PEST ACTIVITY PROGNOSIS IN RICE FIELDS USING FUZZY EXPERT SYSTEM APPROACH

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ABSTRAK

Logik kabur merupakan satu bentuk perwakilan pengetahuan bagi konsep yang tak dapat ditakrifkan secara tepat tetapi bergantung kepada konteks penggunaannya. Sistem Pakar adalah program komputer yang menggunakan pengetahuan manusia untuk menyelesaikan masalah khusus yang memerlukan kepintaran manusia. Oleh kerana pengetahuan yang terlibat dalam pengurusan serangga adalah tidak lengkap dan kabur, maka logik kabur diintegrasikan ke dalam sistem pakar untuk mengendalikan penaksiran anggaran. Sistem Pakar dan Logik Kabur mempunyai kelebihannya tersendiri dan gabungan kedua-dua teknologi yang membentuk sistem pakar-kabur dapat meningkatkan keupayaan sistem (Herrmann, 1996). Berdasarkan keupayaan logik kabur dan sistem pakar, peramalan aktiviti serangga di sawah padi menggunakan pendekatan pakar-kabur telah dibangunkan untuk menyediakan maklumat kepada petani dan penyelidik melalui Internet. Oleh kerana beras merupakan makanan ruji rakyat Malaysia dan Kedah merupakan kawasan utama penanaman padi di Malaysia, kajian ini memfokuskan kepada aktiviti serangga di sawah padi. Dalam MyPEST, jenis serangga yang mengakibatkan kerosakan pada tanaman padi ditentukan oleh sistem pakar, manakala Logik Kabur digunakan untuk meramalkan tahap aktiviti serangga. Ini penting supaya rawatan awal dapat dilakukan sebelum kerosakan bertambah buruk. Sistem MyPEST membantu pengguna dengan mengendalikan rundingan pakar yang dikawalselia oleh sistem pakar dan logik kabur untuk peramalan dan menguruskan ketidakpastian data menggunakan pembolehubah lingistik. Sistem berasaskan web ini juga membantu petani dan institusi pertanian untuk menguruskan ladang dengan cekap dan dapat meningkatkan kualiti serta kuantiti beras yang dihasilkan. Dalam kajian ini, proses peramalan menggunakan lebih daripada satu attribut telah dikaji. Dapatan kajian menunjukkan sekiranya lebih daripada satu atribut terlibat, graf keputusan 3-dimensi yang kurang tegar dihasilkan. Penentuan jenis serangga adalah dalam fasa pertama MyPEST dan diikuti oleh peramalan aktiviti serangga yang dikenalpasti. Sistem ini telah disemak oleh pakar serangga di MARDi dan disahkan membawa manfaat kepada penyelidik di MARDI, MADA dan DOA khususnya dan petani secara keseluruhan.

ABSTRACT

Fuzzy Logic (FL) is a form of knowledge representation which is appropriate for notions that cannot be defined precisely, but depends upon its context. An Expert System (ES) is a computer program that uses human knowledge to solve problems in typical tasks, which normally requires human intelligence. As knowledge involved in pest management is imperfect, vague and not completely reliable, fuzzy logic is integrated in this expert system to deal with the approximate reasoning. Expert system and fuzzy logic have their own significant capabilities the combination of both technologies that forms a fuzzy-expert system or a hybrid system could increase the systems performance (Herrmann, 1996). Due to the capability of fuzzy logic and expert system, pest activity prognosis in rice field using fuzzy expert approach was developed to provide information to the farmers and researchers through the Internet. Since rice is the main staple food of the Malaysian and Kedah is known as 'rice bowl' Malaysia, therefore this study focuses on the pest's activity in the rice fields. In MyPEST, the type of pest that causes damage to the rice plant is determined by the expert system. On the other hand, Fuzzy Logic approach is used to forecast the pest activity level. This is important so that early treatment or action can be applied before damage to the plant becomes worst. The system helps the user by managing the consultation which is performed by the expert system and fuzzy logic to make prediction and dealing with the natural and uncertainty data using linguistic variables. This web based application system also helps the farmers as well as agriculture institution representatives to manage farm successfully and to improve the quality and quantity of rice production. In this study, the forecasting process using more than one attributes was explored. From the findings, if more than one attributes involved, the less rigid 3-dimensional decision graph was produced. The identification for the type of pest is also involved in the first phase of this system which followed by the activity forecasting based on the identified pest. The system has been verified by MARDI entomologist and the system is confirmed to benefit the researchers at MARDI, MADA and DOA particularly, and the farmers at large.

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CHAPTER 1

INTRODUCTION

This chapter briefly explains the background of the project that mainly involves the integration between fuzzy logic and expert system to form a fuzzy expert system in order to utilize the advantages from both approaches. The problem statement, objectives, significance of the project and scopes are also presented in this chapter.

1.1 Background Study

Fuzzy Logic (FL) is a form of knowledge representation which is appropriate for notions that cannot be defined precisely, but depend upon its context. It enables computerized devices to reason more like humans. Fuzzy logic is an excellent means to combine Artificial Intelligence methods (Zadeh, 1993). The advantage of fuzziness dealing with imprecision fits ideally into decision systems; the vagueness and uncertainty of human expressions is well modeled in the fuzzy sets, and a pseudo-verbal representation, similar to an expert's formulation can be achieved. In a sense, fuzzy logic resembles human decision making with its ability to work from approximate data and find precise solutions.

An Expert System (ES) is a computer program that uses human knowledge to solve problems in typical tasks, which normally requires human intelligence. Expert systems were designed to reason through knowledge to solve problems using methods that

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