empathi: An ontology for Emergency Managing and Planning about Hazard Crisis

1. Abstract

The domain of crisis/hazard is erratic with new concepts emerging in varied incidents. There has been prior work in modeling a hierarchical structure for actionable disaster management and response for the organization, but less captures dynamic social media. Furthermore, existing state-of-the-art ontologies/vocabularies/databases circumvent important concepts that really play critical role disaster preparedness. For instance: *Modality of data* can support the creation of a multi-model learnable system for efficient decision making. *Status* of service is important to regulate the supplies during the incident and make sure that victim's request is responded in a timely manner. *Empathi ontology* ingests some of the necessary features of the existing ontologies and provides a hierarchical conceptualized structure to support artificial intelligence and natural language community. Herein we communicate fundamental concepts and requirement of this ontology.

2. Snapshots of the ontology

Empathi ontology comprises of 286 classes and 328 relations defining the dynamics of hazard domain. In this section, we provide some snapshots of some commonly occurring concepts in the hazard domain.

1. Service: It is an act of providing support to someone in a situation of distressing incidents. Core sub-classes of this concept are (i) Financial Care (ii) Healthcare Service (iii) Helpline (iv) Human Remains Management (v) Resource and Information Centre (vi) Supply (vii) Transportation and (viii) Prayer Location. Also, it is important that "service" concept to be linked to Place to precise define the location for ease in accessibility.
2. Modality of Data: Information (raw, structured or semistructured) conveyed or represented by a particular arrangement or sequence of text, audio, video or photos. Sub-classes included by this concept are (i) Audio (ii) Photo (iii) Text and (iv) Video.
3. Hazard Type: lists different types of hazards that can affect human community. It is an entity type that embodies sub-classes (i) Airburst (ii) Coastal erosion (iii) Drought (iv) Earthquake (v) Explosion (vi) Fire (vii) Flood (viii) Hurricane (ix)

Landslide (x) Sandstorm (xi) Storm (xii) Tornado (xiii) Toxic Radioactivity (xiv) Tsunami (xv) Volcano and (xvi) Winterstorm.

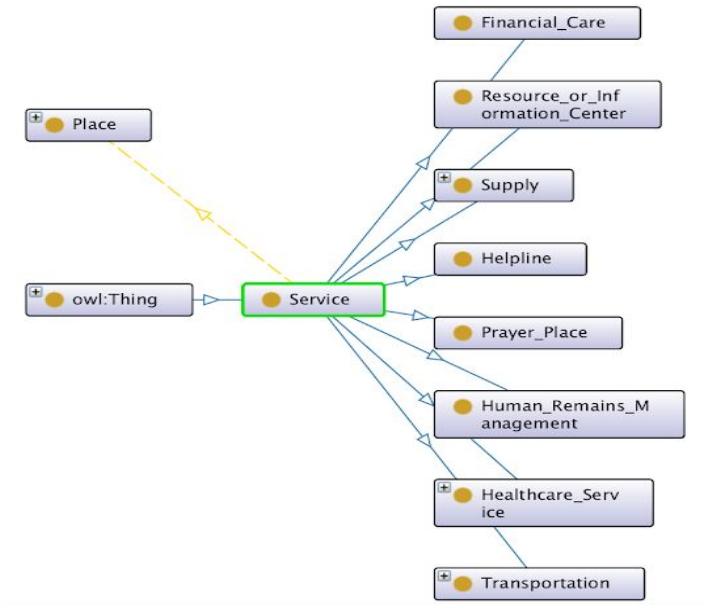

Figure1. class Service in *empathi*

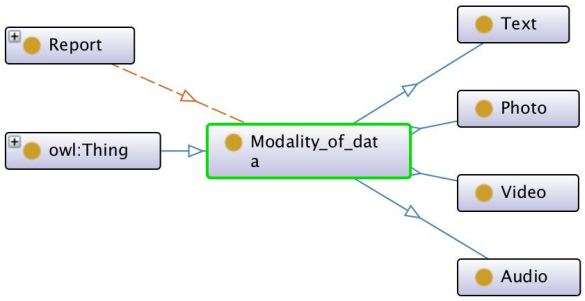

Figure 2. Class Modality of data in *empathi*

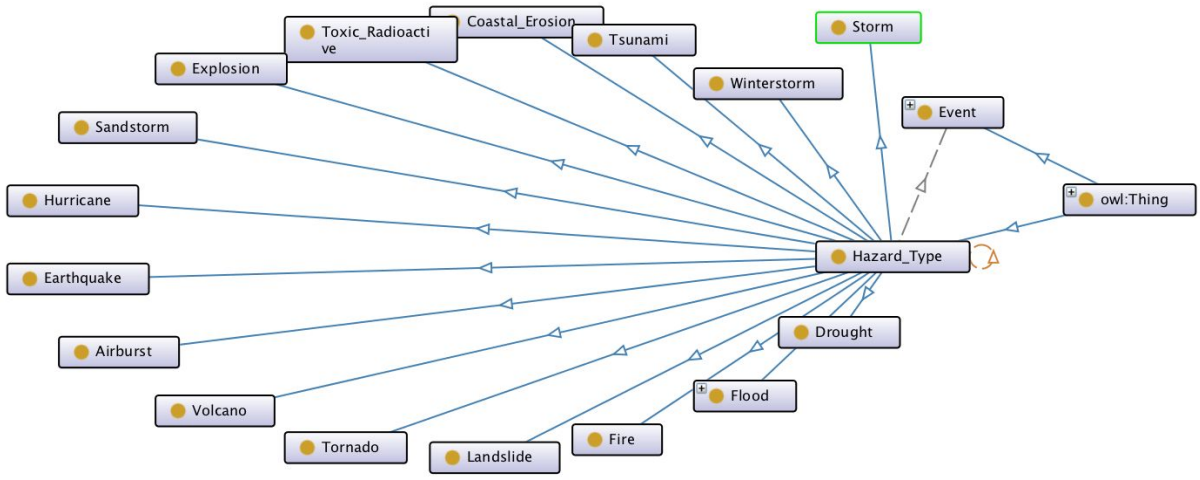

Figure 3. class Hazard Type in *empathi*

3. Namespaces

The namespace for *empathi* is http://knoesis.org/ontology/hazard. *Empathi* uses terms from other vocabularies. A full list of namespaces is represented in the following table.

URI	Reference
http://www.geonames.org/ontology/	geonames
http://ontology.eil.utoronto.ca/icontact.owl	iContact
http://purl.org/dc/elements/1.1/	dc-elements
http://www.w3.org/ns/ma-ont	ma-ont
http://rdfs.org/sioc/ns#	sioc
http://linkedevents.org/ontology/	lode
http://xmlns.com/foaf/0.1/	foaf
http://purl.org/dc/terms/	dc-terms
http://purl.org/dc/dcmitype/	dc-type
http://www.w3.org/2000/01/rdf-schema#	rdfs
http://www.w3.org/1999/02/22-rdf-syntax-ns#	rdf
https://github.com/hxl-team/HXL-Vocab/blob/master/Tools/hxl.ttl	hxl-ttl
http://observedchange.com/moac/ns-20120129/	moac

4. Getting Started

"empathi" is a hierarchically structured knowledge source for identifying actionable information from social media text. It has been built using Protege. It has been designed with the support of following ontologies/databases:

- EM-DAT (Emergency Management Database): http://www.emdat.be/Glossary
- Disaster Domain Model: Existing Kno.e.sis ontology, integrated into empathi.owl. (Disaster-domain-model-v2.rdfxml.owl, created by Dr. Hemant Purohit: https://goo.gl/4qHHHp)
- iContact.owl: An owl file defining an expression for location mention identification.
- SIOC: Semantically-Interlinked Online Communities is an ontology identifying communities of sites on the web created ad-hoc during any event. Folder contains "ns.rdf" which contains axioms, classes, data property and object property of SIOC. Though it has been added to empathi.owl.
- mapping_v3.01.rdf, nearby.rdf, neighbours.rdf, and contains.rdf: These are backup rdf files for GeoNames ontology which can be used when the source is not reachable (we experienced it).

5. Prerequisites

Protege: A tool developed by Stanford University for visualization, querying, reasoning, and creation of the ontology. In order to view different classes, axioms, and properties of "empathi.owl", one can import the file in Protege.
Home Page: https://protege.stanford.edu

6. Installation of Protege

- Text: https://protegewiki.stanford.edu/wiki/Install_Protege5
- Video: (Mac) https://goo.gl/3z1ZLL
  (Windows) https://goo.gl/pLeFQQ

7. Downloading *"empathi.owl"*

- Due to above-listed dependency, please download the following folder: http://knoesis.org/ontology/hazard/
  - Wget command: wget -r -np -nH -R index.html* http://knoesis.org/ontology/hazard
- After Downloading the folder, open “empathi.owl” file in Protege that has been downloaded previously.

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