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Real Time Implementation of Moving Object Detection Using OMAP3530

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Abstract

Moving object detection is key for Real Time Surveillance systems. Surveillance system plays an important role and essential part in the field of security. Moving object detection has been generally utilized for video surveillance system. It is a provocative task to detect a moving object due to its compute-intensive nature but this can be overcome by using background subtraction techniques and by using OMAP Processors like OMAP3530, OMAPL138can also reduce its computational complexity. In this undertaking we use back ground subtraction strategy to recognize an object on DSP processorThe obtained process leads to a stand-alone device for Moving object detection. To actualize this paper we utilized distinctive most recent programming parts like cross compilers, DVSDK.

Keywords: Digital Video Software Development Kit (DVSDK), Open Multimedia Application Platform (OMAP)

Introduction

With most recent progressions in cutting edge innovation security issues have turned into a significant concern. Present days there is more need to safe monitor and secure the spots like banks, shops which incorporate high cost equipment's. So as to defeat these security issues we proposed an ease framework which identifies any unauthorized movements. Real time implementation of moving object detection is very crucial for video surveillance and security purpose. By using image processing techniques we implemented the moving object detection.In this proposed system we used background subtraction technique to detect any unauthorized movements. The moving object detection algorithm includes capturing images, comparing the current image from reference image and identifying the edges and discriminating the object in the image. This moving object detection is implemented on a real time system using OMAP 3530 processor. To implement Moving object detection in real time, compact and make it economical we use Embedded system.

Many algorithms are proposed for moving object detection [10, 11, 12] but most of them are dealing with back ground modeling based on probabilistic methods. Anyway those proposed routines are computationally intricate and tedious. In our paper we used a background subtraction technique [1] that uses a webcam to capture images at different instants.

Hard Ware Design

OMAP 3530 System Architecture

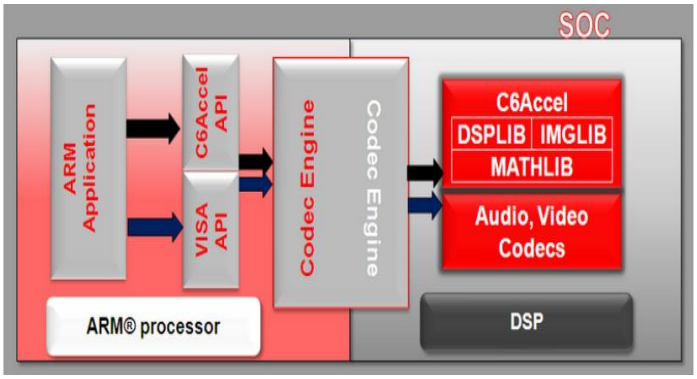
OMAP Stands for Open Multimedia Applications Platform. It is a processor [12] developed by Texas instruments.OMAP 3530 is a combination of ARM (Cortex A8) +DSP (TMS320 C64X) +Power VR SGX 530 [13]. OMAP 3530 supports image, audio and video processing applications. Fig. 1 represents the Hardware design ofmoving object Detection on OMAP3530 .This design shows various functional modules, including Camera Interface Module, Embedded Processor (OMAP3530), memorymodule. Firstly Camera modules captures the frames at every instant and then given as input to the ARM subsystem.

DVSDK

DVSDK stands for Digital Video Software development kit which is a Linux based platform used for accessing the DSP features present in the OMAP3530 processor. DVSDK empowers OMAP3530 framework highlights to create Linux based interactive media applications. The Linux DVSDK empowers OMAP35x system integrators to rapidly create Linux-based media applications that can be effectively ported across different devices in the OMAP35x era, including OMAP3530 and OMAP3525 application processors. For OMAP35x devices which include DSP cores, the DVSDK gives a complete structure to designers to effortlessly influence DSP-accelerated codecs without needing to program the DSP. The DVSDK is free and does not oblige any run-time eminences.By adding the DVSDK to your DVEVM, you will have the capacity to create complete DSP-side and ARM-side applications that take advantage of TI's new DaVinci Technology and the OMAP Technology.

C6Accelerator

C6Accel is a software development tool that permits ARM client to get to the DSP highlights with the libraries present. This C6Accel API's diminish the complexities of utilizing the DSP on a multi centre environment. It helps ARM client to get to DSP effortlessly with the assistance of API's.



C6accelerator Block Diagram

C6Accel incorporates numerous libraries that assistance in performing numerous sign transforming applications .By utilizing C6EZAccel, an ARM developer can utilize the DSP as an accelerator and create a more compelling application by adding by adding separate highlights to their application. ARM developers [21] can leverage C6EZAccel with TI's TMS320C6000 based devices, for example, C6-Integra DSP+ARM processors [21], and also DaVinci computerized media processors to empower snappy and simple DSP acceleration for any ARM application.C6accelerator is a DSP algorithm [22] that follows TI's specified algorithm interface called XDAIS. It also provides a frame work called codec engine that allows efficient execution of algorithms written using XDAIS interface [22] C6accel algorithm includes many core functions that are useful in various signal processing functions such as FFT and filters.

Methodologies:

Object Detection:
Activity of sensing physical movement in a given range is called as Object Detection. Movement can be recognized by measuring change in pace or vector of an object. Two situations are encountered for detection of object. They are Static Camera (A Settled perspective), Moving Camera (moving perspective).

Detecting moving objects in a static scene

Strategy -1
Moving object detection can be detected by applying Background Subtraction Algorithms In this paper we use back ground subtraction technique and c6accelerator API's.

Back Ground Subtraction Technique
For the moving object detection we use background subtraction technique and the working of this technique is as follows [1]

1. To implement this technique we used Static camera for capturing images at every instant.
2. First captured image is directly considered as Reference image and this image is to be subtracted from current capturing image

$$D = |I_{k-1} - I_k|$$

Where D is Difference between the consecutive frames,
I is Frames captured, K is frame number

3. Hence the resultant obtained from above step can be given as input to the c6accel by applying Sobel API to perform edge detection.

Detecting The Moving Target

After taking the difference, the quantity of nonzero pixels will determine the measure of the target. On the off chance that these pixels met the necessity of the framework a move will be taken to send a message to the concerned authority. In the event that the quantity of the nonzero pixels did not approach the base number of the obliged pixels to choose, another frame is taken and goes on to the difference process again.Strategy-1 is fast algorithm and compatible with real time video analysis, yet, numerous issues shows up in using the still background, Sensitivity to illumination of light, where any lighting in that range will bring about the framework to remember it as a moving target in the given range.

Strategy-2

Temporal Differencing

The temporal differencing is the next Strategy which will solve the drawbacks involved in Strategy-1. The fundamental standard of this strategy-2 depends on extracting the frames that are obtained from webcam, and taking the first frame as foundation and the subtraction is to be performed from current frame to the first frame and between the next two consecutive frames and continues.

Sobel Filtering:

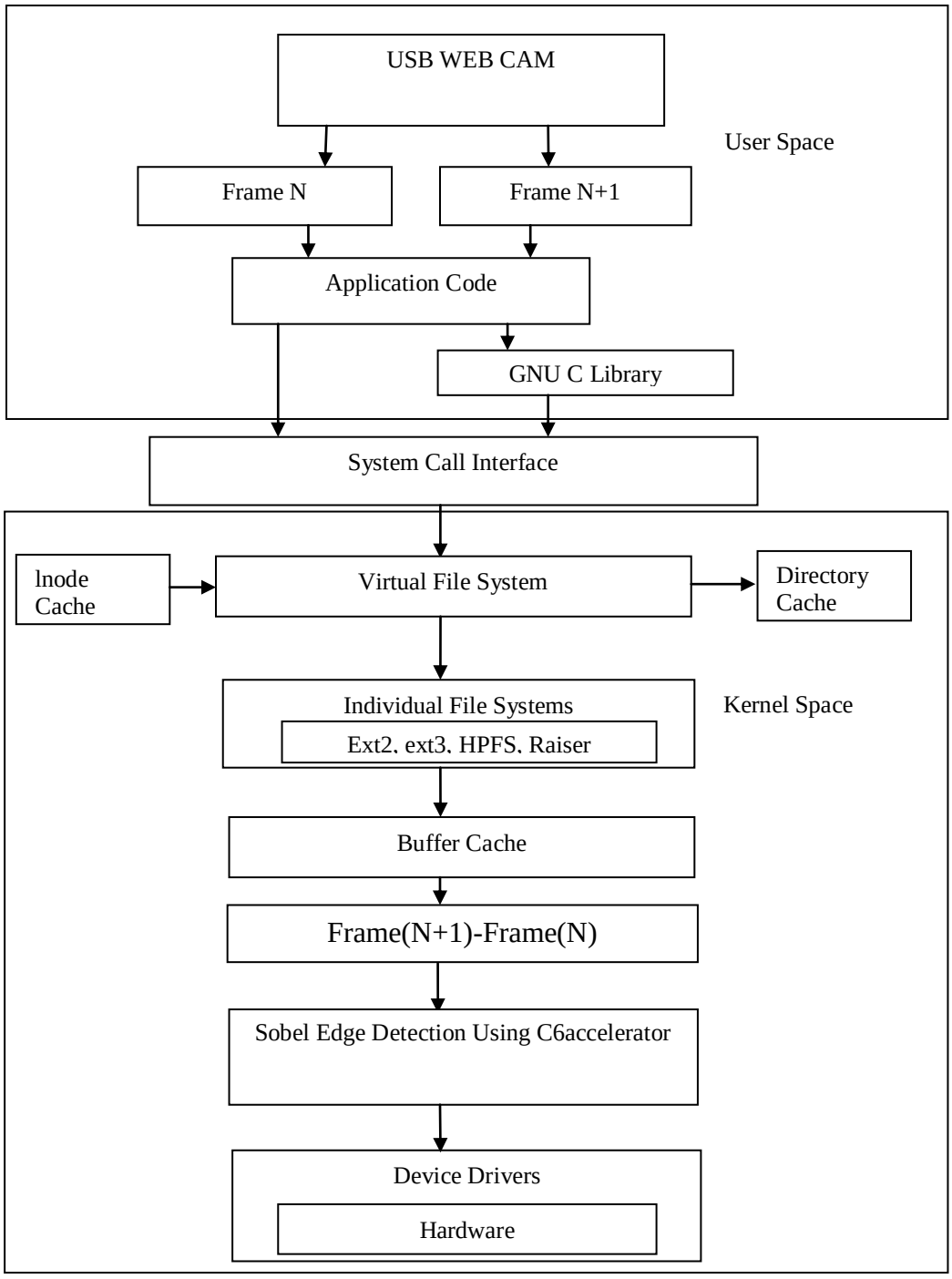
Sobel filtering is an edge detection algorithm which is used to extract the edges of an image. A sobel operator finds image gradient which is a change in the intensity of image. An edge is detected in an image when change in the intensity of image is large. The sobel operator calculates the change in the image intensity by convolving a 3x3 matrix with original image. This 3x3 matrix estimates the image gradients in horizontal (G_x) and vertical (G_y) directions. The magnitude of gradient id calculated by using the below equation

$$G = \sqrt{Gx^2 + Gy^2}$$

$$G_x = \begin{pmatrix} \mathbf{1} & \mathbf{0} & \mathbf{-1} \\ \mathbf{2} & \mathbf{0} & \mathbf{-2} \\ \mathbf{1} & \mathbf{0} & \mathbf{-1} \end{pmatrix} * A, G_y = \begin{pmatrix} \mathbf{1} & \mathbf{0} & \mathbf{-1} \\ \mathbf{2} & \mathbf{0} & \mathbf{-2} \\ \mathbf{1} & \mathbf{0} & \mathbf{-1} \end{pmatrix} * A$$

Where A is the source image, $G_x$and $G_y$are image gradients in horizontal and vertical directions.
We can also calculate the direction of gradient by using the below equation$\Theta=\arctan(G_y/G_x)$

Flow chart:

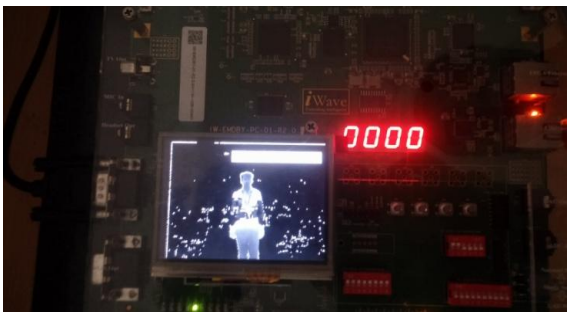


Performance Evaluation Results:

Input-1

Input-2

Subtracted Image



Resultant Image

In the above Input-1 is an image without object, Input-2 is an image with object, Subtracted Image is an image obtained due to subtraction of images from Input-2 to Input-1. Resultant Image obtained after the Sobel Edge Detection

Conclusion

We have designed and implemented a moving object detection system based on the high performance of OMAP3530, which provides more reliable, lower expense and higher performance than based on PC. This moving object detection system with superlative algorithm based on background Subtraction Technique with Temporal Difference can be applied into intelligent video surveillance systemand other involving embedded vision applications. This paper presents an easy and efficient technique to detect a moving object on OMAP3530 processor and this can be extended by interfacing GSM using UART such that a message can be send to the concerned authority. Hence making it a compact, economical and portable security system.

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