

Chapter 54

Satellite Parametric Description to Ontology Concepts and Semantic Classification of Satellite Data

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ABSTRACT

Current satellite data retrieval systems retrieves data using latitude, longitude, date, time and sensor parameters like wind, cloud etc. To achieve concept based satellite data retrieval like Storm, Hurricane, Overcast and Frost etc., requires ontological concept descriptions using satellite observation parameters and concept based classification of satellite data. The current research work has designed and implemented a two phase methodology to achieve this. The phase 1 defines ontology concepts through satellite observation parameters and phase 2 describes ontology concept based satellite data classification. The efficiency of the methodology is been tested by taking the Kalpana satellite data from MOSDAC and weather ontology. This achieves concept based retrieval of satellite data, application interoperability and strengthen the ontologies. The current methodology is implemented and results in concept based satellite data classification, storage and retrieval.

INTRODUCTION

Remote sensing is a powerful technology for earth, ocean and environment observations which are used extensively in various applications, interdisciplinary research and diverse domains. The satellite observations can be broadly categorized in to two major groups, satellite images and observation parameters like temperature, wind speed, precipitation, radiation, etc., in gridded data file formats. The most prominent scientific gridded data file formats for satellite data observations are ASCII, HDF5, Binary, GRIB and

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NetCDF etc. These file formats stores, access, manage and exchange massive diverse and complex satellite observations. The existing system stores, classifies and retrieves the satellite data based on satellite, sensor, date, time, latitude, longitude and satellite observation parameters (wind speed, wind direction, pressure level, Long wave radiation, temperature etc.) and keywords based search. The processing and retrieval of these scientific grid data is based on the observation parameters, and has got a very strong efficient retrieval system, which can address queries like:

- Temperature profiles
- Wind profiles from a satellite for a particular period
- SST profiles in a spatial bounding box (Lat/Lon)
- Rainfall datasets
- Long wave radiation of specific location for a specified duration, etc.

A more enhanced concept based queries like:

- Locate fresh gale
- Locate storm
- Locate moderate solar radiance
- Locate hurricane
- Locate above room temperature
- Show various kinds of winds: storm, fresh breeze, hurricane etc.
- Semantic classification of precipitation

cannot be address using the existing satellite observation processing and retrieval systems. It is observed that there is a conceptual gap between satellite observation parameters and application domain concepts. This raises the need to transform from satellite observation parameter retrieval systems to application domain concept based semantic retrieval of satellite observations. Semantic concept based queries can be addressed by bringing the semantic technology in to remote sensing applications. Satellite observations are stored in grid file formats that contain parametric values of various observations. The satellite observation parameters are like temperature, pressure and wind speed etc. The remote sensing application domain knowledge is represented in semantic world as concept and concept hierarchy like wind, storm, light breeze, hurricane, sunny wealth state etc. Mapping/bridging the conceptual gap between the parametric nature of scientific grid data to the concept description of the domain knowledge, brings semantic based knowledge processing for remote sensing applications. In order to make the retrieval system more efficient, satisfy scientific needs and enhance inter/multi-disciplinary research, the retrieval system should have semantic concept based satellite observation parameters storage, process and retrieval capabilities. Semantic technology transforms the journey from data processing to knowledge processing, leads to efficient and powerful Knowledge based systems. Interoperability of satellite data is a big challenge across heterogynous applications and heterogynous domains. Ontology concept base processing of scientific grid data brings semantic interoperability enhances data exchange, share and common understanding across the world. Semantic enhancement enables concept based search such as cloud burst, cyclone, heavy rainfall, dust storm, hurricane etc. Ontology of various domain are very well defined and developed for diverse applications. The prominence of ontology is reusability, enhancement and extensibility. Satellite observations data is in parametric form and applications domain knowledge

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