DIAGNOSIS OF DISEASE ON PADDY FIELD WITH THE HELP OF WEB BASED EXPERT SYSTEM

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Abstract: This expert system gives advice to Paddy growers in India to improve Paddy productivity. The system contains two main parts namely: strategic part and evaluation part. The strategic part gives a strategic advice (i.e. list of symptoms)after cultivating Paddy crop. The evaluation part diagnoses the disease name and name of pest that occursafter Paddy growing season and gives advice about how to control these problems. This paper proposed a new approach which combines the element of fuzzy, image and expert system to develop an image-based expert system in diagnosing paddy diseases.

This system aims to provide a guide to identify deficiency of nutrients in crops, i.e., disorders in leaves, stems and roots of a plant. The roles, management, symptoms, quantification, critical limits etc. are parameters which will be used to identify the micronutrient deficiencies in the diseased crops. This will help the ultimate user to find remedies to correct the deficient plants

Key Words: Expert System, Agricultural Expert System, Paddy Expert System, WebApplication

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1.INTRODUCTION:

Rice is the staple food in India. Growing best in areas of warm, humid climate, rice require temperature about 20 deg c. to 35 deg c and well distributed rainfall of about 100 cm or irrigation facilities. The important high yielding varieties include IR 8, Jaya, Padma, Hamsa, IET 1039 and 1136.However, several factors such as diseases have affected the production of the paddy. Normally farmers used traditional approach in handling these problems assist by the officer. Paddy fields are a common sight throughout India, be they be northern gang tic plains or southern peninsular plateaus. Paddy is cultivated at least twice a year in most parts of India, the two seasons being known as Rabi and Kharifrespectively. Agricultural production is a complex problem that involves many parameters and requires very complicated optimization and modeling steps. The overall productionProblems involve, among other aspects, land preparation, water and fertilizers requirements, pest control, and variety selection. The crop production management problem also includes the lack of enough experts to support theAgricultural growers and the heavy dependence upon the experiences of these experts. This makes the choice of the expert system approach for the solution of this problem aSuitable one. The Central Laboratory for Agricultural Expert System (CLAES) has been gained a considerable experience in developing expert systems in agricultural domain. This knowledge based systems cover different agricultural production management problems and applied for different crops **[Rafea, 1994]**. The objective of this paper is to present an expert system for paddy production that covers the strategic and evaluation knowledge based systems **[Edrees, 1999a].**CommonKADS methodology **[Wielinga, 1994]** is used to represent the knowledge. Each subsystem consists of domain, inference, and task knowledge. Domain knowledge consists of domain ontology and domain models. Domain ontology presents the vocabularies that are used in the domain models. These vocabularies are categorized into concepts, properties of concepts, and legal values of properties. Inference knowledge shows all inference steps used by the system in solving the problem; it does not show the control sequence of these inference steps. Task knowledge is actually the algorithm of the expert system, it shows the control sequence of the inference steps to achieve system objective. The paper is organized as follows. Section 2 describes the methodology used which consists of Acquiring knowledge, variables, fuzzy sets, fuzzy rules and membership function. Section 3 presents a brief summary of the paper. Section 4 present conclusion and Section 5 present References.

2. Method:

2.1 Strategic Knowledge base

Knowledge in expert system may originate from manySources, such as textbooks, technical reports, case studies,data bases and personal experience. Examples of knowledge obtainedfrom the knowledge acquisition process are paddy diseases(pyriculariaoryzae, cercosporaoryzae, drechsleraoryzae,rhizoctoniasolani), symptoms (type of spot is spindle, colourof leaves is yellow) and symptom values spot, spindle, yellow, narrow) shown as tree representation in Figure 1.

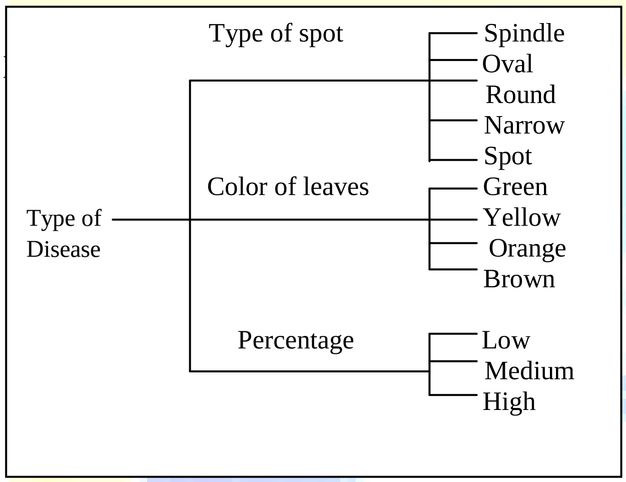


Fig.1. Representation for diseases, symptoms

2.2 Variables

Based on Figure 1, linguistic variables will be defined.There are 13 linguistic variables applied in this paper where10 out of 13 are input linguistic variables and the rest areoutput linguistic variables. Examples of linguistic variablesused are as shown in Tables 1 and 2.

Table 1. Input Variables and Values

Input Linguistic	Variable Value
Shape of spindle	[Spindle]
Shape of oval	[Oval]
Shape of round	[Round]
Shape of narrow	[Narrow]
Shape of spot	[Spot]
Color of spot	[Grey, Brown]
Color of leaves'	[Yellow, Orange, Brown]

Boundary

Color of leaves [Green, Yellow, Orange, Brown]

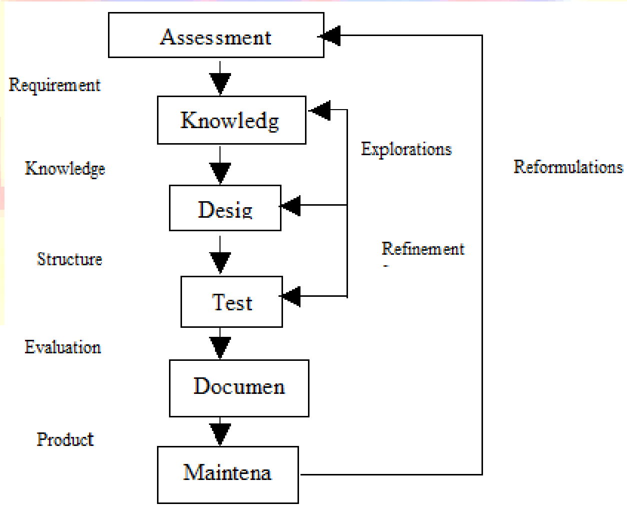
Percentage of lesion [Low, Medium, High]

2.3 Fuzzy image

In order to get the right fuzzy sets as identified by theexpert domain, two steps are conducted i.e. (i) imagecapturing and (ii) linguistic variables measuring. Images aretaken and identified by the expert domain. For examples,images with round shape which are ordered based on thedegree of round are shown in Figure 2.

Fig.2. Examples of round shape images

2.4 Life cycle



F Fig.3. Life cycle of an expert system

The development process of this expert system includes sixphases. The assessment phase involves a preliminary studyof the system's requirements. Knowledge acquisition, in thesecond phase, represents a bottleneck in the development ofan expert system. In the Design phase, the structure andorganization of the knowledge was modeled in the form ofa decision tree, the methods to process this knowledge weredefined, as well as the software tool to be used in theimplementation of the system. Production rules weregenerated from decision tree and the expert system wasimplemented from production rules. The test phase iscontinuous, that is, the knowledge engineer tests theprototype with the domain expert, the user introduces newknowledge and a new prototype is generated and testedagain. In this phase, the test plan and the user evaluationswere registered formally. In the documentation phase, adocument was elaborated with a "knowledge" dictionaryand the resolution procedures of the problems adopted. Themaintenance phase begins when the system is inproduction. It develops periodically, that is, it is dynamic.the knowledge from the "cause of effects" (abductiveinference) ascounterpart to the deductive inference modelin which the knowledge is structured in the form of "effectscause" (Mussruha et al., 2005). The future work will seekto evaluate several alternatives on possible diagnosismodels fornutritional deficiency symptoms in plants, andto develop specific heuristics for the domain of application.For papers published in translation journals, please give the Englishcitation first, followed by the original foreign-language citation.

3. Rules and Implementation:

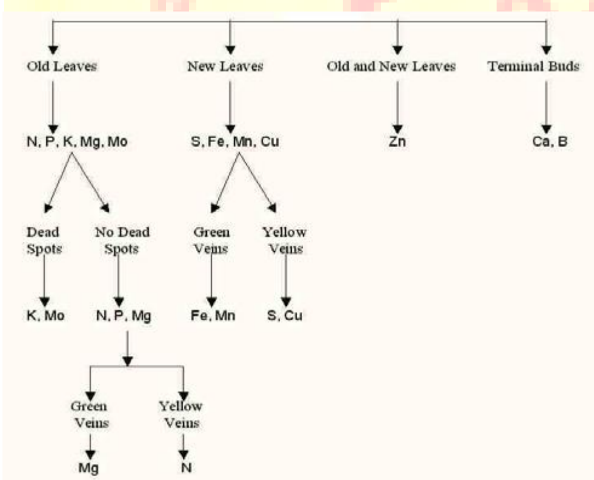


Fig.5.Flowchart for the identification of deficiency symptomsaccording to Reddy and Reddi (1997)

In this web based application we can register a new user. After registration user can use the application. If there is disease on the rice plant on user's farm then user can first select the crop. After selecting the crop user can enter disease name and can select the image of leaf. After this system shows the symptoms and remedies (chemical and non chemical). To do administration admin login is provided to maintain the data. Admin can enter crop name, crop detail in database and can view the grid report of all crops and information of user who uses this application.

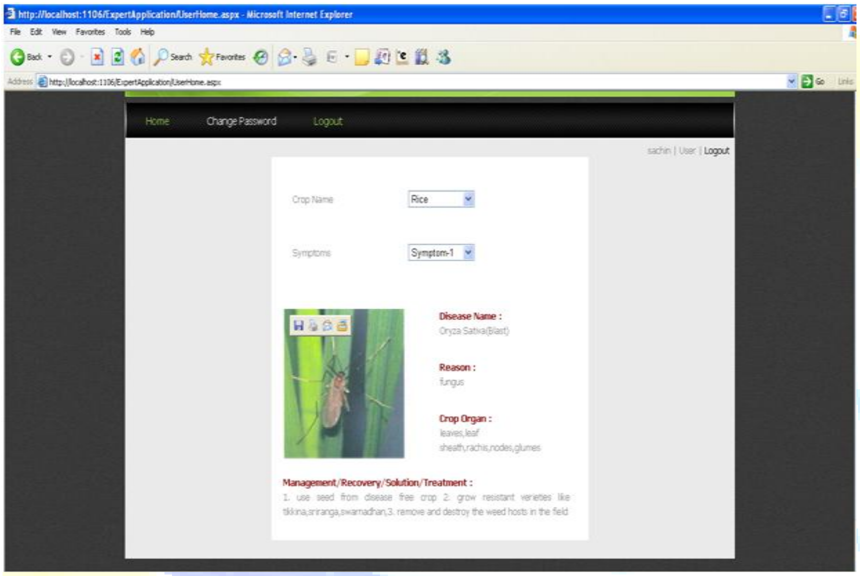


Fig.6. Web application screen shot

4. Conclusion:

It isexpected that this system be used on a large scale. Thisshould contribute to, improving the quality and productivityin agricultural sector. **Future work** in the context ofthe Artificial Intelligence will be to evaluate and possibly todevelop diagnosis models that are more adaptable to thisproblem. The diagnosis is enforced byreasoning of deficiency symptoms and can be seen as acognitive process that embraces generic knowledge aboutthe flaws and explanations of these flaws (a diagnosismodel) as well as knowledge on a private domain andspecific heuristics of the domain. We propose to structurea paddy expert system was developed, verified and tested. It gives strategic advice, which enable paddy growers to apply theright operation at the specific time. This enables users to avoid the problems that mayoccur during growing season. The system also solves problems that may occurduring growing season. It diagnoses the problems and advises users how to controlthese problems either by agricultural operations and chemical operations or non chemical operation.

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