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Agricultural Intelligence Decision System Using Big Data Analysis

Harshitha P Patil[1*] , Gokul D[2] , Dharmatej M[3] , K V Rajashekhar Reddy[4] , Chandan Raj B R[5]

[1,2,3,4,5]Dept. of Computer Science, East West Institute of technology, Vishveswaraya Technological University, Bangalore, India

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Abstract— Using hadoop in big data technologies into agriculture presents a significant challenge; at the same time, this technology contributes effectively in many countries' economic and social development. In this work, we will study environmental data provided by precision agriculture information technologies, which represents a crucial source of data in need of being wisely managed and analyzed with appropriate methods and tools in order to extract the meaningful information by providing decision making support to the farmers.

Keywords—big data technology, hadoop, environmental data, decision making.

I. INTRODUCTION

Agricultural smart selection device is an application program, which presents solutions according to authoritative experts in related fields for the ones application issues that want professional knowledge or a understanding base in a specialised area to remedy. Agricultural shrewd choice device has a huge range of authoritative specialists in agriculture experience, records, data and effects constitute the information base. It may use its information and method to resolve the hassle of simulation of agricultural professional judgment. Sensible choice machine can solve the troubles of agricultural manufacturing.

In the current years, the big volume of actual time data inside the agricultural zone and its want for an green and powerful processing, stimulate the usage of novel technology and platform to collect, keep, technique, examine and visualize big data units for destiny predictions and choice making. huge facts is an evolving term given to a huge area of statistics-in depth technology wherein the datasets are extremely large that managing them turn out to be greater difficult than the way it changed into before. Crucial challenges facing the agriculture zone farmers feel greater forced to undertake in depth farming practices and sustainable agricultural ones, as a way to increase each financial and environmental charges.

In the late 70s, plant pathology professional gadget the use of pc technology is evolved via Illinois university, which become particularly for crop illnesses and insect pest prognosis.

In the mid 80s, the agricultural choice system has shifted from single disorder diagnosis to production management, economic analysis and choice-making and ecological environment. There have been a few achievements in the America, China, and Japan and European international locations.

Since 1990s, with the rapid improvement of pc generation, AI era, database technology, 3S technology and automation control technology, agricultural information technology has entered a new development duration, and wise agriculture choice machine has been developed successively. wise agriculture decision device is in particular a variety of wise era integration within the area of choice device, which include neural community, internet technology, intelligent greenhouse, 3S generation, using current means of statistics processing, a new processing of statistics. [4].

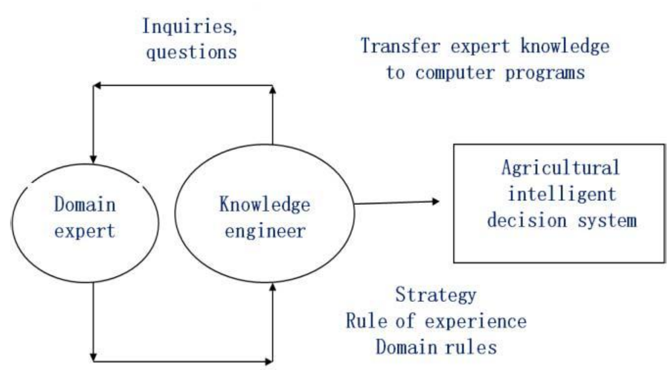


Figure 1.The structure of agricultural intelligent decision system.

The single function of agricultural selection device in this degree is the initial degree of agricultural decision system. The time is on the give up of 1970s to early 80s. Due to the fact the CPU frequency and information processing capability is low, relational database has just started. The rural decision system function is unmarried to solve unique problems, such as sicknesses and pests pest prevention, irrigation management, threat prediction.

The choice gadget for the analysis of soybean disorder and insect pests developed by way of the Illionois university of the united states, in addition to the cotton water management selection device advanced in 1982.

II. RELATED WORK

The purpose of this research was to develop a knowledge recommendation architecture based on unsupervised machine learning and unified resource description framework (RDF) for integrated environmental sensory data sources[1]. In developing this architecture, which is very useful for agricultural decision support systems, we considered web based large-scale dynamic data mining, contextual knowledge extraction, and integrated knowledge representation methods.

Five different environmental data sources were considered to develop and test the proposed knowledge recommendation framework called Intelligent Environmental Knowledgebase (i-EKbase); including Bureau of Meteorology SILO, Australian Water Availability Project, Australian Soil Resource Information System, Australian National Cosmic Ray Soil Moisture Monitoring Facility, and NASA's Moderate Resolution Imaging Spectro radiometer. Unsupervised clustering techniques based on Principal Component Analysis (PCA), Fuzzy-C-Means (FCM) and Self-organizing map (SOM) were used to create a 2D colour knowledge map representing the dynamics of the i-EKbase to provide "prior knowledge" about the integrated knowledgebase. RDF representation has made i-EKbase flexible enough to publish and integrate on the Linked Open Data cloud. This newly developed system was evaluated as an expert agricultural decision support for sustainable water resource management case study in Australia at Tasmania with promising results.

The acquisition of data through remote sensing has become of great importance in precision agriculture, as it covers large geographical areas faster and cheaper than ground inspections [2]. The challenge is to develop technical solutions that can benefit from both huge amounts of raw data extracted from satellite images, but also from the robust amount of knowledge refined during centuries of agricultural practice.

Aiming to accurately classify crops from satellite images, we developed a hybrid intelligent system that can exploit both agricultural expert knowledge and machine learning algorithms. As the crop raw data is characterized by heterogeneity, we drive our attention to ensemble learners, while expert knowledge is encapsulated within a rule-based system. Vote-based methods for solving conflicts between ensemble's base learners have difficulties in classifying exceptional cases correctly and also to give the rationale behind their decision. Prospective decisions of base classifiers are presented to an argumentative system based on defeasible logic that performs dialectical reasoning on pros and cons against a classification decision. The system computes a recommendation considering both the rules extracted from base learners and the available expert knowledge. The investigated case study deals with crop classification into four classes: corn, soybean, cotton, and rice.

New technologies are required for safe, site-specific and efficient control of weeds, pathogens and insects in agricultural crops and in forestry [3]. The development and use of autonomous tractors equipped with innovative sensor systems, data processing techniques and actuation tools can be highly beneficial because this technology allows pest control measures to be applied only if, when, and where they are genuinely needed, thus reducing costs, environmental damage and risks to farmers.

RHEA (Robotics and associated High-technologies and Equipment for Agriculture) is an EC-funded research project conducted by a consortium composed of 15 research partners from eight European countries. The focus of the project is the design, development and testing of a new generation of automatic and robotic systems for both chemical and physical pest management. A heterogeneous fleet of small, cooperative ground and aerial robots equipped with advanced sensors, enhanced end effectors and improved decision control algorithms will be used. Initially, we are investigating three major scenarios: (a) chemical weed control in winter wheat, (b) thermal weed control (i.e., flaming) in maize and (c) variable applications of pesticides in olive crops. A preliminary system evaluation demonstrated that the intelligent sprayer boom applied the control agent to over 95% of the target area and that the response time, 10 s, of the direct-injection system was anticipated in the sprayer system to ensure the accuracy of herbicide spraying.

Agricultural land suitability evaluation for crop production is a process that requires specialized geo-environmental information and the expertise of a computer scientist to analyze and interpret the information [4]. This paper presents ALSE, an intelligent system for assessing land suitability for different types of crops in tropical and subtropical regions (e.g. mango, banana, papaya, citrus, and guava) based on geo-environmental factors that automates the process of evaluation and illustrates the results on an attribute table.

Its main features include support of GIS capabilities on the digital map of an area with the FAO-SYS framework model with some necessary modifications to suit the local environmental conditions for land evaluation, and the support of expert knowledge through on spatial tools to derive criteria weights with their relative importance.

Based on agriculture production knowledge and computer technology, this paper applied database, artificial intelligent, management information system, decision support system, network technology and information integration technology to the field of soybean production, and offered decision support to users in imitating the curse during which experts solved the problems, therefore, guided production practice, introduced structure and function of decision support system of soybean, and then we analyzed the design of the knowledge base and the realization of inference engine in details as well[5].

III. METHODOLOGY

We propose an effective big data analysis technique based on profiling (PHANI) improve their traditional decision-making process using Linear Regression algorithm. we are suggesting what type of grains and vegetables farmer has to cultivate to get more profit.

Here admin will upload the previous 10 year dataset like

- **vegetable demand**
- **crops demand**
- **vegetable yield dataset monthly wise**
- **vegetable demand dataset monthly wise**
- **District wise crops data season wise (Karif, Summer, Winter).**

Admin will upload all the above datasets using the Excel API

New Demand Calculation process:

We are predicting the **Yield from yield dataset using the Linear Regression technique. Let NYLD and no of acres the farmers cultivate NACR and calculate the new demand.**

NewDemand1=NYLD*NACR

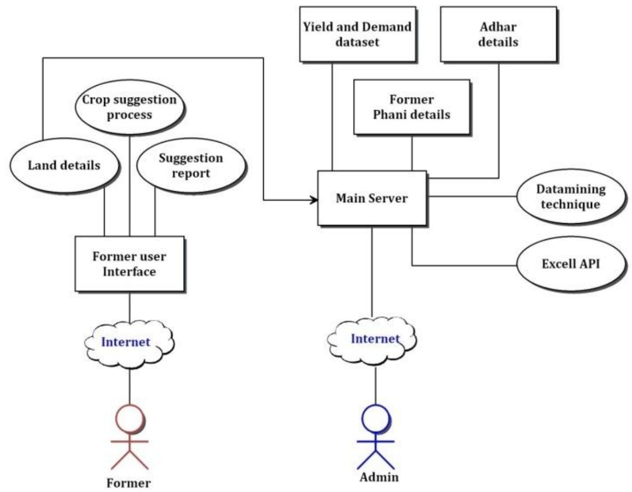
Demand Prediction Process:

We are predicting the **demand from demand datasets of the past ten years using the Linear Regression technique. Let this be NewDemand2.**

Land Suggestion Process:

We are comparing the **NewDemand1** and **NewDemand2.** if **NewDemand2 is greater than NewDemand1 a**dmin will give permission to cultivate.

System Architecture



Knowledge acquisition is an important part of agricultural intelligent decision system, which gathers relevant professional knowledge and experience data from the agricultural experts, and organizes and summarizes a written symbol form. Knowledge acquisition determines the knowledge representation and reasoning methods, establishing knowledge base, writing inference procedures, and debugging and modification.

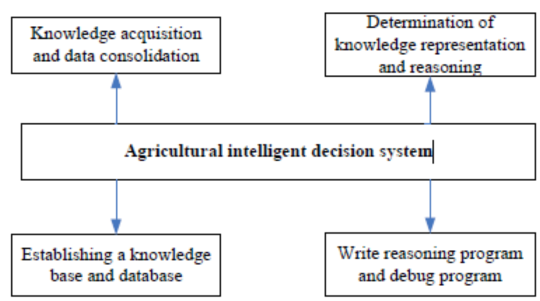


Figure 3. The major component of agricultural intelligent decision system

The major component of agricultural intelligent decision system concludes four parts, which is Knowledge acquisition and data consolidation, determination of knowledge representation and reasoning, establishing a knowledge base and database, and write reasoning program and debug program. Knowledge acquisition and knowledge representation and knowledge use are three key technologies for the construction of an expert system. The basic task of knowledge acquisition is to obtain knowledge for the decision system and to establish a perfect and effective knowledge base to meet the needs of solving the problem in the field of solving. The extraction of knowledge is identified, understood, screened and summed up in order to build a knowledge base, which includes artificial analysis method, statistical analysis method, natural language understanding method and knowledge compilation method.

IV. ALGORITHM

LINEAR REGRESSION

Step1
Let
double[] year_data =
{2008,2009,2010,2011,2012,2013,2014,2015,2016,2017};
double[] demand_data={18,24,32,40,58,72,80,93,102,118};

Step2
SumX = ∑ year_data
SumX2 = SQRT(year_data);
SumY = ∑ demand_data

Step3

double xbar = sumx / n;

double ybar = sumy / n;

Where n=no of the year.

Step4
xxbar += (year_data [i] - xbar) * (year_data [i] - xbar);

yybar += (demand_data [i] - ybar) * (demand_data [i] - ybar);

double beta1 = xybar / xxbar;

double beta0 = ybar - beta1 * xbar;

finalpredicted_value = (beta1*(present_year))+beta0;

V. RESULT

The main Result is providing the suggestions to the farmers using Linear Regression Technique. In this work, we will study environmental data provided by precision agriculture information technologies, which represents a crucial source of data in need of being wisely managed and analyzed with appropriate methods and tools in order to extract the meaningful information.

VI. CONCLUSION AND FUTURE SCOPE

The agricultural intelligence decision system will provide suggestions to the farmers using Linear Regression Technique. By this technique the farmers will be able to take better decisions, increase their yield productivity and profit. Precision farming using Big Data Analytics, however a proven technology innovation is still for the mostly limited to developed (American and European) nations. In developing countries like India, it has picked up a momentum but still has a very long way to go. One of the significant issues for this is the small farm size. As discussed previously, 74% of total farms are less than a hectare. However major agricultural states like Punjab, Rajasthan, Haryana and Gujarat there are more than 20% agricultural land with operational holding size of more than 4 hectares for a single field.

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Authors Profile

Ms. Harshitha P Patil is pursuing her 8 semester B.E in Computer Science and Engineering at East West Institute Of Technology, Bengaluru, India. Her area of interest includes Big Data.

Mr. Gokul D is pursuing his 8 semester B.E in Computer Science and Engineering at East West Institute Of Technology, Bengaluru, India. His area of interest includes Big Data.

Mr. Dharmatej M is pursuing his 8 semester B.E in Computer Science and Engineering at East West Institute Of Technology, Bengaluru, India. His area of interest includes Big Data.

Mr. K V Rajashekhar Reddy is pursuing his 8 semester B.E in Computer Science and Engineering at East West Institute Of Technology, Bengaluru, India. His area of interest includes Big Data.

Mr Chandan Raj B R got M.Tech degree in Computer Science, Bengaluru, India. He is currently working as Associate Professor in the Department of CSE,EWIT. His area of interest includes Big Data.

