

**Universiti Teknologi MARA**

**SIMULATION OF GARDEN WATER  
DISPERSAL CONTROLLER USING FUZZY  
EXPERT SYSTEM**

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Thesis submitted in fulfillment of the requirements for  
**Bachelor of Science (Hons) Intelligent System**  
**Faculty of Information Technology And**  
**Quantitative Science**

NOV 2006

## DECLARATION

I declare that this thesis and the research to which it refers are the product of my own work and that any ideas or quotation from the work of other people, published or otherwise are fully acknowledged in accordance with the standard referring practices of the discipline.

NOV 23, 2006



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## **ACKNOWLEDGEMENTS**

**In the name of Allah the most Gracious and the most Merciful**

**May His blessing be upon the Prophet Muhammad s.a.w**

I would like to express my deep gratitude to Allah S.W.T, for He has bestowed me with ideas, strength, opportunity and He has opened up some peoples' heart to assist me in my task. Without it, I might be lost until today.

My gratitude also goes to all individual and group of people that involved directly and indirectly in this final project especially to my supervisor En. Izham Fariz Ahmad Jinan for his patient, guidance, opinions and valuable advice. To Pn. Marina bt Yusoff, my thesis coordinator, for all the positive comments that she gave to me. To En. Zaki Zakaria, my program coordinator. To En. Abdul Ghani b Ibrahim, the expert from Rubber Research Institute (RRI) and En. Mohd Razip b Dahalan the Kelab Golf Sultan Abdul Aziz Shah superintendent for all their information, guidance, recommendation and tips that they gave to me.

I would also like to thank all the people that I've contacted numerously and in different occasion to collect information and discuss about the issues related to my final project.

My personal gratitude goes to my family, my mother Pn. Palziah Zakaria, my father, En. Jazahanim Amir, my siblings Omar Kaisan bin Jazahanim, Ku Mahirah bt Jazahanim and Omar Arif bin Jazahanim and my uncles, Abdul Ghani Ibrahim and Fadzil A'yad Zakaria for all the unceasing moral support and tolerance that they gave me.

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## ABSTRACT

One of the most important elements in lawn maintenance is the moisture adequacy. For this reason, irrigation, done by manual or automated sprinkler system, has been applied. However, both systems may use excessive amount of water and the amount dispersed may not be suitable for the moisture level of the lawn. Therefore, there is a need to develop an irrigation system that can measure and monitor the soil moisture through data acquired from the soil and also from the climatologic factors that will help to decide when to water and how much water is needed. This research demonstrates the usage of Fuzzy Logic in irrigation control system. The types of fuzzy inference that applied to the irrigation system were Mandani with normal subsets, Mandani with hedges, Sugeno with normal subsets and Sugeno with hedges. The first step applied is the element identification involves in the irrigation process which was determined by consulting the relevant expertise and literature. Once the actual rules and fuzzy sets are determined, the comparison of the conventional irrigation system with all four fuzzy inference methods was conducted with each other. The intention is to see which system is better in optimizing water usage. Lastly, a simulation system was built to demonstrate the soil moisture content of the lawn, the percentage pattern of soil moisture and daily data involved in the system. This project was restricted to the Bermuda Turf grass characteristic, the loam soil characteristic, 92.9m<sup>2</sup> lawn sizes, pop-up spray head sprinkler, evapotranspiration (ET); the climatology factor and the soil moisture reading from tensiometer. This project is significant to the irrigation industry whereby, new irrigation product can be produced using intelligent systems. From the comparison made, it was shown that the fuzzy expert irrigation system performed better based on the lower annual average water usage for the whole year recorded. The most effective fuzzy inference method applied was the Mandani style with normal subsets which uses the least amount of water. The result of this research shows promise for future R&D in intelligent irrigation system either for individual or enterprise level management of plants.