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A SURVEY ON IMAGE PROCESSING TECHNIQUES FOR MOTION DETECTION IN VIDEO SURVEILLANCE SYSTEM

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ABSTRACT

Video surveillance is a normal security procedure in the living environments nowadays due to the requirement of continuous cost effective automatic monitoring necessity for the safe and peaceful life structure. The identification and detection of moving persons or objects is a tedious process with the optimal accuracy in dimensions and validity. The essential and required improvements in the entire methodology critically depend upon the image processing approaches with effective care on the image frames. For this goal Image processing plays a vital role in order to handle the video data in proper way for analysis and prediction of performances for the improvement of motion detection in video surveillance system domain results. This paper presents a survey on motion detection analysis for video surveillance system.

KEYWORDS—*Image processing, Motion detection, Video surveillance, Prediction, Performance*

1. INTRODUCTION

Digital image processing is the use of a digital computer to process digital images through an algorithm. As a subcategory or field of digital signal processing, digital image processing has many advantages over analog image processing. It allows a much wider range of algorithms to be applied to the input data and can avoid problems such as the build-up of noise and distortion during processing. Since images are defined over two dimensions digital image processing may be modeled in the form of multidimensional systems. The generation and development of digital image processing are mainly affected by three factors: first, the development of computers; second, the development of mathematics (especially the creation and improvement of discrete mathematics theory); third, the demand for a wide range of applications in environment, agriculture, military, industry, and medical science has increased.

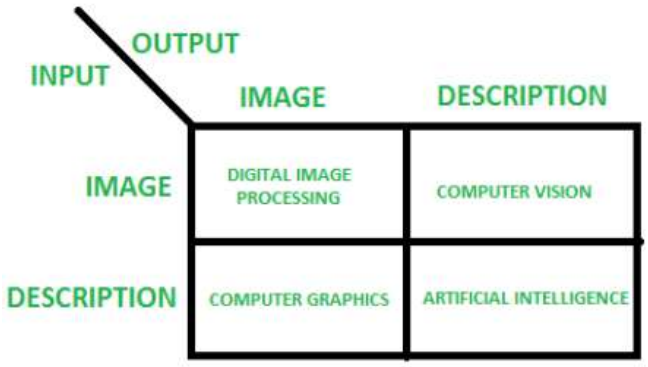

Fig-1: Digital Image Processing

2. VIDEO SURVEILLANCE SYSTEM

A video surveillance system / CCTV are composed of a system of cameras, monitors/display units, and recorders. Cameras may be either analog or digital with a host of possible design features which will be discussed momentarily. These systems can be applied to both interior and exterior areas of a building or property. They can operate 24/7, can be designed to only record in response to movement, or set to record during specific times of the day. Footage can be monitored live by a security guard, monitored remotely if using an IP camera and system (more on that in a moment) by a monitoring company, or can simply be recorded and stored

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by a DVR (digital video recorder) or NVR (network video recorder) for review later should the need arise. Finally, video surveillance systems are closed – this means its signals are not broadcast so that others could intercept and view the content. Only authorized users can access the recorded material.

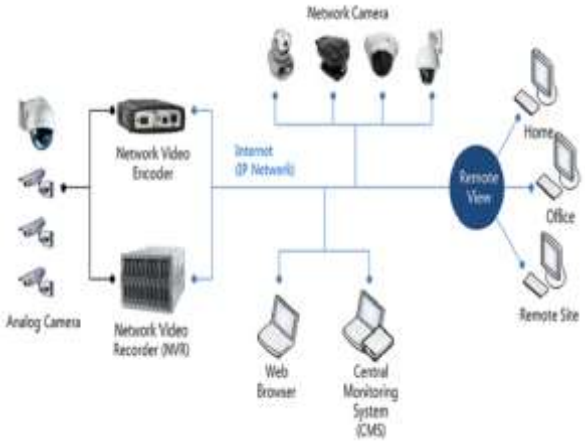

Fig-2: Sample Video Surveillance System [6]

3. TYPES OF IMAGE PROCESSING

There are five main types of image processing:

- Visualization - Find objects that are not visible in the image
- Recognition - Distinguish or detect objects in the image
- Sharpening and restoration - Create an enhanced image from the original image
- Pattern recognition - Measure the various patterns around the objects in the image
- Retrieval - Browse and search images from a large database of digital images that are similar to the original image

4. IMAGE PROCESSING STEPS

- Image Acquisition
  Image acquisition is the first step in image processing. This step is also known as preprocessing in image processing. It involves retrieving the image from a source, usually a hardware-based source.
- Image Enhancement
  Image enhancement is the process of bringing out and highlighting certain features of interest in an image that has been obscured. This can involve changing the brightness, contrast, etc.
- Image Restoration
  Image restoration is the process of improving the appearance of an image. However, unlike image enhancement, image restoration is done using certain mathematical or probabilistic models.
- Color Image Processing
  Color image processing includes a number of color modeling techniques in a digital domain. This step has gained prominence due to the significant use of digital images over the internet.
- Wavelets and Multi resolution Processing
  Wavelets are used to represent images in various degrees of resolution. The images are subdivided into wavelets or smaller regions for data compression and for pyramidal representation.
- Compression
  Compression is a process used to reduce the storage required to save an image or the bandwidth required to transmit it. This is done particularly when the image is for use on the Internet.
- Morphological Processing
  Morphological processing is a set of processing operations for morphing images based on their shapes.
- Segmentation
  Segmentation is one of the most difficult steps of image processing. It involves partitioning an image into its constituent parts or objects.
- Representation and Description
  After an image is segmented into regions in the segmentation process, each region is represented and described in a form suitable for further computer processing. Representation deals with the image's characteristics and regional properties. Description deals with extracting quantitative information that helps differentiate one class of objects from the other.
- Recognition
  Recognition assigns a label to an object based on its description.

5. LITERATURE SURVEY

Eapen, et al. [1] have proposed a method to enhance the edges and reduce the noise level in the input images before dealing with segmentation process. In the pre-processing module they included image resizing, histogram of medical images. In [2] Sivappriya, et al. proposed medical image edge detection. Medical images pre-processing is an important step in medical image segmentation and 3D reconstruction. Puri, et al. presented a pre-processing technique to group pixels into "super pixels". They would like to work with "super pixels" which were local, coherent, and which preserve most of the structure necessary for segmentation at the scale of interest. They applied the normalized cut algorithm to produce the super pixel map. Both contour and texture cues were used [3] in the method. Afifi et al. [4] proposed a system to maintain the quality of image after the image compression process using Wavelet Algorithm. In their work, JPEG and PNG image was used. It was noted that for JPEG image, the size is reduced almost half of original image by using Haar wavelet algorithm. Raju, et al. [5] proposed a solution that enhances the image quality. The enhanced image was then segmented using a modified watershed algorithm that uses mean-shift clustering. The enhancement technique proposed a hybrid version that combined wavelets, improved anisotropic diffusion.

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6. ISSUES IN DATA MINING IN EDUCATION

- ✓ Nontrivial issues: Nontrivial issues denote complicated matters. Generally, these matters take a long turnaround time to settle down. In the context of image processing, such issues could be related to filtration, restoration, registration, fusion, segmentation, and classification of pictures. These processes form a hierarchy of data processing, which takes a long time to carry out.
- ✓ Accuracy: It is a pervasive fact that achieving 100% accuracy is a dream while processing images. The client does not get satisfied with the obtained results.
- ✓ Hard Coded Solutions: The hard coded software embeds data directly from the source code, rather than generating it at a run time. Such kind of data could be an image also. In that scenario, enhancing the contrast of images or filtering could be tough. This challenge could stem from source code, kernel.
- ✓ Diverse Methods of Processing: The method of photo processing may vary. If you talk about filtering digitally, for example, there are many types of filter- Spatial Low pass, Spatial High pass, Fourier Representation, Fourier Low pass and Fourier High pass. These filters are then passed through kernel or mask for transformation.
- ✓ Endless Research: This is the most vital part of any kind of processing. A human brain tends to explore through and innovate for discovering smart ways to simplify processing. This is where open research stands out. Image processing is likewise. This domain also requires churning through existing challenges, identifying loops and patching them with innovative patterns.

7. IMPLEMENTATION IN RURAL URBAN AREAS

- ❖ Study and perform background analysis of images and videos.
- ❖ Investigate integral functional strategies for surveillance environment
- ❖ Bridge the gap between computationally feasible and functionally relevant time scales.
- ❖ Improve multiresolution state prediction.
- ❖ Combine classical and modern techniques in image processing environment.
- ❖ Sample larger sets of dynamical surveillance images and result matching's.
- ❖ Realize interactive modeling.
- ❖ Foster the development of image processing based model.

8. TOOLS PERFORMANCE

The following data illustrates Image processing tools with its implementation scope for the betterment of video surveillance system.

❖ **DIY Filters**

Processing makes it simple to handle images, iterate over the pixels of an image, and perform operations on them.

❖ **GPU Filters**

You can also implement filters using OpenGL pixelshaders.

❖ **Image Filters**

Martin Schneider is currently working on a Processing Library / Wrapper for ImageJ.

Python Tools

❖ **PIL**

The Python Imaging Library provides you with the power to handle and process images.

❖ **SciKit-Image**

Scikit-image is a collection of algorithms for image processing.

❖ **SimpleCV**

SimpleCV is a python wrapper for OpenCV (and a couple of other tools) that makes image processing really easy.

❖ **FilterForge**

FilterForge is a commercial application that lets you create filters using a node based dataflow programming language.

9. RECENT TRENDS

- ❖ Automatic image enhancement and restoration
- ❖ Automatic object segmentation
- ❖ Automatic object detection, classification and recognition
- ❖ Steganography
- ❖ Image Inpainting
- ❖ Text recognition and Information extraction

10. APPLICATIONS

- Image polishing and restoration.
- Medical Field.
- UV Sensing.
- Transmission and encoding.
- Robot vision.
- Pattern recognition.
- Video processing.
- Hurdle detection.
- Future Healthcare
- Fraud Detection.
- Intrusion Detection.
- Customer Segmentation.
- Financial Banking.
- Lie detection
- Corporate Surveillance
- Research Analysis
- Criminal investigation
- Bioinformatics

11. CONCLUSION

The detailed research survey in the field of image processing domain towards video surveillance system with traditional approach when compared to the digital image processing approaches and recent techniques with advanced tools shows that the higher level of impact in the field of image processing approaches with the cope up towards latest trends and systematic pathways for the improvement progress of several advanced strategies. The approaches for image processing dealt with the various levels of implications towards the selection strategies for the analysis and prediction of intruders or manipulations focusing along with the factors in the development of video surveillance system implementations. The tools performance and applications of image processing provides the several directions for the development of different methodologies to implement in the better way. In future this research will lead the direction of video surveillance system for the corporation sector in an effective way.

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