

NETWORK BASED HOME SURVEILLANCE SYSTEM

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DEDICATIONS

To my love.....

Father, Mother, Family

And all my friends.

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ABSTRACT

This project consists of multiple webcams as a surveillance medium which is controlled by a software designed using Microsoft Visual Basic 6, which is used as a surveillance system to monitor, supervise, inspect and to look up for a person or a targeted area. This surveillance system can be operated in Local Area Network (LAN). Many surveillance systems before this use analogue system to supervise. An example is by using analogue camera with Video Cassette Recorder (VCR) system. Another example shows that an average analogue system uses one monitor to view only one real time video from the camera. In the market today, some of the digital surveillance system have been developed using Internet Protocol (IP) camera that is very expensive and couldn't be afforded by all users. The objective of this project is to build a network based surveillance system that can work with multiple channel digital video inputs (webcam). This system allows the user at the client side to view the entire surveillance camera from the client's side. Visual Basics 6 is used to develop the system software to let it work with webcam and can be used to monitor from server and client's side. At the end of this project, users able to use this network based surveillance system to monitor a targeted area or a person either from the server side or the client's side.

ABSTRAK

Projek ini melibatkan beberapa kamera web yang berfungsi sebagai medium pemerhati yang dioperasikan dengan menggunakan pengaturcaraan yang dihasilkan melalui perisian Microsoft Visual Basics 6. Sistem ini digunakan untuk memerhati, memantau, menyemak, meninjau kawasan tertentu dan juga orang perseorangan. Sistem ini boleh beroperasi dalam rangkaian setempat. Kebanyakan sistem sedia ada sebelum ini menggunakan sistem analog seperti mana sistem yang melibatkan perakam video rumah. Kelemahan sistem analog ini ialah penggunaan banyak panel pemerhati untuk memerhati setiap kamera yang digunakan. Dipasaran sekarang banyak terdapat penggunaan sistem dengan sistem digital yang menggunakan kamera bernombor protokol internet yang bernilai tinggi dan kurang mampu bagi semua pengguna. Tujuan projek ini ialah ingin membina sistem pemerhati jaringan setempat dan boleh beroperasi melibatkan beberapa kamera web pada satu masa dan boleh dipantau dari komputer lain pada rangkaian jaringan yang sama. Penggunaan Microsoft Visual Basics 6 dalam projek ini adalah bertujuan untuk membangunkan sistem pemerhati ini agar dapat berfungsi dengan baik untuk keselesaan semua pengguna. Diakhir projek ini, pengguna dapat menggunakan sistem ini untuk memantau dan memerhati individu atau lokasi tertentu samada dari komputer penyedia atau komputer pelanggan atau penerima.

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CHAPTER I

INTRODUCTION

This chapter mainly discuss the overview of this project and its possible applications. A superficial view on the operation, design, program and scope of this project is clarified briefly. An expanded detail of these features can be found in the following chapters.

1.1 PROJECT INTRODUCTION

Network based surveillance system is a system that provide user to monitor, supervise, survey, inspect and to look up for a person or a target area. Surveillance system is useful nowadays in our busy lifestyle, especially for working parents to supervise their children, maid behaviours while they are not around and also to keep their residence safe. This system also can decrease the number of criminal cases and also can provide safer place and can give a lot of benefit to resident, office, restaurant, school academy, hyper market, public area and also private sector by increasing area security monitoring system.

To be specific, this project helps us supervise a targeted area in our network system that can be controlled by using software. An example of the system application is teachers at office can view and supervise their students activities in classrooms, halls, canteen or others places. Let say this surveillance system is used

by mother while cooking in the kitchen, she can also keep an eye on her children playing outside the house while she is cooking. This system can also increase area security, let say to avoid robbery or intruder, by placing one of the webcam at the front door or main gate. So we can get a clear picture about who is coming to our resident, office or others.

Surveillance system nowadays which is already in the market is uses an analogue camera with Video Cassette Recorder (VCR) or Digital Video Recorder (DVR) concept that is analogue system and more technical to use. For this project, it is only use a common webcam as the camera with a basic computer and it is easier to be used. Users just need to plug in the webcam to a personal computer and run the software to start supervision.

1.2 PROJECT OBJECTIVE

- (a) To build a network based surveillance system.
- (b) This software system functions as a surveillance system to supervise targeted area or individual and this system can be operated in local area network (LAN). Thus means, this software can provide a server to control a camera from the server side and user can supervise from another computer in the same network as a client from the client's side.
- (c) The surveillance software system can work with multiple channel digital video inputs (webcam).
- (d) This system uses a webcam as a system camera to replace analogue camera or internet protocol (IP) camera. This software system can work with multiple webcams which means more than one camera at a server.
- (e) System software can let user view all multiple video inputs only by using one monitor.
- (f) This system software can let user view all webcams running in just one monitor at the same time compared to traditional analogue monitor system that use one monitor for only one camera. That means this system is more practical to view multiple camera that is needed to supervise an area such as house or supervise students.

- (g) To get extra knowledge in using programming language and explore more about personal computer usage.
- (h) Programming language such as Visual Basics 6 can be used to develop more software and can be used with other applications to make it more useful. For an example this project uses Visual Basics 6 as programming language to make common webcam work as surveillance camera. This project gives a chance for student to challenge individual potential and creativity to learn something new and to understand the programming language well.
- (i) To help student prepare for working stage specifically in finishing tasks and completing projects and also to manage time well.

1.2.1 Project Objectives Overview

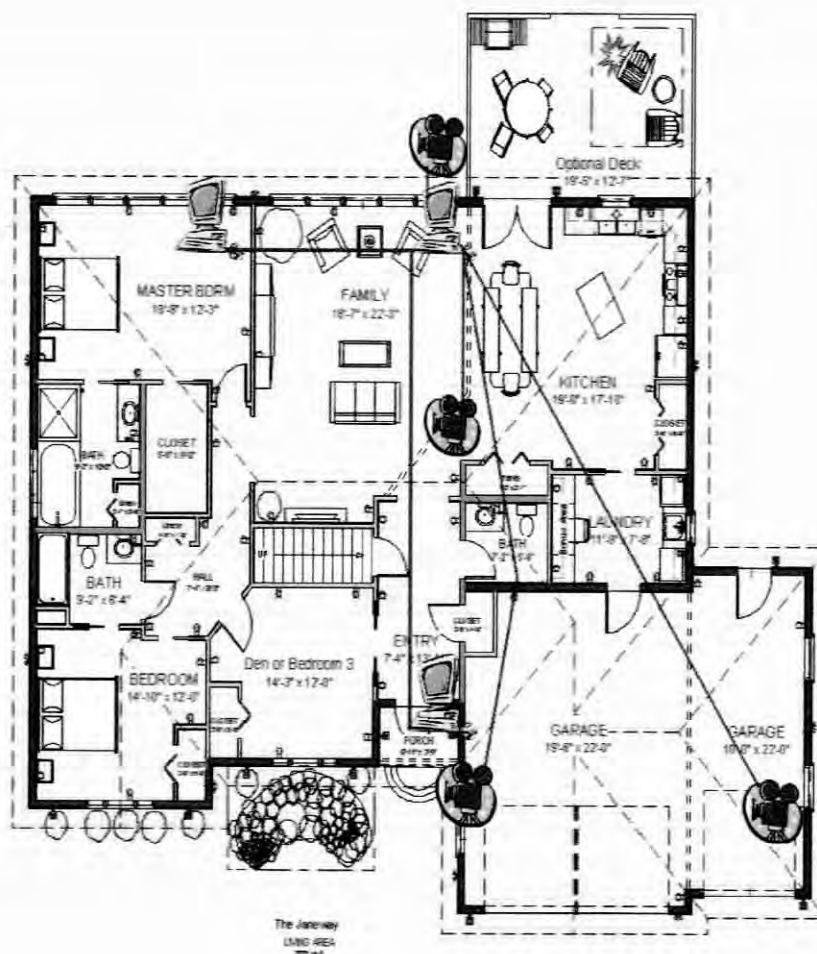


Figure 1.1: Shows sample of Project Overview for usage in resident.

Figure 1.1 shows an example of four webcams that used in a resident and a server computer in a master suite and remote computer at the family living room and at the main entrance. Each computer is connected by using Category 5 (CAT5) network cable. Each of the webcam is connected to server computer. Like in example picture, all cameras from garage, main entrance, backyard and hall are connected to server computer at family living room. Each of the webcam uses Universal Serial Bus (USB) to get connected to a server computer. To extend the USB cable, one set of converter will be used to convert from USB cable to CAT 5 cable. The camera is place maximum 50 meters from the server computer. Further details about this extender will be discussed in Chapter 2.

1.3 PROBLEM STATEMENT

Many surveillance systems before this use an analogue system to supervise. An example is using analogue camera with Video Cassette Recorder (VCR) system. As we know, analogue data format is less safe compared to digital format especially for supervision. Nowadays the system has been upgraded to use analogue camera with Digital Video Recorder (DVR) but it is still in analogue format for the camera. That means chances for the signal to get tapped or adjusted by others are high.

Another example shows that an average analogue system uses one monitor to view only one real time video from the camera. Can we imagine if we had up to 16 cameras to be viewed on 16 monitors screen? It would be high in cost and not so practical for users like us in residence. This software will help user view multiple camera for supervising in only one monitor.

In the market today, most of the digital surveillance system that has been developed nowadays is use only one computer system to monitor or known as stand alone system. It could not be used in network such as local area network. And it is usually this monitoring system use internet protocol (IP) camera that is very expensive that usually not so suitable for all users. This surveillance system provides system that is cheap and very useful.

1.4 SCOPES OF WORKS

To let this network based surveillance system project run well, first it is important to choose a suitable webcam for this project. For this project, Webcam 168 has been chosen. Further details about this camera will be explained later in literature review part. Visual Basics 6 is used in this project as a programming language to develop system software to let the software achieve the entire objective listed. By using Visual Basic 6, the software generated can let user view all webcam real time video can be viewed by using only one monitor.

Because this project is only limited to use on network, the network part is very important. To let server and client part function well, Visual Basic 6 is used to create server side and client's side for the surveillance system. At this level it is important to understand well about window socket (Winsock). Winsock need to be used while coding using Visual Basics for the network part.

Universal Serial Bus (USB) is an important part to understand in this project too. It is because webcam that is used in this project is plugged in to computer by using USB port. So it is important to know well about USB type, its maximum frame capacity, its maximum speed and others to make sure all of the webcams can transmit quality real time video at specific time frame to control their picture quality. This project also only uses limited length of USB cable which is only two meter long.

1.5 PROJECT METHODOLOGY

1.5.1 Research and development process:

- (a) Software - Learn and gain information about writing code in Microsoft Visual Basics 6 (VB6) programming language software through books, tutorial and internet. Then start writing program and set up form using Visual Basic 6 to satisfy and achieve all project objectives.

- (b) Hardware - Literature review through books, internet and journals to gain data and analyze all information especially about webcam, how it operates and other specification. Same is done for USB cable, and also USB extender to extend the cable up to 20 meter long.

1.6 REPORT STRUCTURE

This report has been categorized to different chapters. Chapter one is all about project introduction. This chapter covers about introduction of the project, project objective, and problem statement, scope of work and overview of methodology. Chapter two covers the literature review. This chapter discuss about all literature review result that produce basic work that shows relationship between project study with theory and concept by using figure or suitable model.

Next are chapter three which covers about project methodology which explains what method is use for this project to solve the project problem. In chapter four, it is all about result and discussion of this project. It shows the entire discovery from this project and result of analysis from data that have been gained. This chapter also state how far this project has achieved its project objectives. Lastly chapter six states the conclusion for this report and suggestions for improvement.

CHAPTER II

LITERATURE REVIEW

2.1 SURVEILLANCE SYSTEM

Systems Surveillance is the process of monitoring the behaviour of people, objects or processes within systems for conformity to expected or desired norms in trusted systems for security or social control. [10]

2.2 SURVEILLANCE CAMERAS

Although the word surveillance literally means (in French) "watching over" the term is often used for all forms of observation or monitoring, not just visual observation. Nevertheless, the 'all seeing' and 'eye in the sky' is still a general icon of surveillance. [10]

2.2.1 Closed Circuit TV

Closed circuit TV (CCTV) - where the picture is viewed or recorded, but not broadcast - initially developed as a means of security for banks. Today it has developed to the point where it is simple and inexpensive enough to be used in home security systems, and for everyday surveillance.

The widespread use of CCTV by the police and government has developed over the last 10 years. In Malaysia nowadays, big cities such as Kuala Lumpur and Shah Alam have installed large numbers of cameras linked to police authorities. The justification for the growth of CCTV in towns is that it deters crime. It can be used to deter traffic crime, civil crime and also vandalism. The recent growth of CCTV in housing areas also raised serious issues about the extent to which CCTV is being used as a social control measure rather than simply a deterrent to crime.

The development of CCTV in public areas, linked to computer databases of people's pictures and identity, presents a serious risk to civil liberties. Potentially you will not be able to meet anonymously in a public place. You will not be able to drive or walk anonymously around a city. Demonstrations or assemblies in public places could be affected as the state would be able to collate lists of those leading them, taking part, or even just talking with protesters in the street. [9]

2.2.2 Webcam

The noun webcam has one meaning; a digital camera designed to take digital photographs and transmit them over the internet.

Webcam is another type of surveillance camera that is so popular nowadays used by individuals, parents, business, and corporations to monitor, supervise, survey, inspect and to look up a person or a target area. Usually webcam is used as a messenger in conferences and to capture image. But with software when combined together, it can be used completely as video surveillance tool.

A web camera (or webcam) is a real-time camera whose images can be accessed using the World Wide Web (www), instant messaging, or a PC video calling application. Webcams, like most things, range from simple to complex. If people can understand the essence of a simple Webcam setup, increasing the complexity is only a matter of adding functionality through software, custom code and/or equipment connections.

A simple Webcam setup consists of a digital camera attached to your computer, typically through the USB port. The camera part of the Webcam setup is just a digital camera. The "Webcam" nature of the camera comes with the software. Webcam software "grabs a frame" from the digital camera at a preset interval (for example, the software might grab a still image from the camera once every 30 seconds) and transfers it to another location for viewing. If we're interested in using your Webcam for streaming video, we should get a Webcam system with a high frame rate. Frame rate indicates the number of pictures the software can grab and transfer in one second. For streaming video, you need a minimum rate of at least 15 frames per second (fps), and 30 fps is ideal. To achieve high frame rates, you need a high-speed internet connection. [4]



Figure 2.1: Shows sample webcam use in this project named Webcam 168.

Features:

- (a) Sensor: 1/3 CMOS VGA
- (b) Pixels: 640 x 480/352 x 288/320 x 240/176 x 144/160 x 120
- (c) Colour: 24 true colour
- (d) Interface: USB connection
- (e) Frame per second: CIF 30f /VGA 15
- (f) S/N ratio: >48dB

- (g) Focus range: 30mm to infinity
- (h) Lens viewing angle: 55°
- (i) Storing temperature: 20° – 60°C
- (j) Working temperature: 0° – 40°C

2.2.2.1 Technology

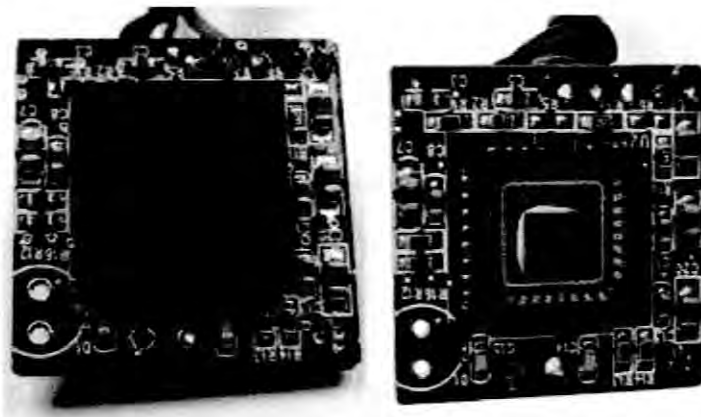


Figure 2.2: Webcams typically include a lens, an image sensor, and supporting circuitry. [4]

Webcams typically include a lens, an image sensor, and some support electronics. Various lenses are available, the most common being a plastic lens that can be screwed in and out to set the camera's focus. Image sensors can be CMOS or CCD, the former being dominant for low-cost cameras, but CCD cameras do not necessarily outperform CMOS-based cameras in the low cost price range. Consumer webcams usually offer a resolution in the VGA region, at a rate of around 25 frames per second.

Support electronics is present to read the image from the sensor and transmit it to the host computer. The camera pictured to the right, for example, uses a Sonix SN9C101 to transmit its image over USB. Some cameras - such as mobile phone cameras - use a CMOS sensor with supporting electronics 'on die', i.e. the sensor and the support electronics built on a single silicon chip, to save space and manufacturing costs. [4]