A Web Based Farmer Query System for the State of Jammu and Kashmir

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ABSTRACT

Agriculture is one of the most important pillars of Indian economy. Communication and information Technology (IT) can make Indian cultivation process better and can profit all people related with agri-business including land holders, marginalized poor agriculturist. To increase the productivity and quality of crops, the farmers often depend on agricultural advisors and experts to provide correct information for making decision for crop. Many times agricultural expert or advisors are not available all the time. This paper presents a review on the technologies which various researchers have used to provide agricultural advisory system based on specific question answering system. A brief description of the web based query processing system along with its workflow and process is also given. A comparative analysis of the recent models used in the literature is also presented in the paper.

Keywords: Web services, Agri-business, QANUS

INTRODUCTION

The farmer query system is a web based query system. In this system, farmer asks query related to the crop, pest, and seasonal harvesting techniques. In the web based query system, the farmer sends its query either in form of text or speech through the interface provided to him and the system after analyzing query returns the relevant answer to the user. The answer depends on the data which is fed to the system at the training phase. The training dataset plays a key role here as the accuracy of the answer depends on the accuracy of the training dataset used for training the system.

In agriculture area, the agriculturists may have concerns and inquiries with respect to cultivation, soil, atmosphere, development process, disease and pest. They express their inquiries in a characteristic dialect which are typically replied by farming specialists. Because of absence of access, separation and time factors, the specialist is typically not present physically to answer each question asked by the farmers. Sometimes farmer fail to understand the information given by the specialist as they use very technical term and most of the farmers are illiterate. In such circumstances, there is possibility of knowledge gap amongst farmers and specialists because farmers believe in traditional methods of farming without the knowledge of soil and seed quality where as the specialist take care of all the parameters like climate, soil, seed, season of sowing etc. There has been noteworthy research in the field of Question Answering frameworks however

there isn't any question answering system being developed particularly for agricultural area/domain. The agricultural question answering system takes the input in the form of unstructured data and then analysis these questions for answers based on the knowledge base of the system and gives relevant to the farmers.

DIFFERENT TYPE OF QUERY SUPPORT SYSTEMS

A. SMS based farmer query system

This service system has been provided to farmers of Thailand. SMS based service is very popular in Thailand because 47.2% population in Thailand is using mobile phone which makes this system more accessible to majority of the target group. The methodology that is used in this system contains:

- Collection of 1000 questions. These questions are raised by farmers based on doubt.
- Response which is provided by experts based on problem or existing document.
- These generate response which is unique and different answers of multiple questions.

B. Ontology based Question-Answering System

Question answering system is proposed to satisfy user's specific need about the information they want. Questions are asked in natural language. Database query is formulated to identify question type, keywords and named entities. The whole process consists of three main modules which perform the whole processing of the user's query. The modules used in the system are:

- Question Processing module
- Query formulation module
- Answer selection module.

C. Agriculture advisory system based on Ontology

This system is designed by an IIT Mumbai student. This system is also ontology based knowledge system. Ontology contains detailed information of cotton crop. All queries about crops are answered by human experts.This paper is organized in 5 sections. Section I introduces the concept of question answering systems being used for agricultural purposes and different type of systems. A brief survey of literature is presented in Section II. Section III gives a detailed description about the web based query support system, its components and procedure. Comparative analysis of the system used by the researchers is presented in Section IV. Finally, the paper concludes in section V.

LITERATURE SURVEY

In paper[1], the author discussed Geographic information system based agricultural system, which can benefit agriculturist amid different phases of farming. It utilizes knowledge base for making better decisions .KrishiMantra[1] generate agriculture recommendation system, using agriculture knowledge based on spatial data. In this agriculturist sends question to query server, with a specific objective to receive relevant data about crop. This question might be connected with crop knowledge, Geographical Information System information or both. Finally outcome is presented on mobile device through SMS.

In paper[2], the author discussed aAQUA, which is an online community question answering forum handling both multi-language and multimedia data. Where agriculturist presents an issue and agribusiness experts or different agriculturist give answers for it .

Ontology based Agro Advisory system[3] is developed by IIT Bombay.   This service is accessible for ranchers to represent their queries to the Agro framework and receiving the best answer for their issue. The Ontology ideas are expounded with field and atmosphere conditions for cotton, illnesses influencing cotton, assortments of cotton, cure for these sicknesses, bother influencing cotton and their safety measure and cure.

In paper[4] Question-Answering System for farmer through SMS in Thai language is been proposed which centerS around similar procedure already connected to language generation, primitive system and thematic roles of the Lexical Conceptual Structure. It works upon a collection of data made out of queries raised by ranchers around thousands of question, the response which have been examine and given by specialists, in view of records presence and the texts they produced from. It provides SMS services based on question answer to the farmer because today most of the population is linked with phone at different location.

LUCENE[5] has been developed which is a tool for Information Retrieval and which is developed by Apache. This tool is extensible, adaptable and efficient which engages full-content look for full-traffic sites, for example Twitter. The user control over storage engine, scoring and low level data are also kept endorsed. It holds various type of query such as fuzzy searches, range searches, wildcard and proximity searches, grouping strategies, promoting a term and Boolean operators. Tool provides a sorted structure of records for a question by utilizing altered ordering on the bulk given as information.

QANUS[5] is an open-source Question Answering structure that main aim is built with extensibility. The domain specific Question answering system can be built easily and new programming logics and modification can be introduced with this powerful QANUS to act as a base level. QANUS utilizes LUCENE for ordering the info corpus and getting the conclusion about for client question. The QANUS QA structure empowers fast model of new question answering (QA) frameworks. So, it is possible to make powerful Question Answering framework with help of QANUS as a baselevel.

Agro advisory system[6] helps the farmer to overcome the hole amongst farmer and agribusiness domain expert and is developed for crop in Gujarat state. This framework involves web services,

cotton ontology and mobile's software development. These services are implemented in Java. RESTful services are produced and deployed on cloud server. Ontology involves information about crop, pest, soil and process of cultivation. The cotton ontology keeps knowledge to response a farmer query. Farmer can get benefit of this application as it is based on simple mobile interface which is easier to use. Prototypes are made using software development kit, JAVA and Eclipse. This is an android based system and aims at improving farming system for cotton crop.

Under the Agro advisory system[6], various systems are defined like:- eSagu-Its objective is to improve and increase crop productivity by giving relevant advise to agriculturist. Agrisnet- This is a website portal which allows fetching of information about fertilizer, weather, plant protection, Soil Health, Weather, seed etc to register farmer. KissanKerela-Under this project Network system, Information System and Services are proposed. It involves crops and market data, for question dealing with, general measurements and soil information. The objective of this system is to have enhancement of crop productivity, amelioration of diseases and obtain better returns. The information got and conveyed through online web-based interface and video channels and TV systems.

Ontology question answering system[7] today huge amount of data available , issue is how to discover the data out of huge information and which data is required by the client and ought to be particular in nature. Data retrieval strategies take care of this issue. Data recovery engines will recover reports containing expressions and passages which may have a response to client inquiry. This paper propose answer about question noting framework to fulfil clients particular data requirement .The QAS framework fills the need of question answering and its design effortlessness makes it productive as far as answer retrieval. It involves question processing, formulation and output.

Android agro advisory system[8] has android application which provides a advise to farmer about cultivation and crop . Then the issue of lack of knowledge of cultivating will get fathomed.

WEB BASED QUERY SUPPORT SYSTEM

This section gives a brief outline on the various technologies that are used for web based query support system. Broadly these can be classified as under:

A. Semantic Web

Semantic web is a developed version of WEB 2.0 and is also known as WEB 3.0. This gives regular structure that enables data to be reused and shared across enterprise, application and community boundaries. These web technologies are XML, RDF, SPARQL and Ontology. XML is used for self-description of data and data exchange. RDF provides foundation for publishing and linking data and used to express data/object and their relationships in data models. SPARQL is query language and information access protocol for semantic web data sources.

B. Geographic information system

GIS is intended to oversee, receive, control, store, analyze and introduce spatial or topographical information. This system contains spatial data that have no banned boundaries. GIS are tools which authorize clients to make intuitive questions (client made inquiries), alter information in maps, analyze spatial information then represent the outcome of all process.

C. Ontology

Ontology involves information regarding the process of cultivation, soil, crop, pest, disease and other significance data. The progress tool protégé is utilized to implement ontology. Ontology Reasoning is a challenging issue in the research. So system should have reasoning capability in ontology.

D. RESTful web services

Services are customized in java utilizing the JAX-RS/Jersy API and the Eclipse IDE. These are produced and implemented on an application server based on cloud given by Heroku. The services are summoned from a few cell phones and thus they associate with different information sources like Open Weather API, SQL database and the Ontologies.

E. SQL based database

Database which hold general information does not alter again and again such as client data, cultivate review data, soil information and so on. The information is brought utilizing SQL query and is put away on a PostGreSQL construct server in light of a cloud based supplier to make it available over the web utilizing RESTful services.

F. The Resource description framework knowlegde base

The learning base holds the information for Cotton crops (in RDF organize) that has been set up by the engineer. It contains a wide assortment of ideas like Climate, Diseases, Pests, Irrigation, and Pesticide and so on. Simple Protocol and RDF Query Language (SPARQL) questions and thinking are utilized on the Ontology to produce comes about for client inquiries and conclude induction from cotton cosmology. Philosophy is produced utilizing protege tool. Resource Description Framework (RDF) information arrange is utilized to speak to the data in cotton philosophy.

FLOWCHART OF QANUS QUERY SYSTEM

QANUS[5] is an open source framework for the question answering system. The tool that is used to implement the QANUS is LUCENE and is used for indexing the input corpus. The

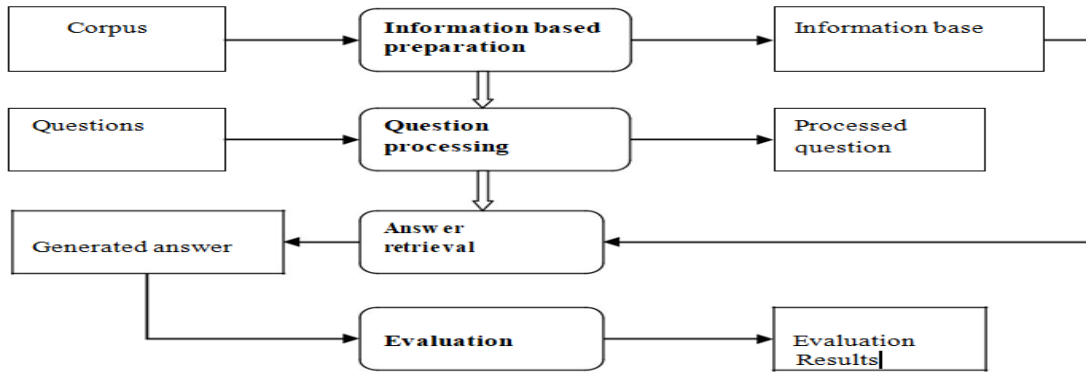working of QANUS query system is shown in Figure 1 and QANUS components discussed as follow.

Figure 1. QANUS query system

A. Corpus

The corpus is fed into the system for the preparation of information base. Which mostly contains agricultural data .

B. Information base preparation

The corpus generally contains unstructured data. In order to process the data, the framework receives XML records as input and executes POS tagging, named element recognizer, grammar parser etc. After that for better working, domain specific named entity recognizer is added in the later stage which arranges the document concurring the domain particular terms as opposed to labelling the words as part of speech. The basic working of information preparation is shown in figure2.
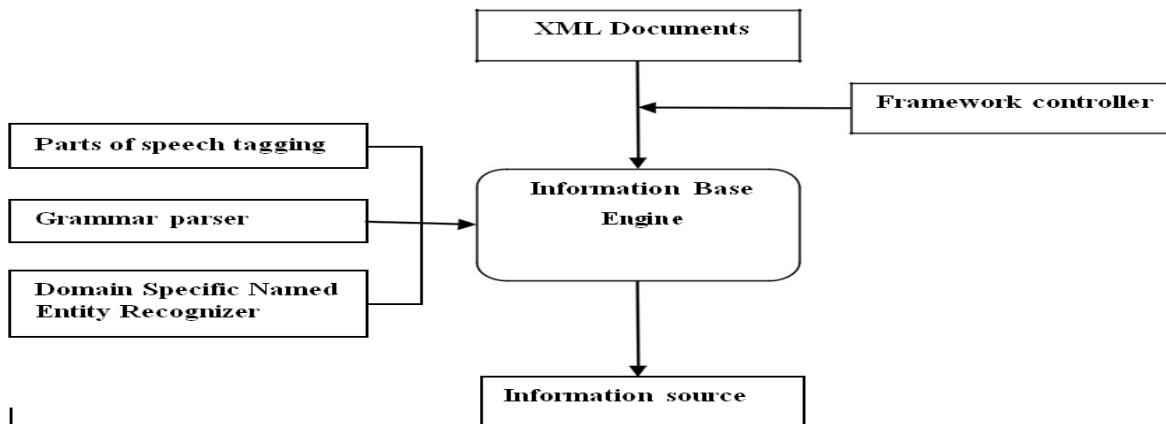
Figure 2. Information preparation stage

C. Information base

It contains the structured data which will act as the knowledge base for the query processing to yield appropriate answers for the given query.

D. Questions

Users can query the system either in their natural language or images as the interface allows them. These questions act as input to the query processing phase.

E. Question processing

The queries which are submitted by the users are processed in the query processor. It determines the expected answers of the queries being entered by the user to the system .The questions are passed through the two stages i.e pre-processing phase and post-processing phase. Pre-processing includes removal of ambiguous terms, stop words and substitution of terms with their synonyms for better processing of the query. Post-processing includes answering the question in the user query format for better representation to the users.

F. Processed questions

After passing through the query processing phase the processed questions are saved in this phase to be presented as input to the answer retrieval phase.

G. Answer retrieval

It makes utilization of the explanations from the question preparing phase, and looks into the data source for correct solutions to the provided queries. In this stage the proper answer string is generated.

H. Generated answer:

The final answer is presented in this phase which acts as output to the user.

I. Evaluation

The evaluation phase checks the appropriate responses given by the answer receiver phase with an arrangement of best quality level answers.

J. Evaluation results

The final outcome of the query after evaluation of results is presented in this phase.

COMPARATIVE ANALYSIS

In this section, a brief summary and comparison of work that has been done by researchers in this field is given. It can be seen that the work based on farmer query system in which farmer put the query on mobile or on application for query related cultivation and crop yielding. Table present ontology management tools/services used by different researchers in this field and table presents a brief comparison of query technology based on different tools and software that have been used to set up a query system. In comparative analysis Table1 have input, output, services and analysis of papers.

	V.kuma [1]	aAUQA[2]	S. Sahni [3]	M.suktarachan[4]	S.Gaikwad [5]	S.chaudhary[6]	A.Singh[7]
Year	2015	No	2015	2009	2015	2015	2013
Tool or services	Ontology management tool	Java server pages/ servlets	Ontology agro advisory system by human expert	Question answering through mobile SMS	LUCENE tool, QUANUS framework	JDK, Eclipse J2EE, Apache Tomat	PQL, Lexical analyser, query cluster and formulation engine
Analysis	Result display on mobiles phones	Multi language and media system for farmer query	Information about cotton crop store on oracle databases.	Message sent on mobile about query which have limited texts.	Answering of the unstructured query is also taken into consideration	Advisory system for cotton crop	Information retrieval tool access data and examine answer according to question.
Input	GIS data and crop knowledge	Textual data ,multimedia audio and video files ,images	Query is posted over a graph	Query in Natural Language	Factoid Questions such as 'which', 'what', 'who', 'where'	Queries can be entered either in Mobile device or web browsers	Documents containing question
Output	Result show on mobile device	Output in English ,Hindi ,Marathi language of user question	Expert gives the answer of query	Answers provided through the SMS	Set of Standard answers are provided as output	Output on mobile device and web browser	Provide answer in different form

Table 1. Comparative analysis of farmer query system

CONCLUSION AND FUTURE WORK

Farmer query system answers the questions of farmer which are posed from either web site or mobile application. This system can help the persons connected to agricultural domain as they don't have to rely on experts for their problems. Rather they have access to necessary information at hand through these systems .In future various features can be added to

improvise such systems so as to increase the productivity of farmers and automatic system which can provide information to farmer without the help of human intervention.

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