

A. IMAGE PROCESSING AND PATTERN RECOGNITION

1. **A NEW CLASSIFICATION TECHNIQUE NEURAL NETWORK ALGORITHM FOR TROPICAL WOOD RECOGNITION SYSTEM (PHD)**

There are many neural network paradigms that have been proven to be successful in solving pattern recognition problems, however, each of them has its advantages and disadvantages. For example, the MLP trained by the BP algorithm has got a simple structure but slow in convergence; another is the fuzzy ARTMAP which has fast convergence but has limitation in solving grey patterns such as an "8" and a "B". This research involves studying existing neural network architectures and learning algorithms with the intention of finding a more powerful neural network paradigm. One feature of the new neural network is its ability to provide confidence level in its results. The neural network algorithm is used for application in wood recognition system.

2. **INTELLIGENT VEHICLE LICENCE PLATE RECOGNITION SYSTEM (MASTERS OF ENGINEERING, PHD)**

Several research has been done in CAIRO to develop an intelligent vehicle license plate recognition system. Some of the algorithms have proven to provide a very good accuracy. However, there remain some problems relating to the images of the license plate, for example dirty images, blurr images, etc. This project is to develop an algorithm to overcome some of the problems faced in the license plate recognition system. The work would involve recognition of special Malaysian vehicle licence plates such as PROTON, PERDANA, SATRIA, SUKOM, etc.

3. **USING SELF ORGANIZING NEURO FUZZY FOR ON LINE HAND WRITTEN SIGNATURE VERIFICATION SYSTEM (MASTERS OF ENGINEERING, PHD)**

An algorithm called self organizing neuro fuzzy has been developed at CAIRO. The algorithm has been applied to a control system applications and have been shown to perform very well. In this project, the algorithm will be applied to on line hand written signature verification system. The online signature verification system must be able to detect forgeries and at the same time reduce rejection of genuine signatures. In evaluating the performance of a signature verification system, there are two important factors: the false rejection rate (FRR) of genuine signatures and false

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acceptance rate (FAR) of forgery signatures by tracing signing with take paper on the tablet.

In this project, the pen position and pen time information will be inputs to the online handwritten signature system. The decision of the signature verification is based on a reliable algorithm with the generation of automatic threshold values. The self organizing neuro fuzzy algorithm will be modified to suit this application. Comparison will be made with the current signature verification system to evaluate the effective of the new algorithm.

4. **OPTIMAL FEATURE REPRESENTATION FOR ON LINE SIGNATURE VERIFICATION SYSTEM (PHD)**

This project will look in methods of optimal feature representation. In this case, features of the hand written signature are extracted and represented as consistency function using AI techniques such as GA or fuzzy GA. The project will involve developing innovative algorithms in order to optimally represent the features as functions which is capable of producing largest between class and an acceptable within class distance measure.

5. **USING FUZZY GENETIC ALGORITHM FOR EYE DETECTION (MASTERS OF ENGINEERING)**

Eye location is one of the important factor for face normalization and will facilitate the location of facial landmark. Eye detection allows focus of the salient features of the face and to filter structural noise and to eventually have a more accurate face recognition. This project involves the use of fuzzy genetic algorithm such as Pittsburgh or Michigan type to detect the location of the eye.

B. FAULT DIAGNOSIS, OPTIMIZATION AND CONTROL

1. **DIAGNOSIS OF FAULTS IN TRANSFORMERS USING FUZZY DATA MINING(MASTERS OF ENGINEERING, PHD)**

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Diagnosing faults in power transformers is a very important task and have to be done routinely. For normal faults conditions, engineers at the utility company will be able to detect. However, there are some conditions in which it is very difficult for normal engineers to diagnose, and hence requires an expert in transformer fault diagnosis.

At CAIRO, a transformer fault diagnosis engine has been developed using fuzzy logic inference to diagnose the power transformer faults using the data obtained from dissolved gas analysis tests and the rules obtained from the experts and also from various ratios used such as Roger's ratio, etc. Laboratory test results taken from various transformers situated in various sub-stations of the utility company are obtained. Expert interpretations of the test results will be provided by the utility company consultants.

This project is a continuation of project in which a fuzzy GA will be used to provide a more accurate interpretations of the faults.

2. **Optimization of BUS DRIVER SCHEDULING SYSTEM USING AI TECHNIQUES(MASTERS OF ENGINEERING, PHD)**

The bus driver scheduling system provides a challenging problem in operation research. This is because a large savings in operation cost can be achieved with optimization. This project is about simulating a bus driver schedule in a transportation system taking into consideration the constraints involved. The problem is about minimizing the number of drivers used for the bus routes in order to minimize the cost. Variants of the AI system will be applied for the optimization.

3. **TIMETABLE SCHEDULING SYSTEM USING PARALLEL GA(MASTERS OF ENGINEERING, PHD)**

A timetable scheduling system using micro GA has been applied to Universiti Teknologi Malaysia course timetable scheduling system. One of the main reason for using the micro GA is to reduce the time to generate the no clash timetable. Micro GA has shown some improvement in the time taken as compared to conventional GA. However, the performance of micro GA can be further improved if it is used in parallel computing. This project is about using the micro GA as in parallel processing or parallel computing in order to improve the time taken for timetable generation

4. **USE OF FUZZY DATA MINING TO PREDICT THE BEHAVIOUR OF CONSUMER BEHAVIOUR (MASTERS OF ENGINEERING, PHD)**

Information such as what a consumer with a certain combination of demographics would most likely to purchase given a range of products, would be a very useful information indeed for retailers as well as market outlets. The information would determine the marketing strategies they can take in order to make an effective marketing and promotion. To a certain extent, this would reduce the marketing costs.

This project is to develop an intelligent engine which would be able to predict the behaviour of the consumer based on their demographics. Based on the market survey data, the engine should utilize Fuzzy data mining for the prediction. Data mining techniques are usually used to discover patterns in a large sets of data. However, the problem of sharp boundaries arises when the data mining association rules are being quantized into discrete values. Fuzzy logic in the form of Fuzzy association rules will be used to overcome the sharp boundaries that usually occur in the data mining association rules. Genetic algorithm should also be used to optimized the fuzzy membership functions.