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Exploiting linked entities and automatic classification for supporting geotectonics knowledge: an application study to geomapping

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In recent years there have been a number of efforts for encoding the tectonic knowledge into logic theories, sometimes resorting to probabilistic models for uncertain elements. Also, the development of the WWW has evolved into the Semantic Web initiative, with the Linked Data paradigm that aims at connecting different portions of the knowledge, also belonging to different disciplinary realms.

In particular, for the case of the geotectonic knowledge a great deal involves the connection of the static description of entities with the dynamic description of processes. The GeoScienceML data model has provided some connections between the geologic entities, namely units and structures, with the geologic processes: for example, a geologic structure is related to (link GeologicHistory) some geologic event, which in turn are related to event processes and environment (links EventProcess and EventEnvironment, respectively).

Moreover, reasoning algorithms can be applied to such knowledge for performing classifications of entities for which some properties hold and for inferring novel links over entities. We believe that the power of computational ontologies together with the spread of the linked data paradigm can greatly support the construction of a logic theory of the geotectonic knowledge by addressing those issues that fall in the expressive power of descriptive logic. This requires an effort of encoding and the developing of specific applications on a large scale.

Here we present the OntoGeonous approach, which exploits the power of computational ontologies, by introducing definitions through necessary and sufficient conditions, SWRL rules for representing knowledge covering distant fragments of knowledge, and the data linking for the automatic classification of entities as well as the creation of novel connections over entities involved in the geomapping process.