




# Construction and Application of a Knowledge Graph

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**Abstract:** With the development and improvement of modern surveying and remote-sensing technology, data in the fields of surveying and remote sensing have grown rapidly. Due to the characteristics of large-scale, heterogeneous and diverse surveys and the loose organization of surveying and remote-sensing data, effectively obtaining information and knowledge from data can be difficult. Therefore, this paper proposes a method of using ontology for heterogeneous data integration. Based on the heterogeneous, decentralized, and dynamic updates of large surveying and remote-sensing data, this paper constructs a knowledge graph for surveying and remote-sensing applications. First, data are extracted. Second, using the ontology editing tool Protégé, a knowledge graph mode level is constructed. Then, using a relational database, data are stored, and a D2RQ tool maps the data from the mode level's ontology to the data layer. Then, using the D2RQ tool, a SPARQL protocol and resource description framework query language (SPARQL) endpoint service is used to describe functions such as query and reasoning of the knowledge graph. The graph database is then used to display the knowledge graph. Finally, the knowledge graph is used to describe the correlation between the fields of surveying and remote sensing.

**Keywords:** knowledge graph; surveying; remote sensing; knowledge visualization



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## 1. Introduction

In 2012, Google officially proposed the concept of the knowledge graph, which aims to assist intelligent search engines [1]. After the knowledge graph was formally proposed, it was quickly popularized in academia and industry and was widely used in intelligent search, personalized recommendation, intelligence analysis, anti-fraud and other fields. Essentially, a knowledge graph is a semantic network and knowledge base with a directed graph structure that describes entities (concepts) and their relationships in the physical world in symbolic form. The knowledge graph is represented in the form of triples (Entity1-Relation-Entity2), where the nodes of the graph represent entities or concepts, and the edges represent the relationships between entities or concepts [2].

Knowledge graphs are a new method of knowledge representation. In essence, the semantic web is an early form of the knowledge graph, which is an abstract concept that describes entities and relationships between entities in the objective world and is also a networked knowledge base composed of entities, properties, and relationships. A knowledge graph is a collection of concepts, entities, and their relationships in the abstract physical world [3]. The knowledge graph has changed the traditional method of information retrieval. On the one hand, knowledge graphs describe the semantic and attribute