KrishiMantra: Agricultural Recommendation System*

Vikas Kumar†
DA-IICT
Gandhinagar
Gujarat, India
vikas_kumar@daiict.ac.in

Vishal Dave‡
DA-IICT
Gandhinagar
Gujarat, India
v.dave05@yahoo.in

Rahul Bhadauriya§
DA-IICT
Gandhinagar
Gujarat, India
rahulsb05@yahoo.co.in

Sanjay Chaudhary¶
DA-IICT
Gandhinagar
Gujarat, India
sanjay_chaudhary@daiict.ac.in

ABSTRACT

With the evolution of Web 2.0, ICT has become the primary need of human beings. There is a gap between the farmers and the knowledge of agricultural experts. ICT can fill the gap between farmers and the experts. In this paper, we have proposed a semantic web based architecture to generate agricultural recommendations, using spatial data and agricultural knowledge bases. Our knowledge base acts as a domain expert and will send recommendations to the farmers based on climate conditions and geographic data. We have shown experimental results as a part of implementation of our proposed architecture. A farmer sends a query to the query engine, in order to get information for a specific crop. Query may be related to GIS data, crop knowledge base or both. The result of the query is displayed on a mobile device.

Categories and Subject Descriptors

C.2.4 [**Distributed Systems**]: Distributed applications; H.4 [**Information Systems Applications**]: Decision support

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†Mr. Vikas Kumar is a Ph.D. candidate at DA-IICT Gandhinagar, Gujarat India.

‡Mr. Vishal Dave is working as a JRF on a project funded by DST at DA-IICT Gandhinagar, Gujarat, India

§Mr. Rahul Bhadauriya is working as a JRF on a project funded by DST at DA-IICT Gandhinagar, Gujarat, India

¶Dr. Chaudhary is a Proffessor at DA-IICT Gandhinagar, Gujarat India.

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Keywords

Services, Ontology, SOA, Recommendation, Semantic Web, Geographic Information System (GIS)

1. INTRODUCTION

India has fourth largest agricultural sector in the world and provides the principal means of livelihood for over 58.4% of India's population [5]. Indian agriculture is facing one of the vital challenges of deceleration in agriculture growth. Main reason for deceleration in agricultural growth is declining investment in agricultural research and development combined with inefficiency of institutions providing inputs and services including rural credit and extension services [6]. Proper application of precision agriculture technology has increased efficiency and profit in comparison to traditional framing practices. Increasing acceptance of ICT in everyday life has an impact on farming, and it can be used to get rid of the problems related to farming and agricultural practices. In our proposed work, we have used GIS and Semantic Web technologies, which can be integrated with each other. Climate change is one of the vital economical and environmental challenges of our time. Climate has got varying effects on agriculture and precision farming. In developing economies, significant percentage of the population is still untouched by the revolution of new technologies and are unaware of such advances. In most of the villages, farmers still rely on old farming practices. Moreover, due to changes in climate parameters like temperature, rainfall, humidity, sunny days, soil moisture etc., agricultural yield is affected severely. Hence, there is a need of enabling technologies to work together and generate recommendations for farmers based on climatic parameters in the form spatial data and knowledge repositories in the form of ontologies.

2. RELATED WORK

This section gives an overview of the related research work in the context of relevant technologies. Y. Jain et al. [7] discussed GIS based agricultural system, which can help farmers during various stages of farming. It uses knowledge base to provide support for better reasoning. N. Li et al. [3] discuss how ontologies and semantic technologies can support the documentation and retrieval of dynamic knowledge in GIScience by offering flexible schemata instead of fixed data structures. S. Latu [2] discusses the impact of economic development activities on the coastal ecosystems in exemplar developing countries, in the Pacific area, and proposes GIS-

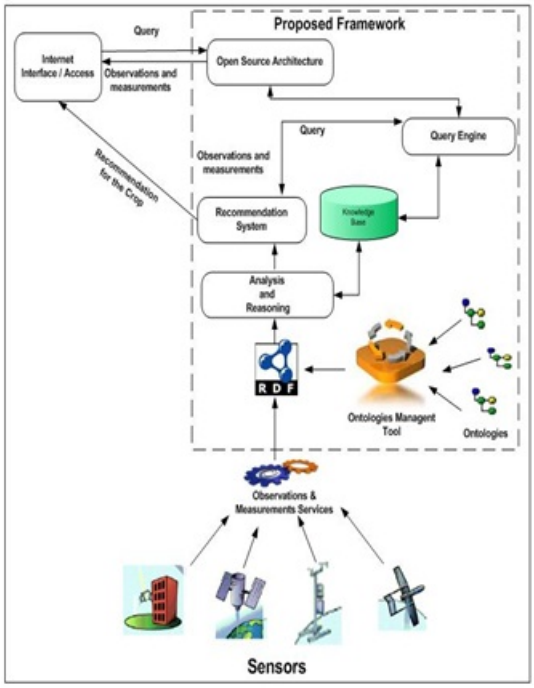

Figure 1: Proposed Architecture

Visualization strategies for moving beyond subsistence and economic development aspirations to socially, economically and environmentally sustainable development activities. R. Jeberson et al. [1] discuss how GIS web services can be designed to handle the disaster such as tsunami, flood, earthquake etc. Neha et.al. [4] developed an ontology for cotton crop in india which can be extended for further making a more robust knowledge base system.

3. PROPOSED ARCHITECTURE

With enormous amount of spatial data now available through the Web, opportunities exists to integrate these data to support complex applications. A common and interoperable solution for discovery, storage and access of geospatial data and information has become the necessity. We aim to evaluate and test our proposed architecture for any of complex applications like agricultural recommendation system specifically in the context of climate change and its impact on agricultural practices. We propose an approach which integrates GIS and ontology to work together by making use of services and generate some needful and fruitful recommendations for the farmers. The primary objective of proposed system is to generate recommendations for different types of queries using two different technologies, GIS and Semantic Web. The proposed architecture is shown in fig.1.

4. EXPERIMENTAL RESULTS

Various queries are resolved by the system and result of a query related to 'Identification of nearest warehouses for a given farm' is generated and shown in Fig.2. Necessary parameters of field and warehouse are shown with generated results. Web interface is developed in Gujarati (regional) language. We have also made recomendations available on the mobile phone through SMS.

5. CONCLUSION AND FUTURE WORK

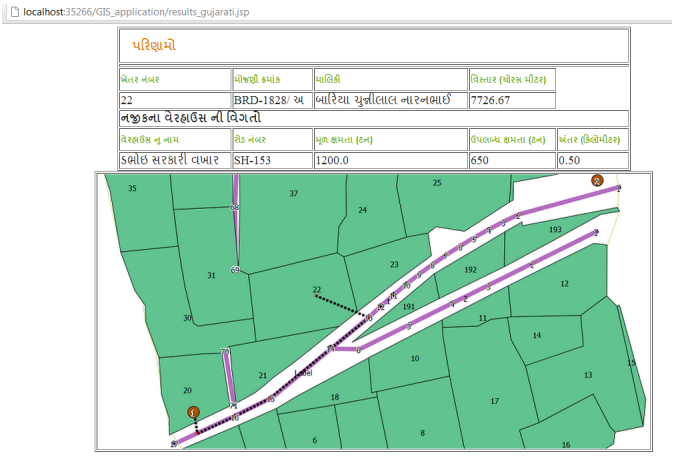

Figure 2: Identification of nearest warehouse

This work is a step for filling the gap between farmers and the agriculture experts by implementing an information system which will make use of geographical data and agricultural domain knowledge bases. We have implemented the information system partially and shown the initial results. Most of the research and implementation work needs to be done, in order to realize the architecture. For complete realization of our proposed architecture, we need to develop ontologies for cotton and spatial data, user Interfaces, integration module and building SPARQL queries.

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