Western Washington University
Electronics Engineering Technology

ETEC 471
Senior Project Proposal
Professor Morton

The Watchful Eye
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10/29/03
Introduction

In today’s society security is a big issue. Everywhere you look in public places these days are security cameras watching you from somewhere. The problem with the security cameras out there is that they are not very smart. The ones we use today are either controlled by a person in some security room, or they just pan back and forth and hope that they catch something on the screen. I propose to design a camera system that uses motion sensors to detect motion of a person, and aim the camera lens at that motion. This camera would provide a more reliable picture of any people moving in the room it is placed in. The camera would also have a manual override where a user in a security booth can manually control the camera if needed. I think this will be a fun project to work on and also is something that may be very useful. I will be designing the portion of the system which controls the camera. The camera itself will be a USB camera connected to a computer.

Description

This camera will incorporate four motion sensors to determine where motion is detected. These sensors will be checking the perimeter area. I would like the sensors to be able to detect motion within at least 5 meters of the camera, so the camera would be able to handle a fairly large size room. The four sensors that I expect to use to search the perimeter are 10 meter range infrared motion detectors with a digital 5 volt output. The output of these sensors will be fed into the 68HC12 microcontroller, and the microcontroller will determine where the camera should be aimed. The camera will then swivel towards the sensor or sensors which are active. If more than two sensors are activated at one time the camera will automatically swivel back and forth 360 degrees.
This would tell the camera that there is too much motion in the room for the microcontroller to determine what to do. The user could also manually select a mode where the camera will swivel back and forth instead of using the motion sensors. So basically there will be three modes: Auto Find, Manual, and Auto Swivel.

The user interface will be set up using a terminal emulator on a PC. The interface will be fairly simple. There will be a menu of options for the user to select for which mode they want to use. I would like the camera to go into the Auto Find mode when the system is initially turned on.

For most of the hardware of the camera, I will look for different pieces that my camera system will fit. I made a conceptual design shown in Figure 2, but this is only a concept and is not set in stone.

Comparison

I have been researching many other cameras on the market, but have not seen any similar to the one I have proposed. Many of the cameras on the market are very sophisticated and have motion detection, but they don’t have a set up that controls the camera to direct it to where the motion is taking place. The motion detector on the competitor’s cameras simply turns the camera on for operation and starts the recording process. My design is specifically going to be used to control where the camera is directed, and not control the features of the camera itself. Some of the better panning systems claimed 180 degrees rotation within one second. I would like to be able to do that for my design within two seconds, which seems very reasonable.
Hardware Description

The digital perimeter sensors will be connected into the 68HC12 microcontroller inputs. I will use a stepper motor for accurate control of where the camera is facing. I want to be able to step 45 degrees with the stepper motor. This will insure good coverage. One or two limit switches will be used to feedback the position of the stepper motor to the microcontroller. The microcontroller will also control the stepper motor in the system.

The manual override of the camera system will be through a computer connected to the microcontroller with a serial cable. The left and right buttons on the keyboard will control the camera in the left and right directions respectively. The system will be set up as shown in the block diagram in Figure 1.

Benefits

This camera would have uses in a wide variety of applications. This would be perfect for any business with a nightly security camera. Since it could pan normally if the user selects, it can be used during the day. When using the motion detectors it would be perfect for night mode where there would be little traffic. This would guarantee that the camera is focused on a moving subject, and not just panning constantly.

Demonstration

I am confident that I will have this camera system fully functional by spring. I will demonstrate how it works in the ETEC 340 lab. Most of the work to get this project done will be done in the lab, and some at home. I have done a lot of research already and am excited to get started sometime soon. To demonstrate how the system works, I will
use a USB camera linked to a computer to have a visual display of the camera. I have a camera already in my possession which will be perfect for this task.

Figure 1: Block Diagram of Camera System
Figure 2: Design Concept