Chapter 9: Summary, Conclusions, Limitations and Recommendations

The chapter covers the summary, conclusions and limitations of the research work and recommendation of the research study.
Summary, Conclusions, Limitations and Recommendations

9.1. Introduction

This chapter entails a summary of the major findings with the conclusion, limitation. It also gives an account of suggestions and recommendations of future research in the fields of computer science regarding expert system. The main purpose of the present research work is development of expert system prototype in helping the farmers to diagnose the common rice plant diseases occurring during their life span in Manipur, India.

The study was undertaken to investigate expert system applications, especially in agriculture with the objectives of identifying the common diseases of rice plant, their causing agents, predisposing factors of the disease and its control measures; to develop database, a rule based expert system using the Java Expert System shell (JESS) that consists of the information about common diseases of rice plant and its control measures and to implement the developed prototype expert system.

A review related research and by extensive consultations with knowledge experts in the field of rice plant, the knowledge domain of
the system were collected. These consultations enable the formulation of production rules of the system to be represented in the knowledge base. It also helps to decide for analysis and interpretation of the proposed system for diagnosis of rice plant diseases.

The expert system has been developed from scratch using the expert system shell JESS and the Java IDE of Netbeans 7.0 for knowledge base development and SQL is used as the Database engine for the system. The JESS file is called in the NetBeans Environment and the Database also. The designed system is than intended for the diagnosis of common diseases occurring in the rice plant. While interacting with the developed system, the response of the domain found to be successful and promising. The developed system compares favourably with other earlier developed expert systems in the diagnosis of diseases in agriculture domain which include Wheat Expert system, Tomato Expert System and AMRAPALIKA: The Mango Expert System etc.

9.2. Effectiveness of System Application

The effectiveness of the system application for diagnosing rice plant diseases has been fully implemented and tested which is seen in the developed system. That testing was not as comprehensive as desirable but was within the restrictions of the research project, and was compares favourably with the testing of other comparable
systems. In general, the system has been an effective aid to the farmers for better production of yields. The development of a working prototype of a system is an important part of any expert system project.

Expert Systems exercise information technology to acquire and utilize human expertise. They can be beneficial to the farmers by providing the expert knowledge in the form of expert system. The system can centralize the decision making process, create efficiency and reduce time needed to diagnose the diseases of similar symptoms. However, the developed system has its limitations of limited knowledge domain compared to human experts.

The proposed expert system acts as a diagnostic tool in getting effective control measures and for better production of yields and assists the farmers in diagnosing rice plant diseases occurring during their life span. It is used in an economic and effective way. As the expert knowledge is already represented in the knowledge base, presence of the domain expert is not needed. The special advantage of such systems is that without the direct expert's participation, it helps in solving the particular tasks and also has the possibility of knowledge aggregation in one system of the numerous experts team.
9.2. General Approach in the Diagnosis Process

The developed system has been designed so that it can provide the expert advice in different areas of rice plant diseases specified by the agricultural experts. The diagnosis process in this system is by supplying the disease symptom with the corresponding photograph of the disease to the system. If the disease of the given symptom is available more than one disease, we will go for the further treatment; otherwise, the system will provide the detail information of the disease and advice the user to control the disease.

9.3. Limitations of the system

The expert system is still incomplete in copying human reasoning even though the system is appreciated. It has two main limits, whose consequence is the simplification of human reasoning: the modification of the reasoning and the information used.

It is necessary to make a model of the diagnosis to atomize the diagnosis with an expert system. It means that we have to describe and to formalize the diagnosis process in order to create a model. But, the formalization of the diagnosis unavoidably simplifies human reasoning process. The arrangement of the diagnosis and atomization of diagnosis method has, certainly, simplifying effects.
The second limitation of the system is concerns with the information used in the expert system. Here, the entire information cannot be introduced as the system is necessarily somewhat imprecise. It is impossible to consider all information existing in reality in order to achieve a common basis used in the diagnosis. Therefore, the more the field of information was limited, the poorer the transcription of human reasoning.

9.4. Recommendation for Future Research

Expert Systems are useful in the field of disease diagnosis in agriculture domain. Therefore, the following recommendations are can be undertaken in improving and extending the expert system for future research:

- Repeating the evaluation of the expert system to give more feedback to the developed expert system and to highlight the other factors which needs improving.

- Expanding and upgrading of knowledge base to incorporate more domain knowledge for diagnosis of rice plant occurring during their life span. It would be necessary scale up the system to cater for new developments For example, the domain knowledge of the developed system is limited to the disease diagnosis of fungal, bacterial and virus diseases.
There should be favourable conditions for the further studies and development of expert systems in different disease diagnosis problem in different areas of agriculture domain.

Hence, the need of expert systems in agriculture for technical information transfer can be identified by recognizing the problems. The advantages that an expert system can offer are better than traditional methods. It is proven that expert systems in agriculture helps a lot in increasing the crop production. By developing an expert system in agriculture it helps the need of the farmers to know the facts and truths in increasing the production.