

Automation Distance Sensitive Security Camera

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Introduction

Closed-circuit television (CCTV) security system has a widely use all over the world. It is an effective way to reduce the burglary rate. But crowded human traffic is not always true in some public area but we sometimes still need security camera for these places. If we use traditional CCTV, it will take up a huge server disk space every day for a high-quality 24/7 video recording requirement. But since there are not such a huge human traffic, we can take photo when illegal action is happened instead of recording video. Illegal action includes opening door, protected stuff being stealing, or people entering prohibited area.

To detect those illegal action, a distance sensor will be installed on TS-7250 board. Whenever the distance value return by the sensor exceed a certain limit difference than previous data. The camera connected to TS-7250 board will be triggered and take pictures. The pictures will be save on FairCom Database Server, which runs on local machine for future use. Also the time stamp of photo should also be recorded. Administrator can access the file system and pull up pictures took

by the camera for security purpose. And the recorded photo can also be used for further face recognition.

This system can be applied in laboratory or power distribution room to monitor the entrance. And it can also work in museum for anti-theft purpose by putting the sensor directly towards protected items. Once the items is moving, the camera will be triggered.

Goals

Short-term goal:

1. Successfully store data into FairCom Database.
2. Successfully read pictures from camera.
3. Successfully generate trigger signal by comparing distance.

The details and schedule will be shown in “Timeline” section.

Long-term goal:

The system will response to any distance change which greater than preset threshold. Once the camera is triggered, 3 pictures will be recorded per second and the recording will last 5 seconds. Basically it will response to two case in final test. Someone suddenly appeared in the front of sensor or some items in front of sensor was moved away.

Expected Outcome

After running the system for a while and the camera has been triggered by distance changing, administrator should see visualized pictures under appropriate resolution on the disk. The pictures record what was happening while the camera was triggered. It is possible to identify a person by the picture.

Specifications

Hardware Diagram

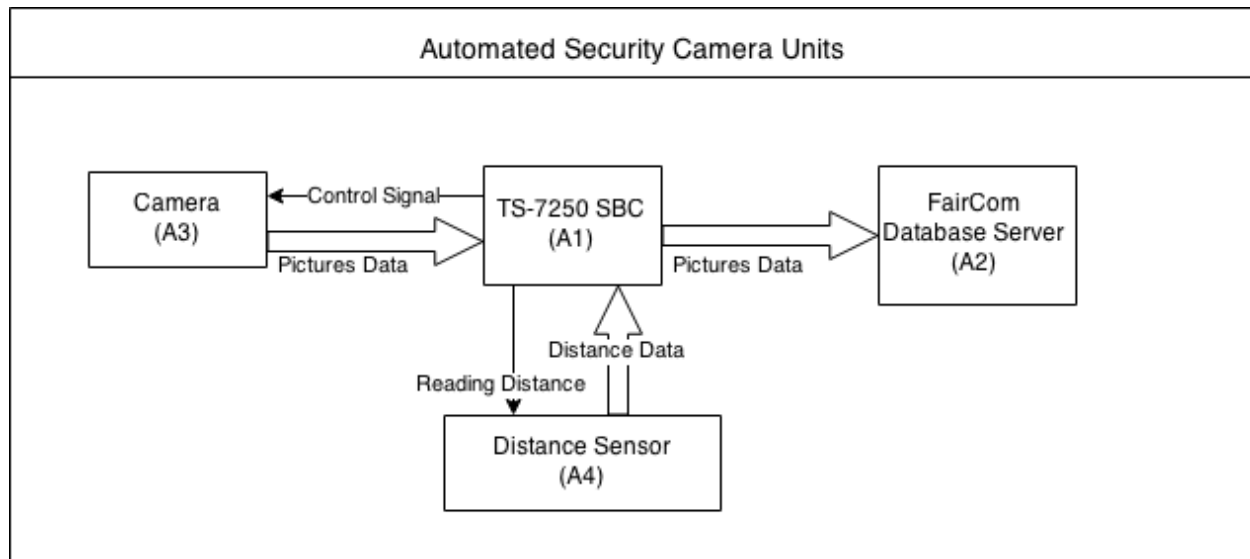


Figure 1 Hardware Diagram

The normal arrow represented control signal, which used to turn on camera or take picture or request distance data from distance sensor. The blank arrow represented data communication between components. The pictures will be requested from Camera and send to FairCom Server.

Software Descriptions

Table 1 Software Description

Microprocessor			FairCom Database
Camera Controller	Distance Reader	Distance Comparer	Pictures Processing

Camera Controller:

Read signal from Distance Comparer to decide when control the Camera to start taking pictures.

Distance Reader:

Request distance data from distance sensor and store the value in buffer.

Distance Comparer:

Compare the distance data with previous data in the buffer. If the difference between two data exceeds the threshold, it will record a time stamp and generate a signal for Camera Controller.

Pictures Processing:

Receive pictures from camera and store in FairCom database.

Software Flowchart

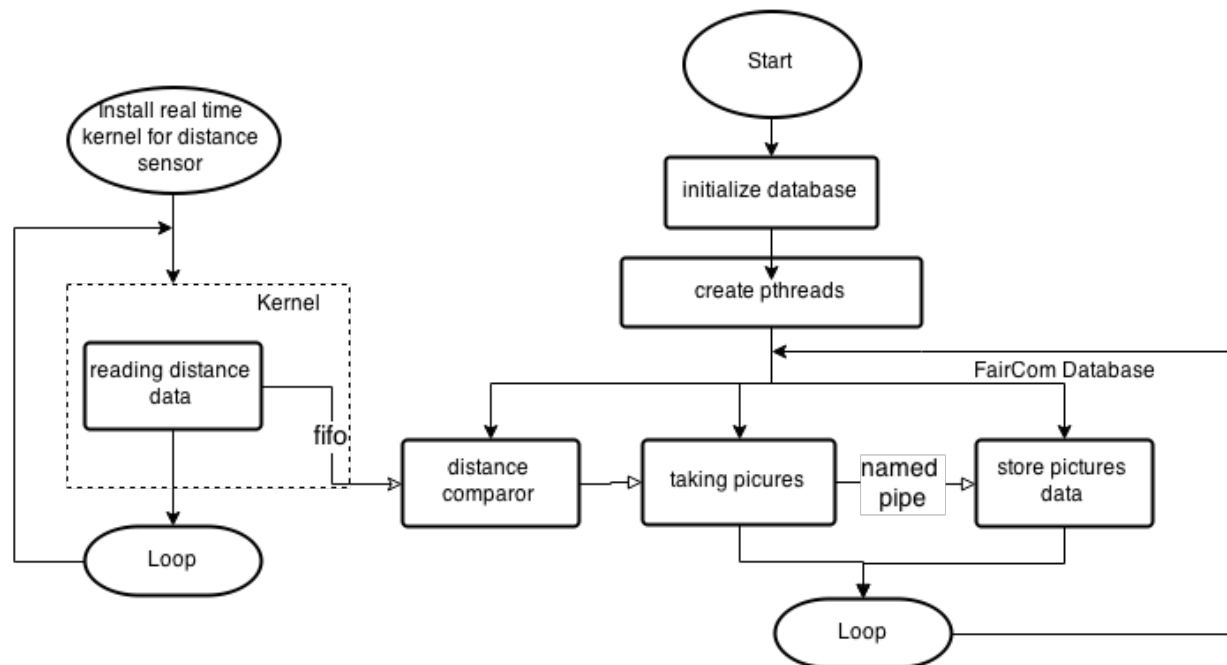


Figure 2 Software Flowchart

Assumption

1. The distance change won't be faster than the reading distance period of the sensor.
2. The item to be detected is in the range of the distance sensor.

3. Camera was set up to face towards the place we want to take pictures.
4. FairCom library for TS-7250 is available to use.
5. TS-7250 have mounted file system from nfs1 server.

Implementation

The distance sensor should read data periodically and the data must be processed immediately to generate signal to control camera. If the task misses deadline, it might miss capturing illegal action. So the reading distance data process should be a real time process and be installed into kernel as a module.

In the kernel, a real time task and a rtf_fifo is created. The sensor should read distance every 100ms. Once the sensor read distance data, the process will put the data into fifo, which will be read by distance comparer process. The distance comparer will generate set a global flag if the difference between the new distance data and previous one exceeds a preset threshold. Whenever the global flag is set, taking picture thread will control the camera. All the picture recorded by camera will be sent to Pictures Processing thread by named pipe. It is a blocked pipe so the Pictures Processing will continue to store pictures in FairCom database only if there is a picture in the pipe.

Test Plan

1. Print out distance data to standard output. Verify that the thread and fifo works fine with real time kernel.
2. Save existed pictures into FairCom database. Browse the database on nfs1 server to make sure the test pictures are successfully saved.
3. Directly write the picture into file to verify main process successfully.

Timeline

Task Mode ▾	Duration ▾	Task Name ▾	Start ▾	Finish ▾	Predecessors ▾
★	8 days	Literature Review and research	Wed 4/1/15	Fri 4/10/15	
★	4 days	Decide Bill of Material	Wed 4/8/15	Mon 4/13/15	
★	4 days	Configure FairCom Database	Mon 4/13/15	Thu 4/16/15	
★	5 days	Configure Camera with TS-7250	Tue 4/14/15	Mon 4/20/15	2
★	6 days	Configure Sensor with TS-7250	Tue 4/14/15	Tue 4/21/15	2
★	5 days	Combined whole circuit together	Wed 4/22/15	Tue 4/28/15	4,5,3
★	1 day	Presentation	Wed 4/29/15	Wed 4/29/15	6
★	10 days	Final Report	Thu 4/30/15	Wed 5/13/15	7

Figure 3 Timeline for Project

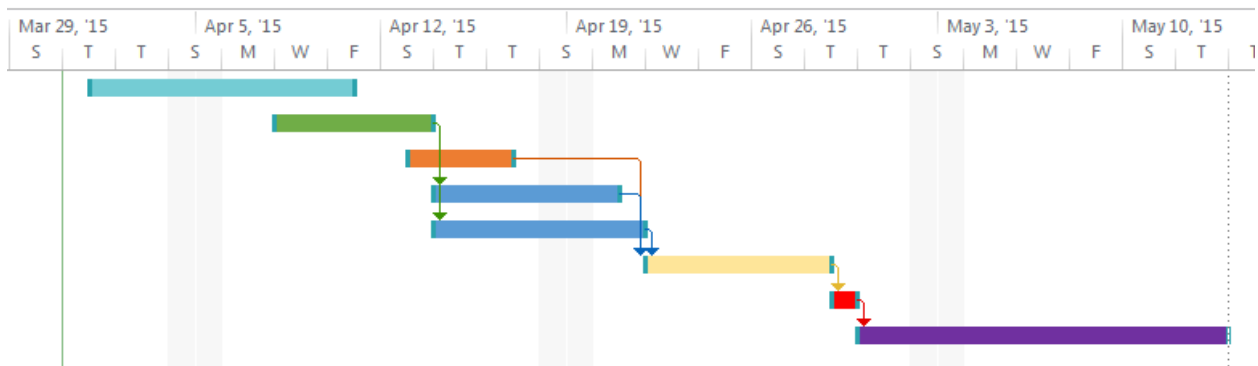


Figure 4 Timeline Graph

Strength and Limitation

Strength

This system will response when distance data detected by sensor changes. This can be applied in several case to record pictures/short video for security use. It can be put in low human traffic public spaces, it can use for static item protection and prohibited entrance monitor. Instead of traditional CCTV, this system can save disk space from 24/7 video recording and save power on camera. It will also record the time stamp when illegal action

happens so administrator don't need to go through every seconds of CCTV video to find suspects.

Limitations

The system is ineffective if it is required to record every seconds of a certain space. And it might fail to response if illegal action happens in a very short period (faster than the distance sensor reading period).