Abstract

Traditionally the main storage area of knowledge was in people's head. This knowledge was passed down to generations as word of mouth. As years went by this kind of knowledge storage and passing down has taken drastic changes. The various means of data storage and dissemination of information have exponentially grown in the last few decades alone. Not just the volume of the data the different mediums of information sources are also increasing.

The increasing volume and diversity of data is demanding new approaches for data extraction. With the lack of education and limited computer resource availabilities in rural areas manually querying multiple data sources on the internet is time consuming and laborious process. The number of information sources is growing exponentially and traditional information systems do not scale well to increasing demands. Internet search engines get data from multiple data sources, but they provide very limited capabilities for combining, processing and organizing information. Search engines find data based on the content of keywords; however no consideration is given to context of the search.

Intelligent multi-agent based framework provides a promising approach to this problem. Multiple agents cooperate with each other to retrieve information from different information sources. Technologies like Ontologies are incorporated into the design to make the application more effective and knowledge oriented. The system also employs fuzzy linguistics approach when appropriate to handle uncertainty and vagueness in user inputs.

The work presented in the thesis is organized as follows.

Chapter 1 introduces the background of the issue taken. The existing scenarios and the problems faced are covered in detail. Along with focus on the general introduction to the research area, a brief look into the technologies used is also looked into. This chapter states the problem of research, identifies main objectives of the research and the technology that is used to solve the problem.

Chapter 2 goes over the concept of Agent based systems. Different kinds of agents and how they can be used to tackle the research problem are discussed in detail. This chapter also
looks into the literature survey. Overall this chapter provides overview of agent architecture and details of literature survey conducted for research work.

Chapter 3 focuses on general architecture of multi-agent system that was developed with agricultural activities in mind. One inspiration for this research comes from cognitive science which provides new insights on how to optimize the performance of knowledge systems. The design suggested in this research work consists of four main layers back end layer, agent layer, repository layer and front end layer. Each layer is discussed in detail. The architecture also talks about how third party tools/technologies are integrated to further enhance and optimize data storage and retrieval process.

To demonstrate the use of the suggested architecture described in the chapter 3, domain of agricultural activity is selected. An experimental system using the suggested framework is developed, which is presented in Chapter 4. Chapter 4 gives the in depth implementation details of the system developed. There are multiple components involved and each one is covered in detail. MySQL is used to store data while JADE provides the support to build and manage agents. This chapter also talks how easily third party tools can be integrated into agents. Along with using the right data retrieval methods this chapter also talks knowledge representation using Ontologies, about personalization and feedback methods to optimize content presented to users.

Chapter 5 goes over the results of the experimental system and to what extent the research work can be justified. A fully functional system with real data store in local knowledge bases helps to test and validate the workings of the system. Test cases cover various scenarios to verify if the objectives of the thesis are met. System performance in areas such as usability, robustness, scalability, user friendliness, accuracy...etc are also monitored and analyzed.

Chapter 6 talks about the research contribution made by this thesis. The suggested framework shows application of various agents in hybridization process where data will be seamlessly extracted from the Internet as well as local knowledge bases. The use of customization methods along with integration of third party tools in agents help to effectively tackle information overload problem.
The research work is tweaked to handle farming industry needs but can be easily extended to other fields such as in tourism industry, health industry, education portals etc. Literacy rates of farmers and their computer proficiency is kept in mind when developing this solution. Internet connection is also not always good in rural areas. In this research we have shown how these limitations can be overcome by utilizing user profile data, feedback from them and applying appropriate filtering techniques.