ONTOLOGY BASED IDENTIFICATION OF PLANT DISEASES AND VARIETIES OF CHILLY

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Abstract

The development of agriculture is one of the most important factors for the development of human life. An Ontology based information system is created for Chilly crops. This system is used in an effective way to extract information about the Chilly crops from the developed crop ontology. Ontology development process consists of eight different stages implemented in chilly crop field. It contains the information of different varieties of Chilly plants and find the various diseases affected on farming, which is prevalent in the Chilly crops, can be extracted from the proposed technique.

Keywords : SPARQL, Mapping, Chilly Crop Ontology.

I. INTRODUCTION

Now a day's raising field of both floras and faunas of particular region in agriculture area which is important source for human survival. Crop Information system means information about particular crop, land preparation, sowing, weeding, and harvest and post-harvest process. The concept of KBS (Knowledge based system) is rooted in the field of artificial intelligence and were system tries to initiate and adapted on human knowledge and other expert system. The component of KBS is knowledgebase, inference engine, database, user tool for knowledge engineering, and user interface. Structure Ontology is to describe domain knowledge with hierarchical structure, which can be used domain of Skelton representation of same Ontology. However, this system can improve the information and functionality of Chilly crop in farming area and were it is used to identify the process of Chilly cultivation practices, Chilly varieties, and pest and disease control measures. As a result of Chilly crop information is found on retrieved knowledge system.

Absence of sufficient knowledge of Chilly crop inter-cultural practices, crop rotation, multiple cropping, irrigation facilities, crop insurance, etc., is standing in the way of Indian agriculture. Lack of effective and meaningful agriculture activity in many parts of our huge countryside is also a great problem of Chilly crop in Indian agriculture. There is no proper co-ordination in between agriculture institutions for Chilly crop information. The symptoms of diseases and the pests, which causes diseases while cultivation is not clearly explained. Moreover, the existing applications are not fully accessible by the farmer.

I. RELATED WORK

Dineshkumar P et. al proposed the agriculture domain is divided into four sub-domains. They are Crop Ontology, Crop Disease Ontology, Soil Ontology and Climate Ontology. These sub-domains are studied individually and ontologies for each sub-domain is constructed separately. Finally, each sub-domain ontology is merged [2].

Taehyung Kim et. al proposed the latest agricultural environments focus on the IT-agricultural union to aim for smart and ubiquitous agricultural services[3].

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Patil Akshay et. al proposed an agricultural review system assist to connecting with farmers as well as the agriculture domain experts. Using these three types of components used in the system are called structure of Ontology, web-based services and android os App development [4].

Jincui Kang et. al gives an information of agricultural fields on internet turn into more popular, investigate the ontology information agricultural system is complicate to explore the accuracy data on information of diverse. In order to appear the information retrieval on internet and such intelligent system of agricultural ontology process [5].

Mrs. Sumathy Easwaran et. al proposed the black pepper ontology created for food-agro sector, the created ontology to extract the new knowledge in the azreas of black pepper [6].
WEI Yuan-yuan et. al suggested the Agricultural Ontology Service (AOS) provide the knowledge serve a implement and development on service of agricultural information. To enrich the need of ontology with expert assistance. [7].

Er. Nikita Rishi et. al proposed the five steps to implement the image processing. They are 1. Image Acquisition, 2.Image Pre-processing, 2.1 Image Segmentation, 3. Image Extraction, 3.1 Feature Extraction, 4. Image classification and 5. Adaptive K-means Clustering Algorithm [8].

Guoxia Yang et. al proposed a construction methodology of an agricultural domain ontology based on thesaurus is used to retrieve the agriculture information effectively. The retrieval method, which is based on the keyword, plays a significant role in searching and utilizing the resources of information, but it is poverty in recall ratio and exactness ratio. The work is to construct the agricultural domain ontology and improve the recall ratio and exactness ratio of the information resources in the field of agriculture[9].

Swaran Lata et. al proposed, India itself has number of portals for various divisions, websites, directorates and a project related to different departments really exists. However, these websites are not able to share information of website services, and it covers unchanging, non-consistent, non-integrated of web information's. Therefore, the proposed technique give answer for all these problems. They use four common procedures to design, to develop and implement a system on agriculture ontology . Then to identified and justified the concepts of real problem, establishing their relationship, frame rules based control and agri subsystem Ontology [10].

Gelian Song et. al gives an agriculture is a big and complex domain knowledge. To get the important agriculture information from complex agriculture system, it needs concept modeling effectively. Therefore, the ontology can answer the knowledge presentation difficulties [11].

II. APPLICATION DEVELOPMENT TO ACCESS CROP ONTOLOGY

Chilly Crop Ontology development process consists of eight stages followed by developing the application[12]:
This development process is not a linear approach it has to undergo various iteration and backtracking steps at different levels of the process.

A. Determine Scope

Development process of ontology is clearly to achieve target domain and goal. The process of domain that cover specific domain and particular user. A collection data and its structure for particular programs to use specific domain. So can use Chilly crop ontology domain for an agriculture.

B. Consider Reuse

Reuse ontology in the same domain, if exists. If does not exist, create new. In our Chilly Crop Ontology creation “Black Pepper Ontology” model is referred. However, there is no existing ontology used in Chilly crop ontology.

C. Enumerate Terms

A first phase process the ontology is down in an unstructured list, all terms are associated to appear in the process. In general, nouns form the basis for concepts (class names namely Chilly crop, and verb phrases form the basis for property names such as has practices [12]. The Chilly crop ontology terms are: Chilly Varieties,Transplanting, Irrigation, Fungal Diseases, Harvesting, Bacterial and Viral Diseases, Climate, Insect and Pests, Yield, Physiological disorder, Nursery Raising, Inter-culture and Weed control and Manure and Fertilizers.

D. Define Taxonomy

The identification process is done by relevant terms were is to be organized with taxonomic hierarchal structure . which is more efficient/reliable to do this in a top-down or a bottom-up approach[12]. In the Chilly crop ontology Varieties is a subclass of Chilly and all the instance of Varieties must also be an instance of Chilly. owl:subClassOf and rdfs:subClassOfare built-in semantics of primitives. Figure1 shows the Classes to – Subclass "is-a" ploted with process of Chilly plant ontology.

A. Define Properties

Here this step is connected and followed with the previous one that is: Natural to organize and manage the properties that connect and linked the classes while organizing these classes in a level by level structure like hierarchy [12].they consider that the structure and semantics of the subclass is relation need and demand that Varieties has a subclass of Chilly, each and every property reported that holds for instances of Chilly must also apply to instances of Varieties. Figure2 shows mapping process of Chilly Crop Ontology Classes with inheritance of ontology. Every property has generality and specificity. The general represents domain and specificity represents the range. To detect the potential irregularity and false construction in the structure of ontology by spotted domain as well as range violations [12].

Object Property: Maps class with other Classes and Maps Individual with other Individual.

Data type Property: Maps an Individual with a data type value.

Annotation Property: Property for adding notes.

In Chilly crop ontology, CanBeAffectedBy is an object property that domain is Chilly and ranges are Fungal_Diseases, Physiological_disorder and Bacterial_and_Viral_Diseases.

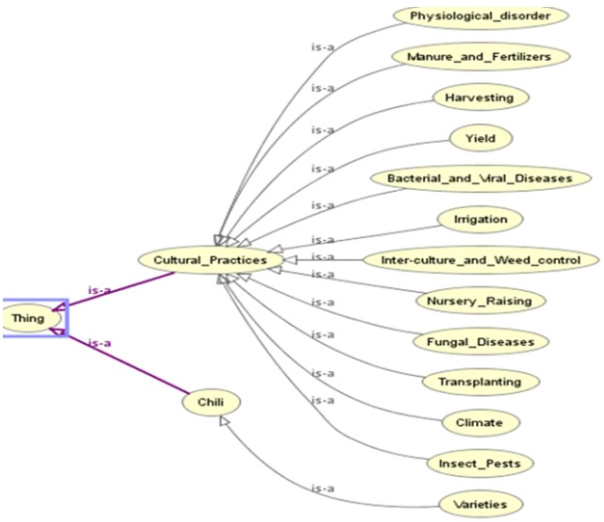

Figure1: Class – Subclass "is-a" mapping

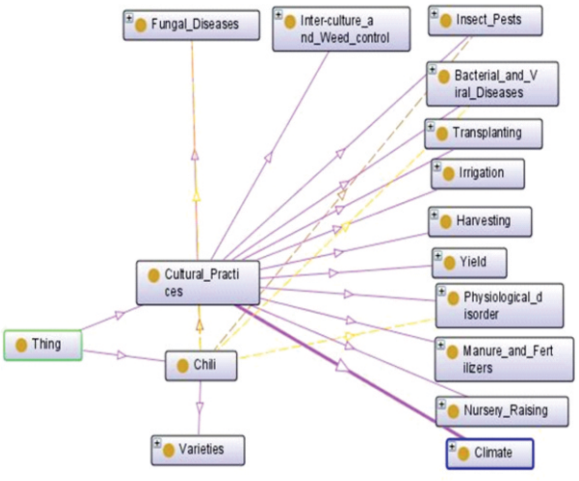

Figure 2 : Chilly Crop Ontology Classes

A. Define Facets

Facets represent restrictions. Types: ValueType and Cardinality.

1. *Value Type*

Represents exact number of values asserted for the slot for that class. E.g., String, Number, Boolean, Integer, etc.,

2. *Cardinality*

Represents exact number of values asserted for the slot for that class. E.g., hasPractices, canBeAffectedBy and canBeAttackedBy.

B. Define Instances

Individuals : Instance of a class. The current process is creating individual instance of classes in the hierarchy. Figure3 shows the Chilly Crop Ontology Varieties Individuals included in our model e.g., CO_1.

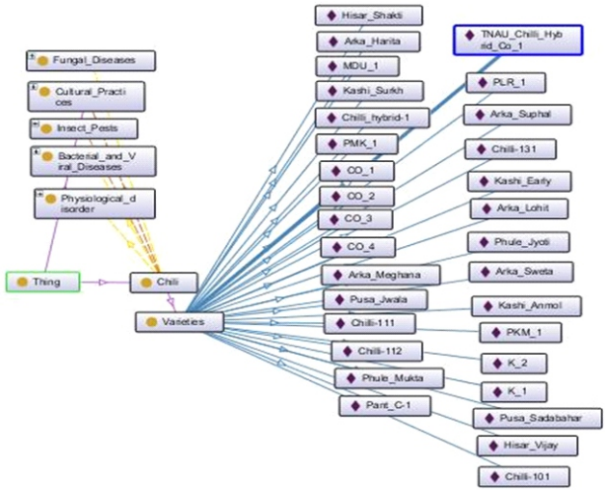

Figure 3 : Chilly Crop Ontology Varieties Individuals

A. Check for Anomalies

OWL and RDF schema has an important advantage in handling or defecting inconsistencies present in Ontology. Similarly, properties like cardinality is frequent sources of inconsistencies. Finally stage is analysis of requirements on property values which is conflict with domain along with the range of restrictions and yet to be provide another source of possible inconsistencies [12]. In the Chilly Crop ontology, there are no inconsistencies and incompatible domain and range definitions.

IV. EXPERIMENT AND RESULTS

A. Experiment

The proposed Chilly crop ontology created. Therefore, retrieve the created ontology to Chilly crop information using SPARQL. SPARQL is a protocol and query language for semantic web data sources. The below SPARQL query used to retrieve the class and subclass in Chilly crop ontology and the figure4 below shows the retrieve the class and subclass in Chilly crop ontology.

```
SELECT ?subject ?object
WHERE
{
?subject rdfs:subClassOf ?object
}
```

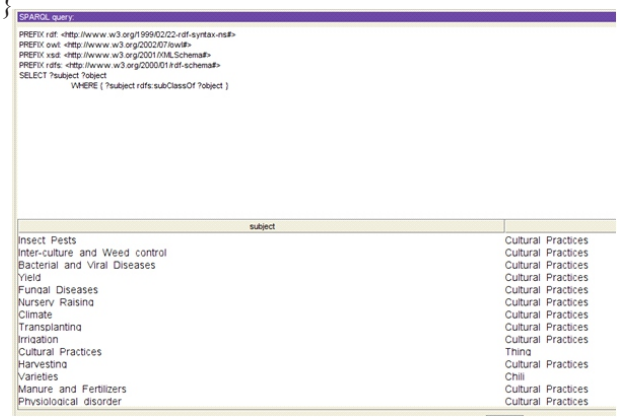

Figure4: Retrieve the Class and Subclass in Chilly Crop Ontology

The below SPARQL query used to retrieve the individuals in Chilly crop ontology and the figure -5 below shows the retrieve the individuals in Chilly crop ontology.

```
SELECT
*
WHERE
 {
?
individual rdf:type ?type .
OPTIONAL { ?type rdfs:subClassOf ?class }
}
ORDER BY ?class
```

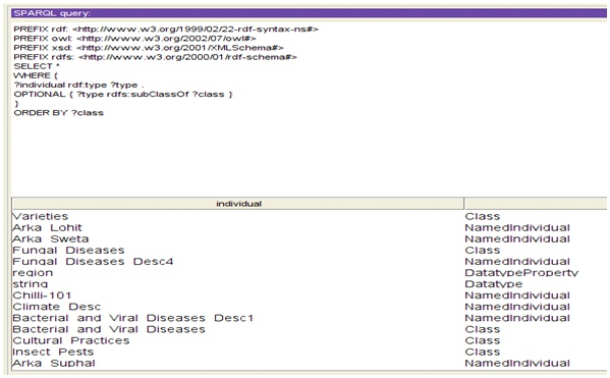

Figure5: Retrieve the Individuals in Chilly Crop Ontology

The Chilly crop variety has thirty-one varieties to retrieve the web page using java servlet, Jena API and NetBeans IDE 6.9.1. Figure -6 below shows the Chilly varieties list and Figure7 below shows the Chilly varieties, feature and region.

Figure 6 : Chilly varieties list

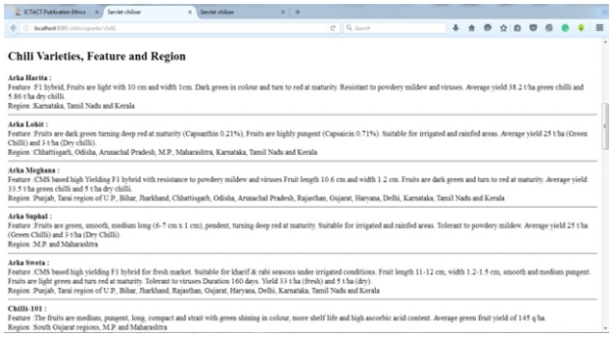

Figure 7 : Chilly varieties, feature and region

The Chilly cultural practices subclasses list and description are retrieved in the web page using java servlet, Jean API and NetBeans IDE 6.9.1. Figure8 below shows the Cultural practices subclasses list. Figure9 below shows the Cultural practices subclasses description.

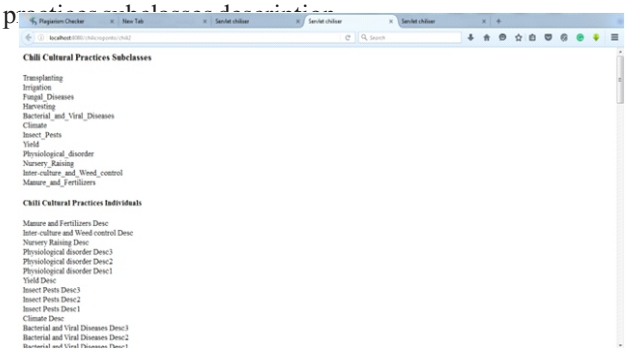

Figure8: Cultural practices subclasses list

A. Results

The result obtained is based on the Chilly crop ontology using SPARQL query. The first experiment was to retrieve the subclass and super class in Chilly crop ontology. The second experiment was retrieving the individuals in Chilly crop ontology. Final experiment was retrieving Chilly crop varieties and Cultural Practices information in web page using java servlet, Jena API and NetBeans IDE 6.9.1.

TrOWL[13], hosted at University of Aberdeen, published under AGPL for open source applications. TrOWL is second version of the Web

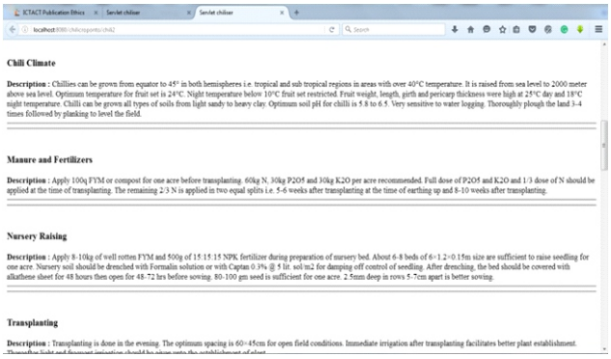

Figure 9 : Cultural practices subclasses description

Ontology Language WL2[14], and it comes under the family of ontology languages, which includes the OWL2-DL, it is most expressive language with OWL2 family and three tractable sub-languages of OWL2-DL therefore first language is OWL2-EL, second language is OWL2-QL and finally next language is OWL2-RL. TrOWL supports not only standard TBox and ABox reasoning, but also conjunctive query answering in SPARQL.

Supported interfaces: Jena, Protege, Command Line, OWL API.

Supported reasoning services: realisation, classification, satisfiability, conjunctive query answering, entailment, consistency.

Supported syntaxes: NA

In the Chilly crop ontology, first step is to select the TrOWL reasoner and second step is to start the reasoner. Now, Chilly crop ontology is efficiently developed and it is shown consistency. However, any inconsistencies in the Chilly crop ontology, which immediately shows error message. Finally, stop the TrOWL reasoner in the Reasoner menu. In, Chilly Crop ontology evaluated using the TrOWL reasoner. It showed consistency taxonomy, object property, data property, instances and individuals, domain and range for Chilly Crop Ontology.

V. CONCLUSION

Agriculture crop ontology for Chilly gave the detailed information about Chilly cultivation and its varieties. The Chilly crop ontology has developed using Protégé tool and retrieved in the web page using java servlet, Jena API and NetBeans IDE 6.9.1. Chilly crop ontology has two main functionalities, first the Chilly varieties and seconds the cultivation process of Chilly. The first functionality explains the varieties of the chillies in India. This will explain the different varieties, its features and the regions it is grown. The second functionality explains the cultivation practices of Chilly. The Chilly cultivation practices has climate information, Manure and Fertilizers information, Nursery raising information, Transplanting information, Irrigation information, Inter culture and Weed control information, Harvesting information, Yield information, Physiological disorder and control information, Insect pests and control information, Fungal diseases and control information, Bacterial, Viral diseases and control information. So, this Chilly crop ontology will be helpful to the farmers.

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