

A Semantic Web of Human Tasks, Instructions and Activities

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Procedural knowledge (or know-how) is a fundamental aspect of human knowledge, and a large amount of it is represented as Web resources, such as step by step instructions and procedures. These resources are typically written in natural language and are not machine understandable. In an ontological format, instead, human know-how can be used by machines in several applications, such as activity recognition, robotics, common sense reasoning, and the development of assistive agents. Despite its importance, however, very little work has been done to create large scale ontologies of human know-how. This contrasts with a much stronger focus on declarative (or factual) knowledge, which has already led to development of several factual knowledge bases, such as DBpedia and ConceptNet.

With the objective of improving the machine understandability of human know-how available on the web, we have developed the PROHOW ontology. PROHOW is a lightweight ontology to represent instructions, namely how tasks can be achieved, and activities, namely what tasks have been (or are being) accomplished. The most important feature of this ontology is that it represents human know-how at the same level of granularity used in human readable resources, such as step by step instructions.

The chosen level of abstraction facilitates the automatic extraction of know-how from existing instructional websites like wikiHow and Snapguide. Existing experiments on these websites have generated a large procedural knowledge base containing the PROHOW representation of over 200,000 sets of instructions. We chose to represent this knowledge as Linked Data in order to enrich it with links to other knowledge bases. Knowledge integration experiments showed that such links can be automatically discovered with better precision and recall than those manually created by a user community. Finally, we tested the machine understandability of this ontology by asking an artificial agent to assist users in following sets of instructions, automating steps whenever possible.