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HOME BASED ENERGY SAVING SYSTEM BY IMAGE PROCESSING

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Abstract- Image and video processing play an important role in the development of technologies for dealing with security issues: surveillance cameras are widely diffused as means of crime reduction, and image analysis tools are used in the forensics field. Lately, the interest in advanced video-based surveillance applications has been increasing. This is especially true in the field of urban railway transport where video-based surveillance can be exploited to face many relevant security aspects (e.g. vandalism, overcrowding, abandoned object detection etc.). The aims at investigating an open problem in the implementation of video-based surveillance systems for transport applications, i.e., the implementation of reliable image understanding modules in order to recognize dangerous situations with reduced false alarm and mis detection rates. Emerging trends in video surveillance applications. Detection and tracking of moving objects is important in the analysis of video data and higher level security assessment. Image registration plays a key role in designing video surveillance system. The purpose of image registration in surveillance application is to geometrically align two or more images to enable in-depth data analysis such as feature detection, or motion sensing. Image registration is especially necessary to compare and integrate image data that comes from different sources times.

Keywords:- Image Processing, Energy Saving System



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INTRODUCTION

Video surveillance systems are widespread and common in many environments. Video surveillance has been a key component in ensuring security at airports, banks, casinos, and correctional institutions. More recently, governments' agencies, businesses, and even schools are turning toward video surveillance as a means to increase public security. With the proliferation of inexpensive cameras and the availability of high-speed, broad-band wireless networks, deploying a large number of cameras for security surveillance has become economically and technically feasible. Several important research questions remain to be addressed before we can rely upon video surveillance as an effective tool for crime prevention, crime resolution, and crime protection. Much of the current research in video surveillance focuses on algorithms to analyze video and other media from multiple sources to automatically detect significant events. Example applications include intrusion detection, activity monitoring, and pedestrian counting. The capability of extracting moving objects from a video sequence is a fundamental and crucial problem of these vision systems. For systems using static cameras, background subtraction is the method typically used to segment moving regions in the image sequences, by comparing each frame to a model of the scene background.

1. LITERATURE VIEW OF PROJECT

We searched if this kind of system is available or not, research work is going on this project like Lockheed Martin and the university of Central Florida (UCF) are jointly investigating the use of a network of COTS video cameras and computers for a variety of security and surveillance operations. The Three main novel aspects of the network presented in this paper are-

- i) The integration of automatic target detection and recognition techniques with tracking.
- ii) The handover and seamless tracking of objects across a network.
- iii) The development of real-time communication and messaging protocols using COTS networking components.

The approach averages the previously developed KNIGHT human detection and tracking system developed by UCF, and Lockheed Martin's automatic target detection and recognition (ATD/R) algorithms. The work presented in this paper builds on these capabilities for surveillance using stationary sensors, with the goal of subsequently addressing the problem of moving platforms.

2. PROJECT OVERVIEW

To track objects successfully in multiple cameras, one need to establish correspondence between objects detected and tracked in each camera.

Our system is able to discover spatial relationships between the camera FOVs and use this information to correspond between different perspective views of the same person. We employ a novel approach of finding the limits of FOV of a camera as visible in the other cameras that is very fast compared to conventional camera calibration based approaches. Using this information, when a person is seen in one camera, we are able to predict all the other cameras in which this person will be visible. Moreover, we apply the FOV constraint to disambiguate between possible candidates for correspondence. When tracking is initiated, there is no information provided about the FOV lines of the cameras. The system can, however find this information by observing motion in the environment. whenever there is an object entering or existing one camera, it actually lies on the FOV line of this camera in all other ones in which it is visible suppose that there is only one target .Then, when it enters the FOV of new camera, we find one constraint on the associated line. To such constraints will define the line and all constraints after that can be used in a least square formulation. In an earlier paper, it was demonstrated that the initialization of FOV lines by one person walking in the environment for about 40 seconds was sufficient to initialize the lines.

These lines were then used to resolve the correspondence problem between the cameras. However it is not always possible to have only one target moving in the scene. When multiple targets are in the scene and if one crosses the edge of FOV, all targets in the other cameras are picked as being candidates for the projection of FOV line.

Since the false candidates are randomly spread on both sides of the line whereas the correct candidates are clustered on a single line, correct correspondence will yield a line in a single orientation, but the wrong correspondence will yield lines in scattered orientation. We can then use Hough transform to find the best line in this case. This method needs more points for reliable estimate of the lines and therefore takes longer time to set up correctly. Additional constraints derived from categorization of objects and their motion may be used to reduce the number of false correspondence, thus reducing the time it requires to establish the lines.

3. Description

Energy saving system by image processing is divided into three parts as shown in GUI of the system. Video surveillance system is taking the images of object entering the portion when it enters it will read the image sequence which is in .avi file format then estimate background from the initial frame of sequence. When object is detected it takes current

image and subtracts it from the background image after this convert the resultant image into gray scale image. If there are smashes it will perform filtering and remove it. Find the area that sort out biggest object in the image using area value and finally find out in which zone centered is presented and according switch on corresponding relay.

4. PHOTO VIEW OF PROJECT

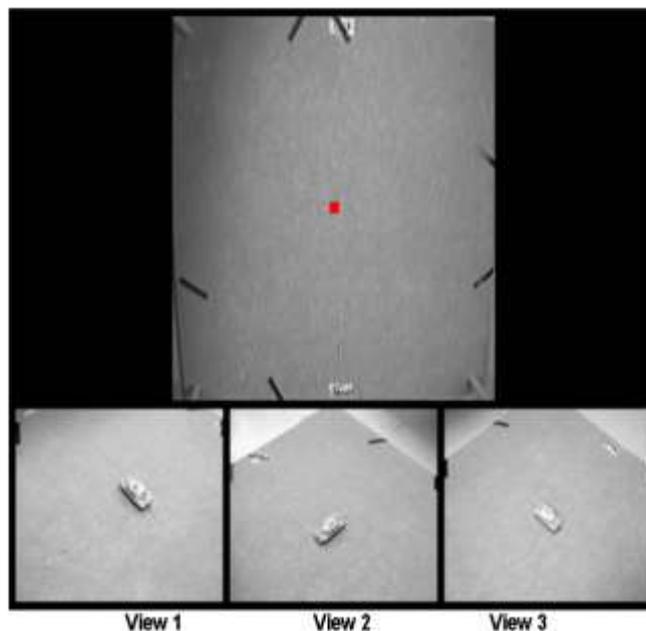


Fig.No.1 Centroid of the object



Fig. No.2 Detection of the object

5.1 Detection

The main difficulties of such approach lie in the fact that, even in controlled environment, the background undergoes a continual change, mostly use to the existence of lighting variations and distracters (example : clouds passing by, braches of trees moving with the wind). The robustness towards lighting variation of the scene is achieved using adaptive background models and adaptive per-pixel thresholds.

Detection is done on the basis of centroid of object is present. In detection, the image is acquired then it can compare with database if it matched with database no change will occur that's why relay will not be operated. When the image is not matched there is a change because of that relay will be operated and finally we get output.

5.2 How centroid is calculated?

The image is detected on the basis of maximum area. The maximum area is calculated depends upon number of pixels present in image. Maximum area is set by the designer according to their requirement. Number of frames is calculated per second when background is removed, then the centroid is calculated by maximum area that is maximum number of pixel in the image. The calculation of centroid is required for detection and tracking purpose.

If we set maximum area of the region for image detection for example 200 then the big image is detected relay is in on position and smaller image is not detected such as insects etc then relay is remain in off position thus energy is saved.

5.3 Tracking

The purpose of tracking is to determine the spatial temporal information of each target present in the scene. Since the visual motion of target is always small in comparison to their spatial extends, no position prediction is necessary to construct the strokes. The association matrix computed by testing the overlap of regions in consecutive frames. Whenever there is a match, the stroke is updated. Tracking also interacts with the detection.

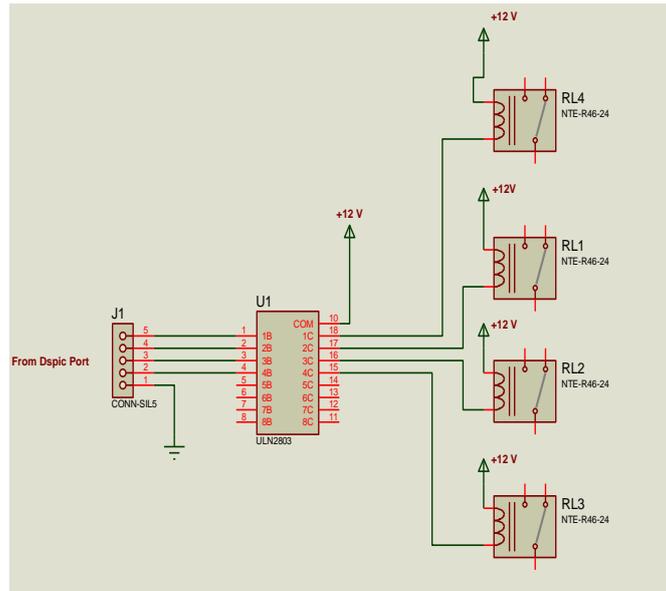


Fig No.3 Hardware description

5.4 ULN 2803

The eight NPN Darlington connected transistors in this family of arrays are ideally suited for interfacing between low logic level digital circuitry (such as TTL, CMOS or PMOS/NMOS) and the higher current/voltage requirements of lamps, relays, printer hammers or other similar loads for a broad range of computer, industrial, and consumer applications. All devices feature open-collector outputs and freewheeling clamp diodes for transient suppression.

The ULN2803 is designed to be compatible with standard TTL families while the ULN2804 is optimized for 6 to 15 volt high level CMOS or PMOS.

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ and rating apply to any one device in the package, unless otherwise noted.)

| Rating | Symbol | Value | Unit |
|-------------------------------------|-----------|-------------|------------------|
| Output Voltage | V_O | 50 | V |
| Input Voltage (Except ULN2801) | V_I | 30 | V |
| Collector Current – Continuous | I_C | 500 | mA |
| Base Current – Continuous | I_B | 25 | mA |
| Operating Ambient Temperature Range | T_A | 0 to +70 | $^\circ\text{C}$ |
| Storage Temperature Range | T_{stg} | -55 to +150 | $^\circ\text{C}$ |
| Junction Temperature | T_J | 125 | $^\circ\text{C}$ |

$R_{\theta JA} = 55^\circ\text{C/W}$
Do not exceed maximum current limit per driver.

ORDERING INFORMATION

| Device | Characteristics | | |
|----------|----------------------|--------------------------------------|----------------------------------|
| | Input Compatibility | $V_{CE}(\text{Max})/I_C(\text{Max})$ | Operating Temperature Range |
| ULN2803A | TTL, 5.0 V CMOS | 50 V/500 mA | $T_A = 0$ to $+70^\circ\text{C}$ |
| ULN2804A | 6 to 15 V CMOS, PMOS | | |

5. General Description

The LM78XX series of three terminal regulators is available with several fixed output voltages making them useful in a wide range of applications One of these is local on card regulation eliminating the distribution problems associated with single point regulation The voltages available allow these regulators to be used in logic systems instrumentation Hi-Fi and other solid state electronic equipment Although designed primarily as fixed voltage regulators these devices can be used with external components to obtain adjustable voltages and currents The LM78XX series is available in an aluminum TO-3 package which will allow over 10A load current if adequate heat sinking is provided Current limiting is included to limit the peak output current to a safe value Safe area protection for the output transistor is provided to limit internal power dissipation If internal power dissipation becomes too high for the heat sinking provided the thermal shutdown circuit takes over preventing the IC from overheating Considerable effort was expended to make the LM78XX series of regulators easy to use and minimize the number of external components It is not necessary to bypass the output although this does improve transient response Input bypassing is needed only if the regulator is located far from the filter capacitor of the power supply

For output voltage other than 5V, 12V and 15V the LM117 series provides an output voltage range from 1.2V-57V.

6. Features

- Output current in excess of 1A
- Internal thermal overload protection
- No external components required
- Output transistor safe area protection
- Internal short circuit current limit
- Available in the aluminum TO-3 package

7.1 Parallel port

- Less commonly referred to as the **Centronics interface** or **Centronics connector** after the company that originally designed it, the port was later developed by [Epson](#). The **parallel port** is found on the back of IBM compatible computers and is a 25-pin (type
- an example of the DB25 interface found on the back of the computer.
-

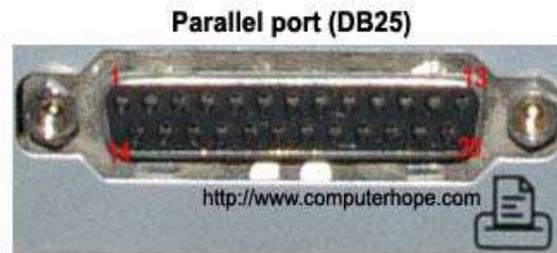


Fig.No.4 Parallel port

7. Identifying

In the above graphic of a parallel port you can notice the DB25 parallel port connection is easy to identify and is often the biggest connection on the back of the computer. The connection is in the shape of the letter D, is a [female connector](#), and has 25 pins.

8. Additional technical information

The DB25 connector has an 8-bit data bus, supported a maximum cable length of 15 feet; although there are 50 foot cables, it is not recommended that these cables be used as it can create poor connection and data signals. Below is additional information about each of the pins on this connector. Pin 1 through 25 identified in the image above.

| PIN | PURPOSE |
|--------|--------------------------|
| Pin 1 | -Strobe |
| Pin 2 | +Data Bit 0 |
| Pin 3 | +Data Bit 1 |
| Pin 4 | +Data Bit 2 |
| Pin 5 | +Data Bit 3 |
| Pin 6 | +Data Bit 4 |
| Pin 7 | +Data Bit 5 |
| Pin 8 | +Data Bit 6 |
| Pin 9 | +Data Bit 7 |
| Pin 10 | -Acknowledge |
| Pin 11 | +Busy |
| Pin 12 | +Paper End |
| Pin 13 | +Select |
| Pin 14 | -Auto Feed |
| Pin 15 | -Error |
| Pin 16 | -Initialize Printer |
| Pin 17 | -Select Input |
| Pin 18 | -Data Bit 0 Return (GND) |

| | |
|--------|--------------------------|
| Pin 19 | -Data Bit 1 Return (GND) |
| Pin 20 | -Data Bit 2 Return (GND) |
| Pin 21 | -Data Bit 3 Return (GND) |
| Pin 22 | -Data Bit 4 Return (GND) |
| Pin 23 | -Data Bit 5 Return (GND) |
| Pin 24 | -Data Bit 6 Return (GND) |
| Pin 25 | -Data Bit 7 Return (GND) |

Below is an explanation of each of the above purposes.

Pin 1 = Data acknowledgement when the signal is low.

Pin 2 - 9 = Data transfer pins.

Pin 10 = Acknowledge that the data has finished processing and when the signal is high indicates ready for more.

Pin 11 = When the signal goes high indicate that the printer has accepted the data and is processing it. Once this signal goes low and Pin 10 goes high will accept additional data.

Pin 12 = Printer paper jam when signal is high or no signal if printer jam.

Pin 13 = When high signal printer is indicating that it is on-line and ready to print.

Pin 14 = When low signal PC has indicated that the printer inset a line feed after each line.

Pin 15 = Printer sends data to the computer telling it that an error has occurred.

Pin 16 = When low signal PC has requested that the printer initiate an internal reset.

Pin 17 = When low signal the PC has selected the printer and should in return prepare for data being sent.

Pin 18 - 25 = Ground.

9. Working of Motion Sensors

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors. PIRs are basically made of a pyroelectric sensor (which you can see above as the round metal can with a rectangular crystal in the center), which can detect levels of infrared radiation. Everything emits some low level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves. The reason for that is that we are looking to detect motion (change) not average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low. For many basic projects or products that need to detect when a person has left or entered the area, or has approached, PIR sensors are great. They are low power and low cost, pretty rugged, have a wide lens range, and are easy to interface with.

10. How PIRs Work

The PIR sensor itself has two slots in it, each slot is made of a special material that is sensitive to IR. The lens used here is not really doing much and so we see that the two slots can 'see' out past some distance (basically the sensitivity of the sensor). When the sensor is idle, both slots detect the same amount of IR, the ambient amount radiated from the room or walls or outdoors. When a warm body like a human or animal passes by, it first intercepts one half of the PIR sensor, which causes a positive differential change between the two halves. When the warm body leaves the sensing area, the reverse happens, whereby the sensor generates a negative differential change. These change pulses are what is detected.

11. The PIR Sensor

The IR sensor itself is housed in a hermetically sealed metal can to improve noise/temperature/humidity immunity. There is a window made of IR-transmissive material (typically coated silicon since that is very easy to come by) that protects the sensing element.

Fig. No. 5 Motion Sensors



12. Lenses

PIR sensors are rather generic and for the most part vary only in price and sensitivity. Most of the real magic happens with the optics. This is a pretty good idea for manufacturing: the

PIR sensor and circuitry is fixed and costs a few dollars. The lens costs only a few cents and can change the breadth, range, sensing pattern, very easily.

In the diagram up top, the lens is just a piece of plastic, but that means that the detection area is just two rectangles. Usually we'd like to have a detection area that is much larger. To do that, we use a simple lens (<http://adafru.it/aKq>) such as those found in a camera: they condense a large area (such as a landscape) into a small one (on film or a CCD sensor). For reasons that will be apparent soon, we would like to make the PIR lenses small and thin and moldable from cheap plastic, even though it may add distortion. For this reason the sensors are actually Fresnel lenses

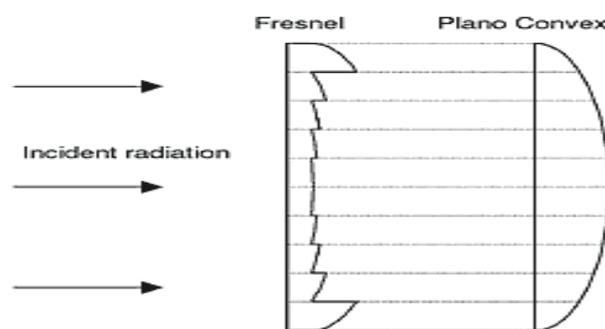


Fig. No. 6 : The Fresnel lens condenses light, providing a larger range of IR to the sensor.

13. Software description

14.1 Tool

MATLAB (matrix laboratory) is a numerical computing environment and fourth-generation programming language. Developed by Math Works, MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, Java, and Fortran.

Although MATLAB is intended primarily for numerical computing, an optional toolbox uses the MuPAD symbolic engine, allowing access to symbolic computing capabilities. An additional package, Simulink, adds graphical multi-domain simulation and Model-Based Design for dynamic and embedded systems.

In 2004, MATLAB had around one million users across industry and academia. MATLAB users come from various backgrounds of engineering, science, and economics. MATLAB is widely used in academic and research institutions as well as industrial enterprises.

14.2 Structures

MATLAB has structure data types. Since all variables in MATLAB are arrays, a more adequate name is "structure array", where each element of the array has the same field names. In addition, MATLAB supports dynamic field names (field look-ups by name, field manipulations, etc.). Unfortunately, MATLAB JIT does not support MATLAB structures; therefore just a simple bundling of various variables into a structure will come at a cost.

Function handles

MATLAB supports elements of lambda-calculus by introducing function handles, or function references, which are implemented either in .m files or anonymous/nested functions.

Classes

Although MATLAB has classes, the syntax and calling conventions are significantly different from other languages. MATLAB has value classes and reference classes, depending on whether the class has handle as a super-class (for reference classes) or not (for value classes). Method call behavior is different between value and reference classes.

14.3 GUI (Graphic user Interface)

- MATLAB supports developing applications with graphical user interface features. It also has tightly integrated graph-plotting features. The aim of this course is to develop initial skills for building Graphical User
- Interfaces (GUIs) in MATLAB7. First we give a summary of MATLAB's
- graphics object hierarchy and review the syntax for accessing and manipulating
- object properties. Then we discuss standard user interface components and
- consider situations when descendants of axes can be used to design purpose built
- graphical controls. Programming techniques are analyzed using moderately
- simple conceptual examples and exercises. The structure of application
- m-files generated by the MATLAB GUI development environment and some
- techniques for inclusion of Java components and ActiveX controls into MATLAB

14. Programming MATLAB GUI

In this section we will discuss some concepts and techniques needed to program GUIs. Typically we would like a GUI to respond in an appropriate manner to events resulting from the interaction of the user with one or another component of the GUI. In a common scenario, after some specific graphical interaction with the UI component, a corresponding event is triggered and a callback function is executed. The reference to the callback function is passed using the relevant component's property (such as Callback, Clicked Callback, Button Down Fcn, etc.) In many cases the actions performed by the callback

depend on the state of the GUI, so a standard mechanism is required which would allow each callback to routinely access Properties of objects. Data exchange must also be properly organized. A GUI writer must be aware of certain MATLAB language conventions. For example, if the callback property is specified as a string, then the callback expression is evaluated in the base workspace, but if it is specified as a cell-array, then the variables additional to the callback object handle and the event data will be interpreted in the scope of the segment of the code where the callback property was originally set.

15.1 Background on MATLAB and the Image Processing Toolbox

Math and computation MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. Typical uses include the following:

- Algorithm development
- Data acquisition
- Modeling, simulation, and prototyping
- Data analysis, exploration, and visualization
- Scientific and engineering graphics
- Application development, including building graphical user interfaces

MATLAB is an interactive system whose basic data element is a matrix. This allows formulating solutions to many technical computing problems, especially those involving matrix representations, in a fraction of the time it would take to write a program in a scalar non-interactive language such as C.

The name MATLAB stands for Matrix Laboratory. MATLAB was written originally to provide easy access to matrix and linear algebra software that previously required writing FORTRAN programs to use. Today, MATLAB is in a state of the art numerical computation software that is highly optimized for modern processors and memory architectures.

In university environments, MATLAB is the standard computational tool for introductory and advanced courses in mathematics, engineering, and science. In industry, MATLAB is the computational tool of choice for research, development, and analysis. MATLAB is complemented by a family of application-specific solutions called toolboxes. The Image Processing Toolbox is a collection of MATLAB functions (called M-functions or M-files) that extend the capability of the MATLAB environment for the solution of digital image

processing problems. Other toolboxes that sometimes are used to complement the Image Processing Toolbox are the Signal Processing, Neural Networks, Fuzzy Logic, and Wavelet Toolboxes.

The MATLAB & Simulink Student Version is a product that includes a full-featured version of MATLAB, the Image Processing Toolbox, and several other useful toolboxes. The Student Version can be purchased at significant discounts at university bookstores and at the MathWorks web site (www.mathworks.com). As we discuss in more detail in Chapter 2, images may be treated as matrices, thus making MATLAB software a natural choice for image processing applications.

15. Result

It is possible because of this to detect human motion and thus can be used to detect the presence of human. Once the presence of human is detected the relative relay can be operated and thus we can switch ON or OFF the electrical outputs.

16. CONCLUSIONS

Surveillance systems significantly contribute to situation control. Such systems transform video surveillance from a data acquisition tool to information and intelligence acquisition systems. Real-time video analysis provides surveillance systems with the ability to react to an activity in real time, thus acquiring relevant information at much higher resolution. The long-term operation of such systems provides the ability to analyze information in a spatial-temporal context. Because of motion sensors it is possible to detect the presence of human motion and can operate the related relay.

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