GRAPHICAL USER INTERFACE (GUI) FOR SUPERVISORY CONTROL OF COMPUTER INTEGRATED MANUFACTURING (CIM-70A) USING SCADA

AFARULRAZI BIN ABU BAKAR

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

UNIVERSITI TEKNOLOGI TUN HUSSEIN ONN MALAYSIA

PENGESAHAN STATUS LAPORAN PROJEK SARJANA

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64 JALAN CUCUR ,TAMAN SOGA,
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Graphical User Interface (GUI) for Supervisory Control of Computer Integrated Manufacturing (CIM-70A) using SCADA

AFARULRAZI BIN ABU BAKAR

A thesis submitted
In fulfillment of the requirement for the award of the
Degree of Master of Engineering (Electrical)

Faculty of Electrical and Electronic Engineering
Universiti Tun Hussein Onn Malaysia

MAY, 2006

I declare that this thesis is the result of my own research except as cited in the references".

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DEDICATION

This is special dedicated to my beloved mother Aminah bte Sarib , my father Abu Bakar Bin Md Nor , my lovely fiancé Norasikin bte Harpan and my family for their continuous love and prayers , also to all my friends for their patient , kindness and cooperation . I wish to thanks all of you for your support during my studies in UTHM.

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ABSTRACT

Supervisory Control system and the Acquisition Data or SCADA is generalization of effective plant monitoring and control system in meeting production needs etc. The aim of the study is to prepare a SCADA system for AS/RS, functional Mechatronics Educational Material which simulates to real-life production system. Graphical control buttons to the system will be design to perform single or multiple tasks. The software is form Citect Pty. Limited called Citect SCADA. This project will be discussed as it applied in a CIM-70A at Mechatronic Laboratory of UTHM. Designing a controlling and monitoring system not only for AS/RS but it is also a way providing up-to-date data. It will provide system operators with central or local control using clear, concise, resizable graphics pages (screens). Graphical control buttons to the system will be design to perform single or multiple tasks. In the last chapter, some methodologies for solving the problem as well as to improve the SCADA are proposed.

ABSTRAK

Sistem kawalan penyeliaan dan pemerolehan data atau SCADA adalah generasi baru kepada sistem pengawasan kilang dan sistem kawalan dalam memenuhi keperluan pengeluaran dan sebagainya. Matlamat kajian adalah menyediakan sebuah sistem SCADA untuk AS/RS, yang berfungsi sebagai bahan pendidikan Mekatronik yang mana mensimulasi sistem sebenar pengeluaran. Gambarajah direkabentuk untuk mengawal tugas-tugas tunggal atau tugas berganda. Perisian yang digunakan adalah Citect SCADA daripada Citect Pty. Projek ini akan dibincangkan sebagaimana ia diaplikasikan pada sistem CIM-70A di Makmal Mekatronik, UTHM. Merekabentuk satu pengawalan dan sistem pengawasan bukan sahaja untuk AS/RS tetapi juga satu cara menyediakan data terkini. Ia akan menyediakan operator sistem dengan pusat atau kawalan tempatan menggunakan jelas , ringkas dengan halaman-halaman grafik (skrin). Gambarajah butang-butang kepada sistem akan reka bentuk untuk melaksanakan tugas-tugas tunggal atau berganda. Di bab terakhir, beberapa metodologi untuk penyelesaian masalah serta untuk meningkatkan SCADA dibincangkan.

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LIST OF ACRONYMS/SYMBOLS/TERMS

AS/RS	-	Automatic Storage and Retrieval System station
Gbps	-	Giga bits per second
CIM70A	-	Computer Integrated Manufacturing Training Kit
DCS	-	Distributed Control Systems
GUI	-	Graphical User Interface
HMI	-	Human Machine Interface
I/O	-	Input/Output
UTHM	-	Universiti Tun Hussien Onn Malaysia
LAN	-	Local Area Network
m	-	mili
PLC	-	Programming Logic Controller
RTU	-	Remote Terminal Unit
s	-	second
SCADA	-	Supervisory Control and Data Acquisition
VMS	-	Virtual Memory System
CIO	-	Common Input/Output
COM	-	Component Object Model
DM	-	Data memory
FKEE	-	Faculty of Electrical and Electronic Engineering
IEEE	-	Institute of Electrical and Electronic Engineer
IEC	-	International Electrotechnical Commission
IP	-	Internet Protocol
GRAFCET	-	Graphe Fonctionnel de Commande Etape Transition
CRT	-	Cathode Rectifier Tube
DSP	-	Digital Signal Processing
Bps	-	bit per second

LAN	-	Local-Area Networking
CPU	-	Central Processing Unit
WAN	-	Wide-Area Networks
MT	-	Multi Tasking
TNBT	-	Tenaga Nasional Berhad (Transmission)
SAMS	-	Substation Alarm Monitoring System
MPS	-	Modular Production System
SYSCON	-	System Control of Communication Network
DMS	-	Distribution management system
EMS	-	Energy management system

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CHAPTER I

INTRODUCTION

1.0 Introduction

SCADA is the acronym for Supervisory Control and Data Acquisition. The term refers to a large-scale, distributed measurement (and control) system. SCADA systems are used in various applications in many different industries. Such as control chemical or transport processes, in municipal water supply systems, to control electric power generation, transmission and distribution, gas and oil pipelines, and other distributed processes. SCADA systems are used in various applications in many different industries. Whatever our application, SCADA will help to deliver and effective plant monitoring and control system. SCADA is a computer-based system for gathering and analyzing real time data and making suitable decisions based on the analysis (Rajesh Kumar, Syed Akif Kamal, Furqan M.Khan, 2004). For big or small applications alike, we have a flexibility to choose our own system design, confident our system will be fast, efficient, and

completely scalable. It can record continuously a large amount of measurement points (channels) simultaneously; process the acquired data via powerful computing capability, and present data to the people everywhere in a graphical and real-time form.

Training on the actual real-life of production plant is often not possible, since the risk of a malfunctioning system would be too great and the production process would be considerably disrupted. Computer Integrated Manufacturing (CIM-70A) at Robotic Lab, UTHM allow Industrial Automation Systems of different levels of complexity involved many automation technologies such as mechanics, pneumatics, electric and electronic engineering, sensors, drives technology, PLC technology, industrial communication and computers. SCADA system falls under level 2 of control in a plant automation hierarchy.

Cell computer control and coordinate of devices in level 1 which consist of Master Conveyor. It has flexibility to change control function and communicate in real-time corresponding to devices in level 1. This level 1 encompasses devices such as, Vision inspection Station, Pin Insertion Station and AS/RS. Level 0 basically classified as automation component, such as sensors, pneumatic modules, mechatronic modules and control components.

1.1 Background of Problem

CIM-70A of UTHM's Robotics Laboratory is a Computer Integrated Manufacturing (CIM) which produces seven segment numbers from 0 to 9. The system can be control through SCADA software. The SCADA system for the CIM is control from two different windows thus used different method of communications. SCADA communicate with Master Conveyor and ASRS through COM1 and COM6 respectively. In this form, implementation of CIM system using Ethernet cannot be fully access by the user or operator. The Vision Station setting for pins location and pattern match earlier not accurate and the position of the pattern is not precise. The finished products pass through the vision sometimes not exactly same to the actual product. This project will concentrate on monitoring data status on ASRS location status let in the rack and the error massage from ASRS.

1.2 Objective

Designing SCADA for supervisory control of CIM70A system using CitectSCADA communicate with control level. It will provide system operators with central monitoring system with using clear, concise, resizable graphics pages (screens) and error alarm. To add the new value of knowledge on SCADA in term of communication, data transfer and programming for education purposed. Set up new setting for pattern recognition and location of Vision Inspection Station and data transfer from ASRS to Master Conveyor through serial communication.

1.3 Scope of Project

This project is based on some constraints listed below:

i) This project designs a SCADA system for ASRS in Robotic Laboratory.
ii) The stations included in the design are Master Conveyor Station, ASRS and Vision Inspection Station.
iii) Transfer a Data Memory from ASRS to the Master Conveyor through CIO.
iv) The process of PLCs programming of this system designed by using GRAFCET which then interpreted to ladder logic through CX-Programmer.

1.4 Thesis Layout

This thesis organized as follows: Chapter 1 explains the overall background of study. The heart of this study is presented well through this chapter. Chapter 2 explains the literature research based on SCADA system. The introduction on Computer integrated Manufacturing System (CIM-70A) in terms of operation, networking and communication explained in chapter 3.

Chapter 4 explains on the method that used through the study on SCADA. System development by using PLC represent by GRAFCET discussed in this chapter. This chapter will more focuses on SCADA software. All the method will be explain well as a future references. SCADA will be explaining perfectly plus with useful figure and graph.

Chapter 4 will explain results that reflect my problem statements as stated in first chapter. The results from the PLCs to SCADA discussed in this chapter. Chapter 5 will go through about the conclusion and recommendation. This entire thing is done after completing my dissertation references and appendices are enclosure for future reference.