

SURVEILLANCE SYSTEM USING AVR ATMEGA16

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DECLARATION

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DEDICATION

Dedicated to my beloved family and everyone who contributed for this project.

ACKNOWLEDGEMENT

Thanks to The Almighty as His kindness and loveliness make this final year project is possible. I am deeply indebted to my supervisor, En. Rosmadi bin Abdullah whose help, stimulating suggestions and encouragement helped me in all the time of research and writing of this report.

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ABSTRACT

CCTV and other visual device had been use widely around us for various purposes, for traffic control, safety precaution and others. The image from the CCTV can serve as prove for crime or as reference in study. This project will aim to make the interface between CMOS camera C3088 with the AVR ATMEGA16 microcontroller. The communication for AVR and the computer is through serial port while the communication between AVR microcontroller to camera is using I²C protocol. HyperTerminal were used to send and receive serial data to and from computer. Microcontroller will process the command from the computer and based on these command, microcontroller will send appropriate data to the camera and ask the camera to capture and send photo back to the computer. The picture obtain from the camera can be use for surveillance or can be process for image processing purpose.

ABSTRAK

Kamera litar tertutup dan peralatan visual yang lain telah digunakan dengan secara meluas dalam kehidupan kita untuk pelbagai tujuan, untuk kawalan trafik, langkah keselamatan dan pelbagai lagi. Imej yang diambil oleh kamera litar tertutup dapat dijadikan bukti jenayah atau digunakan untuk rujukan dalam pembelajaran. Sistem ini dibina dengan tujuan untuk menyediakan satu aplikasi antara kamera CMOS model C3088 dan cip kawalan mikro AVR ATMEGA16. Komunikasi antara AVR dan komputer adalah melalui terminal seri manakala komunikasi antara cip kawalan mikro AVR dan kamera menggunakan protokol I²C. HyperTerminal digunakan untuk menghantar dan menerima data seri dari dan ke komputer. Cip kawalan mikro akan memproses arahan dari komputer, berdasarkan arahan yang diberikan itu cip kawalan mikro akan menghantar data yang bersesuaian ke kamera dan meminta kamera untuk merakamkan imej dan menghantarnya ke komputer. Imej yang diterima dari kamera dapat digunakan untuk tujuan pengawasan atau untuk tujuan pemrosesan imej.

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LIST OF SYMBOLS

I/O	-	Input Output.
IC	-	Integrated Circuit.
R	-	Resistor.
C	-	Capacitor.
LED	-	Light Emitter Diode.
k	-	kilo.
V	-	volt.
mA	-	mili ampere.
Hz	-	hertz
CCTV	-	Close Circuit Television
PCB	-	Printed Circuit Board

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

Closed-circuit television (CCTV) is the use of video cameras to transmit a signal to a specific place, on a limited set of monitors.

It differs from broadcast television since its signals are not transmitted openly though it may use point-to-point wireless connections. CCTV is often used for surveillance in areas that may need monitoring such as banks, casinos, airports, military installations, and convenience stores.

In industrial plants, CCTV equipment may be used to observe parts of a process from a central control room; when, for example, the environment that needs to be observed is not suitable for a human being to be there. CCTV systems may operate continuously or only as required to monitor a particular event. A more advanced form of CCTV, utilizing Digital Video Recorders (DVRs), provides recording for possibly many years, with a variety of quality and performance options and extra features.

The first CCTV system was installed by Siemens AG at Test Stand VII in Peenemünde, Germany in 1942, for observing the launch of V2-rockets. The noted German engineer Walter Bruch was responsible for the design and installation of the system.

CCTV recording systems are still often used at modern launch sites to record the flight of the rockets, in order to find the possible causes of malfunctions [1], while larger rockets are often fitted with CCTV allowing pictures of stage separation to be transmitted back to earth by radio link [2].

In September 1968, Olean, NY was the first city in the United States to install video cameras along its main business street in an effort to fight crime. The use of closed-circuit TV cameras piping images into the Olean Police Department propelled Olean to the forefront of crime-fighting technology.

1.2 OBJECTIVE OF THE PROJECT.

The main objective of this project is to design and fabricate an interface between C3088 camera and the computer, using AVR ATMEGA 16 and display the image captured by camera on the computer so this system will operate as a surveillance system.

1.3 SCOPE OF PROJECT

In order to achieve this project, there are several scope had been outlined. The scopes of this project are:

- I. AVR Programmer need to be designed using DXP Protel.
- II. Make AVR and its environment work.
- III. Using Winavr software to compile the project program.
- IV. Serial communication is used to transmit the data to the PC.

1.4 ADVANTAGES OF THIS SURVEILLANCE SYSTEM

There are several advantages of this system that are:

- I. This system doesn't need expensive and complicated storage system like Digital Video Storage (DVR).
- II. The image taken can be seen through a television set since C3088 camera that been used in this project capable to feed live video from its AV out pin.
- III. This system can be easily integrated with other devices such motor or sensors because several pin at ATMEGA16 microcontroller are not use. The entire PORTB of ATMEGA16 is not use so it can be use to feed color image from the camera in the future.

1.5 OUTLINE OF THESIS.

This thesis consists of five chapters. This chapter discuss about overview of the project, research objective, project scopes, and advantages of the system and thesis organization.

Chapters 2 contain a detailed description of this surveillance system literature review. It explains about the concept, history and application of system and also the involved components in this project.

Chapter 3 includes the project methodology. It explains how the project is organized and the flow of process in completing this project. Also in this topic discusses the methodology of the system, circuit design, pin assigning, software used and specification of the system.

Chapter 4 will be discussing about the results obtained in this project and discussion about the result.

The conclusions for this project are presented in the final chapter 5 along with the recommendations for the project and for the future development.

CHAPTER 2

THEORY AND LITERATURE REVIEW

2.1 INTRODUCTION.

In this chapter include the study of surveillance system, close circuit television and AVR microcontroller as well as the software use to programmed and debug the microcontroller. This chapter also include the PC communication protocol which been use in this project.

2.2 SURVEILLANCE SYSTEM.

The term surveillance is often used for all forms of observation or monitoring, not just visual observation. The word surveillance is commonly used to describe observation from a distance by means of electronic equipment (such as CCTV cameras), or interception of electronically transmitted information (such as Internet traffic or

phone calls). However, surveillance can also refer to simple, relatively no- or low-technology methods such as human intelligence agents and postal interception.

Surveillance is very useful to governments and law enforcement to maintain social control, recognize and monitor threats, and prevent/investigate criminal activity. With the advent of programs such as the Total Information Awareness program and ADVISE, technologies such as high speed surveillance computers and biometrics software, and laws such as the Communications Assistance For Law Enforcement Act, governments now possess an unprecedented ability to monitor the activities of their subjects [3].

However, many civil rights and privacy groups such as the Electronic Frontier Foundation and ACLU have expressed concern that by allowing continual increases in government surveillance of citizens that we will end up in a mass surveillance society, with extremely limited, or non-existent political and/or personal freedoms. Fears such as this have lead to numerous lawsuits such as Hepting v. AT&T [3][4].

2.3 CLOSE CIRCUIT TELEVISION.

Closed-circuit television (CCTV) is the use of video cameras to transmit a signal to a specific place, on a limited set of monitors. It differs from broadcast television in that the signal is not openly transmitted, though it may employ point to point wireless links. CCTV is often used for surveillance in areas that may need monitoring such as banks, casinos, airports, military installations, and convenience stores.

In industrial plants, CCTV equipment may be used to observe parts of a process from a central control room; when, for example, the environment is not suitable for humans. CCTV systems may operate continuously or only as required to monitor a particular event. A more advanced form of CCTV, utilizing Digital Video Recorders

(DVRs), provides recording for possibly many years, with a variety of quality and performance options and extra features (such as motion-detection and email alerts).

Surveillance of the public using CCTV is particularly common in the UK, where there are reportedly more cameras per person than in any other country in the world. There and elsewhere, its increasing use has triggered a debate about security versus privacy.

The first CCTV system was installed by Siemens AG at Test Stand VII in Peenemünde, Germany in 1942, for observing the launch of V2-rockets. The noted German engineer Walter Bruch was responsible for the design and installation of the system. CCTV recording systems are still often used at modern launch sites to record the flight of the rockets, in order to find the possible causes of malfunctions [1], while larger rockets are often fitted with CCTV allowing pictures of stage separation to be transmitted back to earth by radio link [2]. In September 1968, Olean, New York was the first city in the United States to install video cameras along its main business street in an effort to fight crime. The use of closed-circuit TV cameras piping images into the Olean Police Department propelled Olean to the forefront of crime-fighting technology. The use of CCTV later on became very common in banks and stores to discourage theft, by recording evidence of criminal activity. Their use further popularized the concept. The first place to use CCTV in the United Kingdom was King's Lynn, Norfolk [5]. In recent decades, especially with general crime fears growing in the 1990s and 2000s, public space use of surveillance cameras has taken off, especially in some countries such as the United Kingdom. The CCTV is also uses for other purpose in our everyday life, the common use of it are:

(i) Industrial processes

Industrial processes that take place under conditions dangerous for humans are today often supervised by CCTV. These are mainly processes in the chemical industry, the interior of reactors or facilities for manufacture of nuclear fuel. Use of thermo graphic cameras allow operators to measure the temperature of the processes. The usage of CCTV in such processes is sometimes required by law.

(ii) Traffic monitoring

Many cities and motorway networks have extensive traffic-monitoring systems, using closed-circuit television to detect congestion and notice accidents. Many of these cameras however, are owned by private companies and transmit data to drivers' GPS systems. The London congestion charge is enforced by cameras positioned at the boundaries of and inside the congestion charge zone, which automatically read the registration plates of cars. If the driver does not pay the charge then a fine will be imposed. Similar systems are being developed as a means of locating cars reported stolen.

(iii) Transport safety

A CCTV system may be installed where an operator of a machine cannot directly observe people who may be injured by unexpected machine operation. For example, on a subway train, CCTV cameras may allow the operator to confirm that people are clear of doors before closing them and starting the train. Operators of an amusement park ride may use a CCTV system to observe that people are not endangered by starting the ride. A CCTV camera and dashboard monitor can make reversing a vehicle safer, if it allows the driver to observe objects or people not otherwise visible.

2.4 I²C COMMUNICATION.

Originally, the I²C bus was designed to interact within a small number of devices on a single card, such as to manage the tuning of a car radio or TV. The maximum allowable capacitance was set at 400pF to allow proper rise and fall times for optimum clock and data signal integrity with a top speed of 100kbps. In 1992, the standard bus speed was increased to 400kbps to keep up with the ever-increasing performance requirements of new ICs. The latest I²C specification, released in 1998, increased the top

speed to 3.4Mbps. All I²C devices are designed to be able to communicate together on the same two-wire bus and system functional architecture is limited only by the imagination of the designer [6].

But while its application to bus lengths typically found within consumer products, such as PCs, cellular phones, car radios, and TV sets, grew quickly; only a few system integrators were using it to span a room or a building. The I²C bus is now being increasingly used in multiple card systems, such as a blade server, where:

- The I²C bus to each card needs to be isolatable to allow for card insertion and removal while the rest of the system is in operation
- Many more devices need to be located onto the same card
- The total device and trace capacitance could exceed 400pF.

New bus extension and control devices help expand the I²C bus beyond the 400pF limit of about 20 devices and help control more devices, even those with the same I²C address. These new devices are popular with designers as they continue to expand and increase the range of use of I²C devices in maintenance and control applications.

I²C Features

- Only two bus lines are required: a serial data line (SDA) and a serial clock line (SCL)
- Each device connected to the bus is software-addressable by a unique address and simple master/slave relationships exist at all times; masters can operate as master-transmitters or as master-receivers
- I²C is a true multi-master bus including collision detection and arbitration to prevent data corruption if two or more masters simultaneously initiate data transfer
- Serial, 8-bit oriented, bi-directional data transfers can be made at up to 100kbit/s in the Standard-mode, up to 400kbit/s in the Fast-mode, or up to 3.4Mbit/s in the High-speed mode

- On-chip filtering (50ns) rejects spikes on the bus data line to preserve data integrity
- The number of ICs that can be connected to the same bus segment is limited only by a maximum bus capacitive loading of 400pF.

I²C Designer Benefits

- Functional blocks on the block diagram correspond with the actual ICs; designs proceed rapidly from block diagram to final schematic
- No need to design bus interfaces because the I²C-bus interface is already integrated on-chip
- Integrated addressing and data-transfer protocol allow systems to be completely software-defined
- The same IC types can often be used in many different applications
- Design-time reduces as designers quickly become familiar with the frequently used functional blocks represented by I²C bus compatible ICs
- ICs can be added to or removed from a system without affecting any other circuits on the bus
- Fault diagnosis and debugging are simple; malfunctions can be immediately traced
- Software development time can be reduced by assembling a library of reusable software modules.

2.4.1 APPLICATIONS OF I²C.

There are some specific applications for certain types of I²C device such as TV or radio tuners but, in most cases, a general purpose I²C device can be used in many different applications because of its simple construction.