SMART CAGE SYSTEM

NANTHAKUMAR A/L MUNISAMY

This report is submitted in partial fulfillment of the requirements for the award of Bachelor of Electronic Engineering (Telecommunication Engineering) With Honours

Faculty of Electronic and Computer Engineering
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SUPERVISOR NAME : DAVID YAP FOOK WENG

DATE : 27 APRIL 2010

Dedicated to:

My beloved parents, supervisor (Mr.David Yap Fook Weng), lectures and friends for their supports and help.

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ABSTRAK

Projek ini adalah untuk membina sebuah system pengawalan reban ayam. Tujuan projek ini dijalankan adalah untuk menghasilkan dan membangunkan satu system untuk mengawal paras air, paras makanan dan suhu di dalam reban ayam. Sistem ini hantar isyarat kepada pemilik, semasa paras air dan paras makanan rendah sementara itu, suhu dikawal dengan mengunakan pemanas dan kipas. Sistem ini mengunakan pengawal AT89S51 dan program ini ditulis dengan mengunakan MPLAB. Perisian ini berkomunikasi dengan perkakasan yang disambungkan kepadanya, contohnya pengesan suhu, pengesan paras air dan pengesan paras makanan. Litar pengesan direka agar ia dapat menyediakan keluaran yang serasi dengan program yang ditulis agar ia dapat berinteraksi dengan keluaran daripada litar pengesan. Perisian ADOBE FLASH digunakan untuk menunjukkan projek ini dalam animasi. Untuk merealisasikan projek ini suatu kenyataan, kajian yang mendalam dilakukan mengenai pegesn, pengawal AT89S51 dan perisian. Projek ini ditujukan kepada pengusaha reban ayam.

ABSTRACT

This project is to build controlling system inside cage. The purpose of this project is to create and develop a system that controlling temperature, water level and food level inside cage. Smart Cage System is an alerting system which able to alert owner once the temperature level inside cage is unstabilized and water & foods in low level. In this project microcontroller AT89S51 is used as a main component to control whole system and the MPLAB Integrated Development Environment (IDE) used for write programming. Microcontroller will interface with the components like temperature sensor, water level sensor and weight sensor. Sensor used to receive and send the signals to the AT89S51 for control this system. ADOBE FLASH used as software to develop an animation of this project. In order to realize this project, extensive background studies have been done on sensors, microcontroller AT89S51 and Adobe Flash. The basic and important methodologies that have been used in this project are literature review, system development, field testing and build up software. This project can be implemented at chicken farm.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Smart cage system is a system to ensure pets can survive even if there no one at home. Smart cage system will alert owner when food level & water level inside cage low and unstabilized temperature level inside cage. This system used to control food level, water level and temperature level in the cage.

Water level controller and food level controller are used to keep the water and food in certain level inside a bowl. When the water or foods level inside bowl is low, the signal will send to owner automatically. The temperature controller is used for make sure that the temperature level inside the cage in stable. The suitable temperature for pets (chicken) is between 29˚c to 35˚c. When the temperature inside cage is hot (>35˚c), the fan will turn on automatically and if the temperature is cold (<29˚c), the heater will turn on automatically.

Microcontroller is a controller that widely used in controlling process. Microcontroller used to control the devices by receiving the input signals, processing the input signals and sending the output signals. Food, water and temperature level are controlled by microcontroller in smart cage system.

1.2 Background of Project

This project is to develop a control system that will keep the water & food in certain level inside a bowl and keep the temperature level in stable. Water level sensor is a device that used to detect the level of liquid within a tank and weight sensor is used for detect food level inside bowl. Temperature sensor is used to detect the range of the temperature inside cage. Signal from water level sensor, weight sensor and temperature sensor will be send to the microcontroller by using Radio Frequency Transmitter. RF Receiver will receive the signal and send to microcontroller. Then, the microcontroller processing the input signals and sending the output signals to owner. These processes operate based on open loop system.

Microcontroller AT89S51 acts as a main part in this project as it triggers and controls the whole circuit. Process of controlling the water level, temperature and foods level will be controlled by Microcontroller. Closed loop system is used as it has a feedback that can trigger any error or disturbance and thus making the temperature inside cage stable and level of the water in the bowl that is required. The task to be performed is to study literature, design, build, and test. The animation of this system is developed by using Flash software. This project can be implemented in the industry area.

1.3 Objectives of Project

Following are the objectives set in this project:

i) To design a circuit that control the temperature, water level and food level inside cage.
ii) To alert owner once water and food level is low inside smart cage system.
iii) To develop the model of the control system based on the Microcontroller.
iv) For get some literature review about control system that involve in this project like sensor, valve, microcontroller and Flash software.
v) To reduce manpower if the project implemented through industrial area.
vi) To design animation for whole project by using Flash software.

1.4 Problem Statement

i) Temperature inside cage that not stabilized or uncontrolled brings lot of problem to the animals. Weather factor and other disturbance can easily change the actual temperature that is required and its will affect the animals health.
ii) Owner has to bring the pets along whenever the person goes out.
iii) Frequently owner has to check foods and water level inside cage manually.
iv) Time consuming for owner.
v) Affect the pet's health when the people forget to provide food and water.

1.5 Scopes of Work

Smart cage system designed to detect the temperature, water and foods level inside cage. Sensors are used for temperature controller, water level controller and foods level controller. This project will involve the research on the controller with microcontroller. Microcontroller will be the main part of the project as it control whole the project. Flash software also will be used to develop the animation for water level, temperature and foods controller.

1.6 Research Methodologies

The smart cage system builds by using microcontroller as a main component. Microcontroller used to control the all part in this project. Microcontroller receives the signals from sensors like temperature sensor, water level sensor and weight sensor and sends output signals to control the output of the project. With this system the water and food inside bowl and temperature can controlled and maintained. The procedures and methods used to achieve the project objectives are:

a) Literature review and background study

- Water level, temperature and weight sensor
- Microcontroller
- Radio Frequency Transmitter and Receiver
- FLASH software

b) Studying and develop animation of the project with software

- FLASH Software used to develop the animation

c) Build temperature sensor circuit, water level sensor circuit, power supply circuit, relay circuit and weight sensor.

d) Studying and handling the microcontroller to control the whole project

- Studying Microcontroller system
- Studying and develop Microcontroller program

e) Combine the hardware components with software system which is microcontroller

f) Field testing

g) Thesis writing

h) Come out with complete final project and report

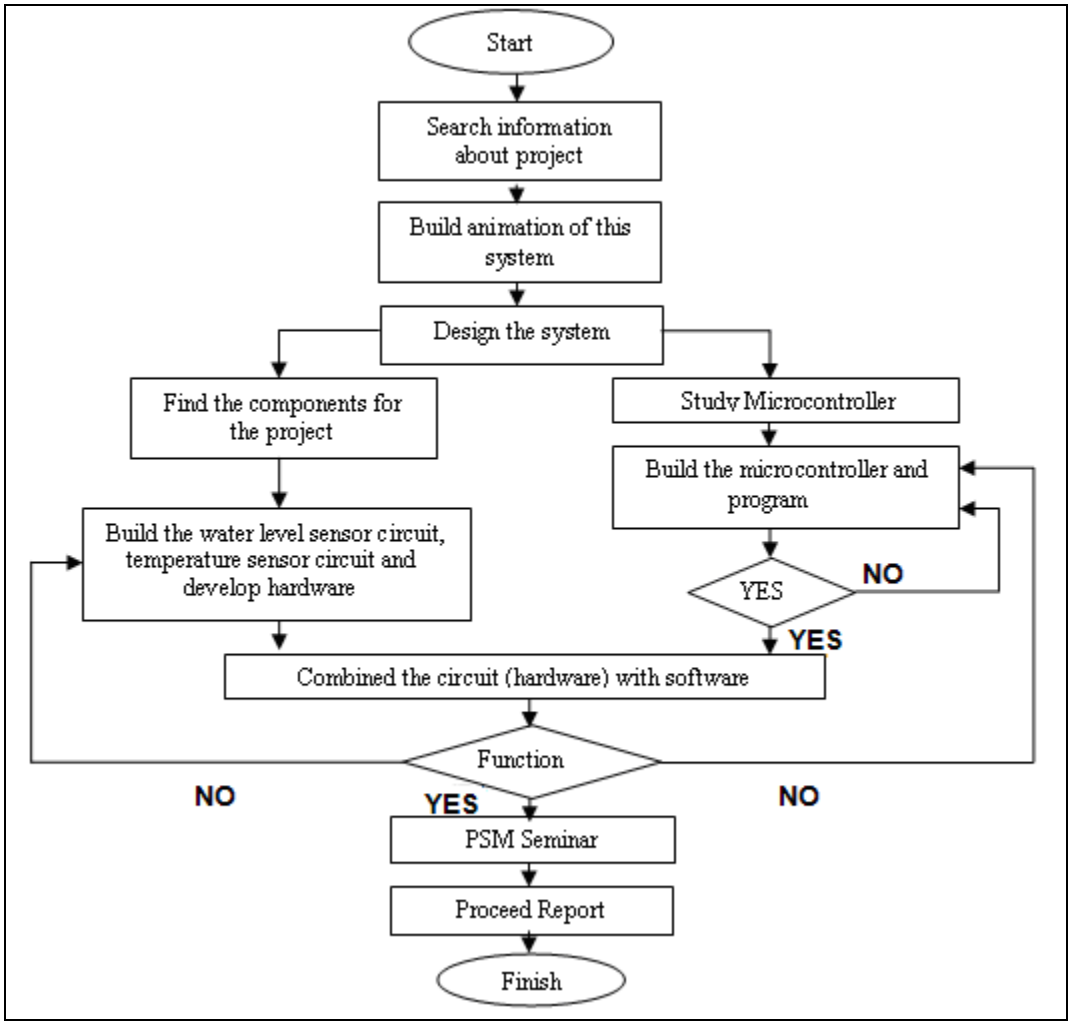

Figure 1.1 Flow Chart of Methodology

1.7 Thesis Outline

This report divided into several chapters which are Introduction, Background and Literature Review, Theory, Project Methodology, Result and Analysis and Conclusion. Each chapter begins with identifiable objectives and brief overview.

First chapter is an introduction to the project. It consists of objectives, scope of works, problem statements and research methodologies that clearly describe what is the project is all about.

The second and third chapter contains about theory and concept of the entire project. Literature review based on technologies and information has been done in order to create a specific research about this project. Several research are been highlighted such as sensors, RF Transmitter & Receiver, microcontroller and used Flash software as an animation of the project.

Chapter four explained the methodology of implemented used in this project in detail. In this chapter, the methods and the project flow has been explained clearly. Chapter five describes the results and analysis obtained on this project. This is the main chapter that shows the development of the project and thus, provides a full analysis on the project, starting from theoretical findings to a conceptual design and lastly simulation results. Last chapter of the thesis describes some suggestion have been made to make this project much better.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

This chapter explains literature review based on current and exist technologies and information has been done in order to create a specific research about this project. Research hypothesis is been described clearly. From literature review, there will be an analysis regarding the advantages and disadvantages for each phase of this project.

2.2 Control System

Control system is a set of devices that control, manage or command other devices. Control system operates in logical and natural basic process. Before the automatic control system introduced, there were manual control system used to control the process. Manual control system regarded to the human aided control system. Humans are placed to monitor and control the system through observe the set points.

Automatic control system introduced to replace the human function in the control system. Automatic control system designed with the electrical & electronic and mechanical devices. Relays, valves, actuators, sensors are included in this automatic

control system. There were two basic control system, open loop control system and closed loop control system. [1] [2]

2.2.1 Open Loop Control System

In the open loop system, there are no feedback signals applied to control the system. Error in the system will not be measured and the measured error will not be adjusted to control the input of the system. Bread toaster, water heater kettle are the some of the open loop application system applied product. Open loop control system is easy to apply. While disadvantage of this system is can't trigger the input of the system by measuring the error from output. Figure 2.1 below show the open loop control system block diagram.

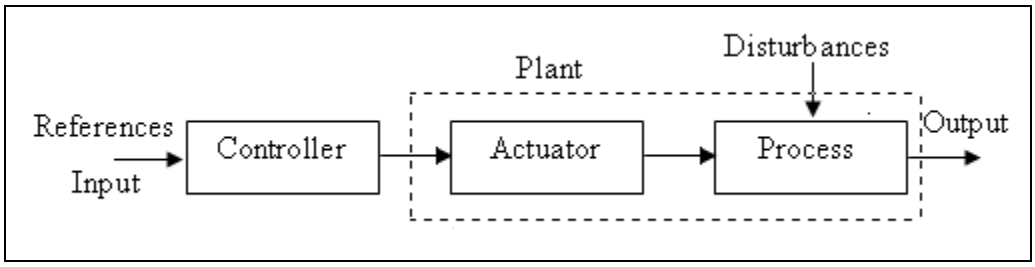

Figure 2.1 Open loop control system

2.2.2 Closed Loop Control System

Closed loop control system function with the feedback signals. Feedback signals measured from the output error of the process. The output signal will compared with the input reference. If error is occurred between these two signals, feedback signals send to the input of the process to adjust the input signal. Through the new produced input signal, the error will reduced until there were no errors occurred. The process will be stable through this closed loop system and can produce the desired output. [2] Water level controlling and water temperature controlling are some of the closed loop system used

produced desire output even disturbance or error produce due to the process. Figure 2.2 show the block diagram of the closed loop control system.

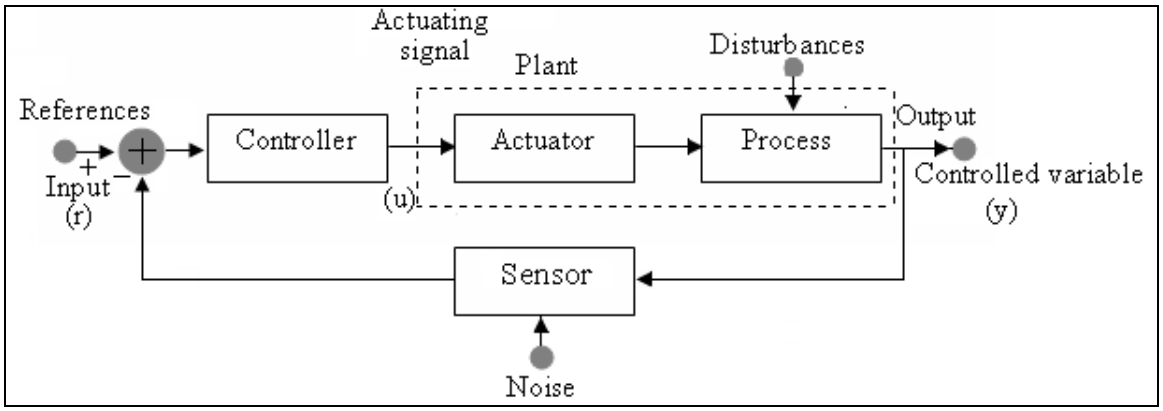

Figure 2.2 Closed Loop Control System

2.2.3 Comparison of Control System

ITEM	OPEN LOOP	CLOSED LOOP
Controlling process	Can't stabilized the process	Unstable process can be stabilized
Feedback	Does not use feedback system	Use feedback system to correct the errors
Cost	Low cost	High cost
Application	Use for simple process like bread toaster	Use for critical process like automobile cruise control

Table 2.1 Comparison of Control system [2]

2.3 Input Devices

Input devices are function as to send the signals which detected from process to the Microprocessor. Sensor is an input device to determine the pressure, liquid level, temperature and so on. Proximity switch, level sensor, temperature sensor are included in this specific automatic sensing devices.

Some sensors can't connect directly to the Microprocessor, because these sensors can't generate enough level of signals such as voltage or current. There will be some additional circuit used to amplify the signals from the sensors before connected to the Microprocessor.[2] Figure 2.3 shows some input devices.

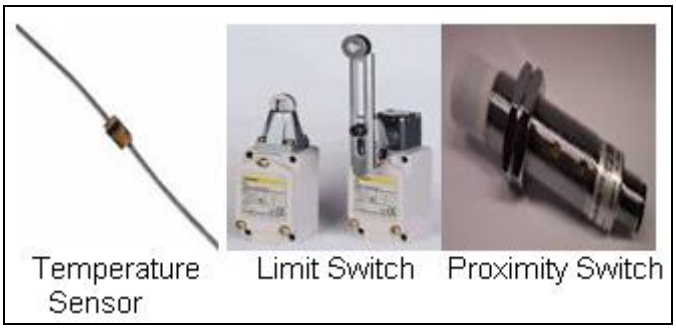

Figure 2.3 Input Devices

2.4 Output Devices

Output devices function as to receive the output signals from Microprocessor. These devices will take action as command by the Microprocessor. Solenoids, motor, display, heater are common output controller devices. The output signal from Microprocessor is low and only can active some of the output devices directly. Even the output signal from Microprocessor is low, but external supply or circuit used to active the output devices. [2] Figure 2.4 shows some output devices.