or volume over which something extends; "the vast extent of the desert"; "an orchard of considerable extent"*

Localisation module

- Implementation of long short-term memory-based (LSTM) named-entity recognition (NER) approaches to further enrich the metadata with geolocation information.

English

How quick-thinking mother saved family from Grenfell fire by flooding her flat

Emergency declared in #Paraguay after flooding from torrential rains. https://t.co/Z.....

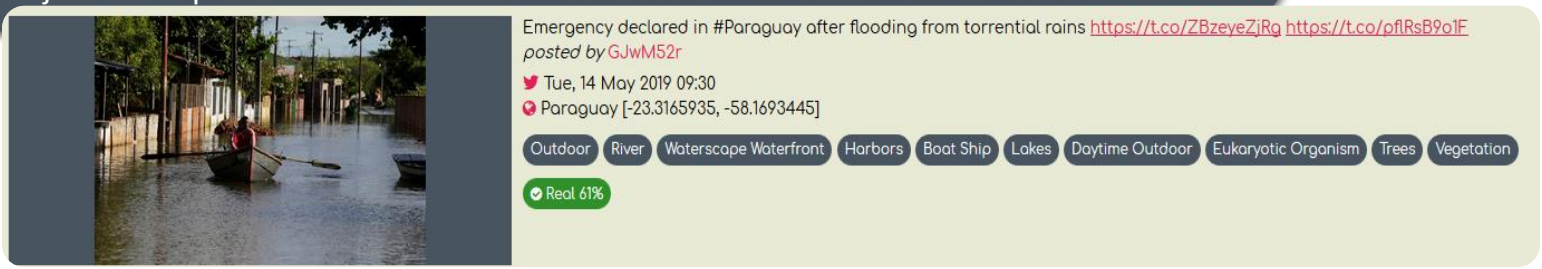
Italian

Presentazione il sistema di #allertameteo della #ProtezioneCivile della città di #Gorizia

Ponte Milvio fa acqua: ancora un allagamento in via Prati della Farnesina... #news #Roma

Finnish

Lumi riittää jo meidän pihaan! #Joensuu #lumi #sää

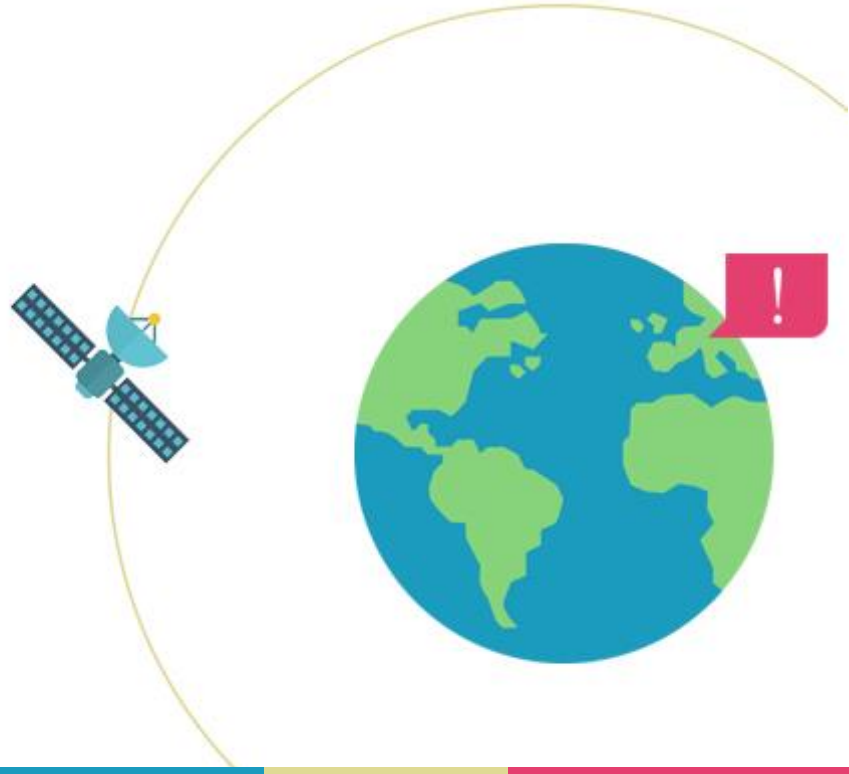


Results

- Building a rich semantic network of interlinked data
- Extracting additional inferences using reasoning framework
- Recognizing localization information
- Replying complex semantic queries
- Supporting decision making and decision-support systems

Thanks!

Any questions?



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