GREENTHUMB: A MOBILE APPLICATION TO ASSIST FARMERS

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ABSTRACT

India is called as land of agriculture. Agriculture accounted for 14% of the GDP (gross domestic product) in 2015-16, about 55% of the workforce. In recent years any information can be obtained from mobile devices by connecting them to internet. Farmers need advice to take decisions during the farming activities. The project is to develop a mobile application that assists farmers in various aspects. This app guides a farmer from planting to harvesting in a timely manner, provides recommendations for plantings based on soil conditions, guidelines for plant growth by suggesting the fertilizer mix and current market status regarding the particular crop is also investigated and intimated to farmers. This also provides information about the weather. There is significant amount of information available in the web regarding agriculture. Data is transformed and stored in database in the form of Ontology based repositories. RDF and OWL are the Ontology based repositories used. Large datasets stored in Ontology based repositories improvises the speed in querying semantic data. RDF (Resource Description Framework) is constructed for semantic data on a Relational Database containing structured and unstructured data. A schema is identified for the Relational database and RDF representing the schema is constructed using Jena API. OWL (Web Ontology Language) is a language for defining and instantiating Web Ontologies which refers to the science of describing entities in the world and how they are related. Semantic queries based methodology is proposed to improve the query efficiency and reduce operation cost. Retrieving data from ontology-based repositories is done using SPARQL.

Keyword: - *NPK value, OWL, RDF, Market prices, Android App, Weather, fertilizer mix, pesticide.*

1. INTRODUCTION

India is called as land of agriculture. Agriculture plays a significant role in India's socio-economic sectors. India is the world's largest producer of many fresh fruits and vegetables, milk, major spices, selective fibrous crops such as jute, staples such as millets and castor oil seed. India is the second largest producer of wheat and rice, the world's major food staples. Farmers play a key role in agriculture. They require various kinds of information related to agriculture. Web contains enormous amount of information regarding agriculture. The challenging task for farmers is to retrieve this information that has been stored in different formats and to understand them. Now-a-days farmers are able to afford a low cost smart phone. Therefore with the increase in mobile technology and mobile enabled information services information can be directly delivered to farmers by means of mobile application. In this paper a mobile application is developed that provides suggestions to the farmers regarding the farming activities like type of crops that can be planted based on soil test values, pesticides, fertilizer mix. This also provides information about weather and market prices. Semantic search is a methodology used to retrieve data from the web efficiently. Web contains large datasets. Data is transformed into Ontology based repositories like RDF and OWL. Large datasets

stored in Ontology based repositories improvises the speed in querying semantic data. Semantic queries based methodology is proposed in order to improve query efficiency and reduce operation cost in smart phones.

2. FEATURES OF THE SYSTEM

GreenThumb is an android based application. This has a simple interface that provides recommendations to farmers regarding type of crop that can be grown, suggests pesticides for controlling the pests and fertilizer mix. This also gives information about weather as notifications and market prices for the crops. Information related to agriculture is maintained in a Database. This data is transformed into Ontology based repositories like RDF and OWL. Ontologies are created for each aspect and data is retrieved using these ontologies. SPARQL is query language used to retrieve data from repositories.

3. LITERATURE SURVEY

Development of Fertilizer Apps (F Apps) for well informed Decision Making among the Farmers – Manikandam Block

This paper proposes the idea of developing an android app that suggests the fertilizers quantity to be applied on rice crop. This paper mainly focuses on Manikandam block in Tiruchirappalli district. Amount of fertilizers to be applied is given at the rate kilogram/hectare, calculations are done using specific formulae: product of blanket recommendations ratio that are stored in database and specific value for Urea, super phosphate and Muriate of Potash respectively.

MahaFarm – An Android Based Solution for Remunerative Agriculture

MahaFarm' includes agro-based crop information, weather updates, daily market prices and news/loan informational updates. The application has been designed taking Maharashtra into consideration.

Implementation of Keyword Search Mechanism on RDF Graph Model

This paper proposes the implementation of a keyword based querying system operating on RDF databases. Querying the information is done using structured queries utilizing graph-pattern languages like as SPARQL. Indexing, pruning and refinement are the technologies used. Mining algorithms are used to form sub graph from RDF graph data. To retrieve the well-organized keyword from sub graph keyword matching algorithm can be used for graph data.

Comparative Study of Semantic Search Techniques using RDF

In this paper, comparison is done on various searching techniques which make use of RDF, based on certain parameters. The main intention is to identify the searching techniques which will be best suited for different purposes.

Survey of Android apps for agriculture sector

Mobile computing, cloud computing, machine learning and soft computing are the immerging techniques which are being used in almost all fields of research. The paper is about how Android Apps of agricultural services have impacted the farmers in their farming activities.

4. MODULES

A. Farmer Registration and Plants Ontology
B. Pest Ontology and Weather Report
C. Fertilizer Mixing and Marketing
D. Semantic Search

MODULE A: FARMER REGISTRATION AND PLANTS ONTOLOGY

The farmer has to register details. The server in turn stores the farmer information in its database. Farmer enters soil test value (N, P, K) to the server, now soil test value checks in Soil ontology. Each N, P, K value checks in each data

type attribute in Ontology. Plants will be recommended to the farmer by the following strategy: Exact or above N, P, K values are checked with data type attribute in Soil Ontology, if both matches, relevant plants will be recommended first. Next one or two N, P, K values, if matches found then relevant plants will be recommended. Farmer Information saved as an individual in Farmer Ontology.

Fig A.1 Menu Page

Fig A.2 Registration Page

MODULE B: PEST ONTOLOGY AND WEATHER REPORT

Farmer uploads a pest image to the server. The server checks in Pest Ontology to retrieve the solution of an uploaded pest image. Everyday system monitors weather report of the farmer district from phone db and stores weather information in database. The past 3 days weather status informed to the farmer. If farmer request weather report and server provides solution from Weather Ontology.

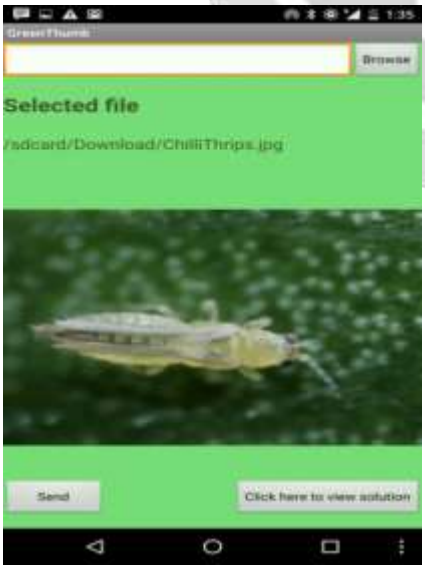

Fig B.2 Pest Solution

Fig B.1 Pest Image Upload

MODULE C: FERTILIZER MIXING AND MARKETING

Farmer request fertilizer mix for plants to Server by giving the input as acre, plants, reason. Server checks in Soil Ontology and retrieve N, P, K values of the plant. Then check in Farmer Ontology and retrieve farmer plants N, P, K values. By comparing both values and also checks the reason (Growth, pests), server provides fertilizer mixing for plants. Admin maintains price details of vegetables and fruits. Farmer request price and marketing information of plants, server provides solution from Marketing Ontology.

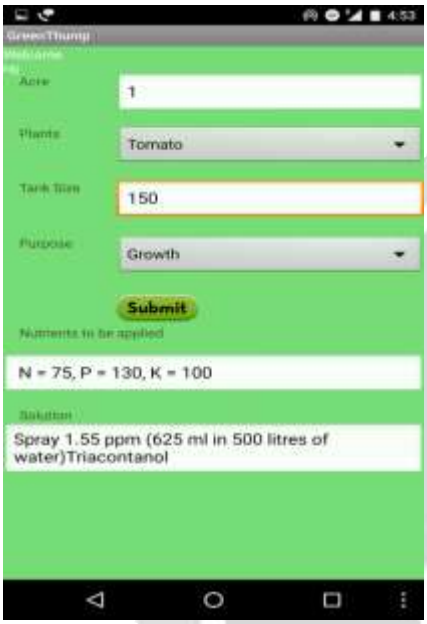

Fig C.1 Fertilizer recommendation Page

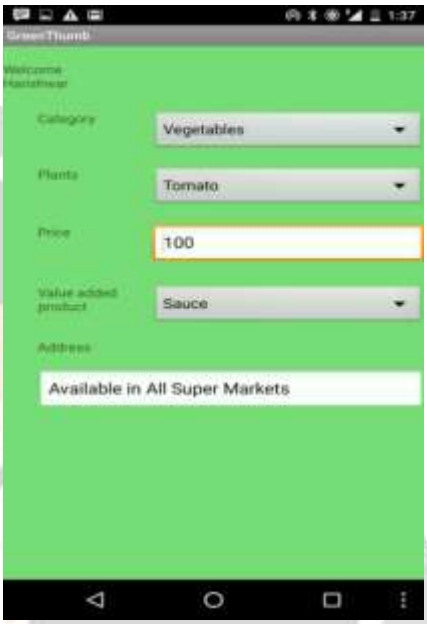

Fig C.2 Market Price

MODULE D: SEMANTIC SEARCH

All the data in the database is transformed into ontology-based repositories like Web Ontology Language (OWL) and Resource Description Framework (RDF). OWL is a language for defining and instantiating Web ontologies. OWL may include descriptions of classes, properties and their instances. RDF forms the relationships between the data. The Resource Description Framework (RDF) is constructed for semantic data on a Relational Database containing Structured as well as unstructured data. A Schema is identified for the relational database and a RDF representing the schema of the database is constructed through model provided by the Jena API. The RDF is generated by mining the text contents uploaded by the users in blogs and the contents of the file are analyzed and the Meta contents are manipulated. Similar data's are grouped together that relate to the same resource. The data level processes are subjected to structure level processing by indexing the semantic data elements. Multiple RDF s are grouped and structured together to form a master RDF data that holds all the semantic information's of a Server that support reasoning in any formats of query processing. The Different resources are interlinked with high degree of relational factors by the predicates in the triples. The Query processing is handled directly in the RDF file by iterating the triples forming a discrete relation with the Service query and the URI representing the location of the resource is returned. OWL facilitates greater machine interpretability of Web content than that supported by XML, RDF, and RDF Schema (RDF-S) by providing additional vocabulary along with a formal semantics.

Fig D.1 Building Semantic RDF

Fig D.2 Semantic Web Page

Fig D.3 Semantic Search

Fig D.4 Semantic search result page

5. ALGORITHMS USED

Algorithms used are NLP and Bubble sort

Natural Processing Language (NLP):
NLP parses the given sentence and makes use of POS tagger to determine the parts-of-speech of each word. This most common tags used are N, V, Adj, Adv but ignores prepositions.
Eg: For the given sentence "the book on the table", NLP parses each word and considers only "book", "table" and categorizes into tags.
NLP also uses some inbuilt functions such as named entity recognition, natural language generation, natural language understanding, relationship extraction, sentence breaking and semantic analysis in case of other exceptions. NLP package used is WordNet.

Bubble sort:
RDF data is sorted and stored using criterion and the URIs that are retrieved during semantic search are based on priority.
For instance, a query requires to search for two terms like ceaser and calpurnia among set of files, bubble sort retrieves the files that have maximum probability of these two words

6. CONCLUSION

GreenThumb provides information about possible crops, pesticides and fertilizers, weather report, marketing. This also illustrates how the semantic search works. Usage of Ontology based repositories for semantic search has resulted more advantageous than other technologies.

7. REFERENCES

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