CANAL IRRIGATION CONTROL SYSTEM IN PADDY FIELD

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ABSTRACT

System of irrigation is an important system for paddy. Although system of irrigation for paddy is available nowadays, but it is a manual system, where farmers need to measure the water level in the field and to ensure that the water level is in the correct level. Therefore, this project is designed to improve the existing irrigation system to more modern system; this is one of the objectives of the project. Besides, another objective of this project is irrigation system is controlled by a Programmable Integrated Circuit (PIC), which it can control the water level more consistent and while LCD Display used to display either a condition level of 5cm or 10cm of water on the appointed day. The aim of this project is to provide facilities to the farmers, where they can monitor water levels. This project is more efficient and systematic, where irrigation of water in and drain at paddy field is controlled automatically. The main contribution of this project is application of the PIC in which it is able to control the main controller for the water level in rice fields.

ABSTRAK

Sistem pengairan merupakan sistem yang penting dalam penanaman padi, untuk menjaga kualiti padi. Sistem pengairan sawah padi sedia yang ada, biasanya adalah secara manual. Dimana pesawah perlu mengukur paras air dalam sawah dan perlu memastikan paras air pada paras yang betul. Oleh itu, projek ini direka untuk mempertingkatkan sistem pengairan yang sedia ada kepada sistem yang lebih canggih; ini adalah salah satu objektif projek ini direka. Disamping itu objektif lain bagi projek ini adalah sistem pengairan ini dikawal oleh *Programmable Integrated Circuit (PIC)*, dimana ia boleh mengawal paras air lebih konsisten dan *LCD Display* digunakan untuk memaparkan kedaan paras air sama ada 5cm atau 10cm berdasarkan hari yang telah ditetapkan. Tujuan projek ini adalah untuk memberi kemudahan kepada para petani, di mana mereka dapat memantau paras air dengan lebih tepat. Projek ini lebih cekap dan sistematik, dimana saliran keluar masuk air di sawah dikawal secara automatik. Sumbangan utama dalam projek ini adalah aplikasi PIC di mana ianya merupakan sistem kawalan yang berkemampuan menjadi pengawal utama kepada paras air di dalam sawah padi.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVATION

PIC	-	Programmable Integrated Circuit
LabVIEW	-	Laboratory Virtual Instrumentation Engineering Workbench
PCB	-	Printed Circuit Board
PSM	-	Projek Sarjana Muda
LED	-	Light-Emitting Diode
LCD	-	Liquid Cristal Display
PLC	-	Programmable Logic Circuit
MCU	-	Microcontroller Unit
LED	-	Light Emitting Diode
MARDI	-	Malaysian Agricultural Research and Development Institute
JPS	-	Jabatan Pengairan dan Saliran
USB	-	Universal Serial Bus

LIST OF APPENDIX

CHAPTER I

INTRODUCTION

1.1 Introduction of The Project

This project is about how a system designed to control the drainage of irrigation water into paddy fields. This system will be controlled by PIC16F877. The PIC controller will control the motor pump in order to maintain the level of water in the field and additional of LCD display is to display the condition of system. While motor pump used in this system is to pump water, it has two conditions it will be work; firstly it will pump water into paddy field and second it will pump out water from paddy field. Specific level of water for paddy field is 5cm and 10cm, so if level of water more than specific level or overload so motor pump for pump out of water will be function. Besides level of water is depends on day that state in '*Buku Panduan Pengurusan Air untuk Tanaman Padi*' by JPS which they state that day 5 until day 14 level of water is 5cm while day 15 until day 80 level of water in paddy field will increase from 5cm to 10cm and day 81 until day 95 water pump will pump out water from paddy field. This system is more systematic and user friendly than conventional system, which should be open to drain off irrigation water to paddy fields. In addition, the system can also improve the quality and quantity of rice.

1.2 Objectives

This project is purposely to study about canal irrigation control system in paddy field. It is because to know how to improve irrigation control system that using in paddy field. The system will used software, so before design this system, must to understand how PIC16F877A program works. While another objective is to design a water level circuit, output circuit, power supply circuit and then combine it together with PIC controller that used in this project.

Objectives of the project are:

i. To improve the conventional paddy field irrigation system to a modern system.
ii. To design and develop irrigation control system in paddy field using PIC.

1.3 Problem Statement

Malaysia is a country that has a lot of paddy field fields, but farmers are still using manual systems for the irrigation of crops. As we know, the irrigation system is important to paddy plants in which the nature of the paddy itself which it needs water to alive, where level of water are not too many and too few. Besides, the weather in Malaysia is a factor that caused the destruction of rice crops which are sometimes dry, and sometimes floods, so a good irrigation system is necessary to prevent farmers from losses. Based on current technology nowadays, I propose to develop a system of canal irrigation control system in paddy field by using a PIC to control the water pump and motor function and the LCD display will display current result as my final project.

1.4 Scope of Projects

The scope of this project is to study and research several information that related to the project that will be designed. The project is divided into two parts, namely the software and hardware. Hardware design is about looking for the materials and resources on the right track with the project. The main thing that is emphasized in the hardware design is the ability of the circuit, the price and size. Besides that, it need to ensure that the project will be fully functioning when all the circuits needed are combined together in a design. While in software design is focused on find and review software for the project and can be combined with the hardware. The software that used for this project should be suitable, simple program design, and easy to understand functions.

1.5 Report Structure

This final year project consists of six chapters. First part of this paper discusses the concept of canal irrigation control system in paddy field, the factor that initiates the canal irrigation system to be developed and its objectives.

The second part described literature review of canal irrigation system and background study of the irrigation project.

The third part is covered the methodology of project which design and development of canal irrigation control system in paddy field project.

The fourth part which is Chapter IV is covered design of project and how the project functions according to methodology.

The fifth part which is Chapter V consists of results and applications of canal irrigation control system in paddy field project also include the analysis of project and software.

Finally, the last part is part which concludes the overall development project and how to improve it very well.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

Much research in the irrigation system of previous projects has been reviewed. The purpose of the research is to identify technologies have been used and how to improve the system. The project previously many uses of PLCs (Programmable Logic Circuit) as a controller for controlling the irrigation system. Additionally, the research also conducted in the industry, which is to determine how the rice irrigation system used in Malaysia.

2.2 Economic Assessment Of An Irrigation Canal Automation And Control Project

According to M Abu-El Magad, Eman Kamel, and Khaled Kamel [6]. The automation and remote control system improvements comprise electrically powered motorized gate operators with local control (at each regulator) by a programmable logic controller (PLC) actuated by water level limit transmitters. The PLC units are monitored and controlled from a PC sub-master station located at the irrigation manager's office. A computer Simulation model is available to the manager to enable

evaluation of alternative control scenarios prior to carrying them out. In addition, equipment was provided for remote monitoring of gate openings and water levels at 10 of the most important secondary canal turnouts supplying 40% of the total area irrigated below the head-gates. A more detailed description of the system and the improvements implemented was presented.

2.2.1 The PLC System

Each site is equipped with an Allen-Bradley PLC, which is equipped with an adequate number of Input/Output modules, communication modules, and associated panels. The ladder program was implemented using Allen-Bradley 6200 series software. The program logic implemented a downstream water level control which involved the adjustment of upper and lower gates repeatedly. It also calculated the flow rate through the regulator based on the Irrigation Conveyance Simulation System (ICSS).

System control can be provided in local or remote mode. Remote mode can be active only when the system is placed on the Automatic (AUTO) position. If the switch for any of the motors is placed on manual position, only local control mode is available for such motor/gate. Gates are maintained at approximately equal openings by adequate selection of the next gate to be moved and by constraining the movement to only one gate at a time for a small distance. If a motor fails to start or is put on manual position, it does not get included in the control selection and sequencing.

The user interface, graphics, database and communication are implemented using Allen-Bradley Control View software. Water levels, gate openings, upstream level, downstream level, lock gates position, flow conditions and the flow rate are monitored and continuously displayed for each of the regulators. Also motors and operation switches are displayed. A status page is provided for each site with alarm types and possible cause. Remote entries of set points are also provided. Color codes used