

UNIVERSITI MALAYSIA PAHANG

**BORANG PENGESAHAN STATUS TESIS♦**

JUDUL: **IMPLEMENTATION OF PID CONTROLLER FOR CONTROLLING THE LIQUID LEVEL OF COUPLED TANK**

SESI PENGAJIAN: 2008/2009

Saya AHMAD SYAUQI BIN ADNAN (860630295895)  
(HURUF BESAR)

mengaku membenarkan tesis (Sarjana Muda/~~Sarjana~~ /~~Doktor Falsafah~~)\* ini disimpan di Perpustakaan dengan syarat-syarat kegunaan seperti berikut:

1. Tesis adalah hakmilik Universiti Malaysia Pahang.
2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan tesis ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. \*\*Sila tandakan ( √ )

**SULIT**

(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)

**TERHAD**

(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

**TIDAK TERHAD**

Disahkan oleh:

\_\_\_\_\_  
(TANDATANGAN PENULIS)

\_\_\_\_\_  
(TANDATANGAN PENYELIA)

Alamat Tetap:

**PT 310 TAMAN PUTIH,  
KG SRI AMAN,  
16800 PASIR PUTEH,  
KELANTAN.**

**EN. MOHD SYAKIRIN B RAMLI**  
( Nama Penyelia )

Tarikh: \_\_\_\_\_

Tarikh: : \_\_\_\_\_

- CATATAN:
- \* Potong yang tidak berkenaan.
  - \*\* Jika tesis ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali tempoh tesis ini perlu dikelaskan sebagai atau TERHAD.
  - ♦ Tesis dimaksudkan sebagai tesis bagi Ijazah doktor Falsafah dan Sarjana secara Penyelidikan, atau disertasi bagi pengajian secara kerja kursus dan penyelidikan, atau Laporan Projek Sarjana Muda (PSM).

# **Level control (Tank 1) of Coupled Tank Liquid Level System Using Integral Control State Feedback Controller**

AHMAD SYAUQI BIN ADNAN

This thesis is submitted as partial fulfillment of the requirement for the award of the  
Bachelor Degree of Electrical Engineering (Power Systems)

Faculty of Electrical & Electronic Engineering  
University Malaysia Pahang  
(UMP)

MEI, 2009

“All the trademark and copyright use herein are property of their respective owner. Reference of information from other sources is quoted accordingly; otherwise the information presented in this report is solely work of the author.”

Signature : \_\_\_\_\_

Author : AHMAD SYAUQI BIN ADNAN

Date : \_\_\_\_\_

**TABLE OF CONTENTS**

<b>CHAPTER</b>	<b>CONTENTS</b>	<b>PAGE</b>
	TITLE	i
	DECLARATION	ii
	DEDICATION	iii
	ACKNOWLEDGEMENT	iv
	ABSTRACT	v
	ABSTRAK	vi
	TABLE OF CONTENTS	vii
	LIST OF FIGURES	xi
	LIST OF TABLES	xii
	LIST OF ABBREVIATIONS	xiii
	LIST OF APPENDICES	xiv

1	INTRODUCTION	1
	1.1 Background of project	1
	1.2 Problem Statement	2
	1.3 Objective	3
	1.4 Scope of Project	3
	1.5 Summary	4
2	LITERATURE REVIEW	5
	2.1 Overview	5
	2.2 Article	5
	2.2 Summary	7
3	METHODOLOGY	8
	3.1 Overview	8
	3.2 Project Flow Chart	10
	3.3 Modeling of Coupled Tank System	12
	3.4 Controller Design	16
	3.5 MATLAB	20
	3.6 Visual Basic 6	22
	3.6 DAQ card	26
	3.6 Summary	27
4	RESULT, ANALYSIS AND DISCUSSION	28
	4.1 Overview	28
	4.2 MATLAB Simulation result	28
	4.3 Real Time Result	30

4.4	Comparison between simulation and real time experiments with controller	32
4.4	Summary	32
5	CONCLUSION AND FUTURE RECOMMENDATION	33
5.1	Conclusion	33
5.2	Future Recommendation	34
5.3	Costing and commercialization	35
	REFERENCE	36
	APPENDIX A	37
	APPENDIX B	38
	APPENDIX C	45

APPENDIX D	55
APPENDIX E	56

**LIST OF FIGURE**

<b>FIGURE</b>	<b>TITLE</b>	<b>PAGE</b>
3.1	Overall flow chart work of progress	7
3.2	Flow chart for software and hardware development	10
3.3	Block Diagram of integral control feedback controller combines with Plant	20
3.4	Integral Control Feedback Controller	20
3.5	The first GUI	23
3.6	The second GUI	24
3.7	The third GUI	24
3.8	Advantech USB DAQ 4716 card	26
3.9	Advantech USB DAQ 4716 card connection between computer and plant	26
4.1	MATLAB simulink model	28
4.2	Output for tank 1	30



**LIST OF TABLE**

<b>TABLE</b>	<b>TITLE</b>	<b>PAGE</b>
3.1	Parameter Values	14
3.2	Parameter Values	15
5.1	Total estimation cost	36

**LIST OF ABBREVIATIONS**

PID	-	Proportional-Integral-Derivative
DAQ	-	Data acquisition
GUI	-	Graphic User Interface
CTS-001	-	Coupled Tank Liquid Level System
V	-	Voltage
USB	-	Universal Serial Bus
RC	-	Resistor-Capacitor Circuit
VB	-	Visual Basic
PSM	-	'Projek Sarjana Muda'

**LIST OF APPENDICES**

<b>APPENDIX</b>	<b>TITLE</b>	<b>PAGE</b>
A	M-file coding	37
B	First GUI coding	38
C	Second GUI coding	46
D	Third GUI coding	55
E	DAQ card Datasheet	56

“I hereby acknowledge that the scope and quality of this thesis is qualified for the award of the Bachelor Degree of Electrical Engineering (Power Systems)”

Signature : \_\_\_\_\_

Name : EN. MOHD SYAKIRIN BIN RAMLI

Date : \_\_\_\_\_