Design and Implementation of Object Detection Technology Using ABPD Algorithm

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Abstract-The real time moving object is used for various security applications. A real-time surveillance system needs to detect moving objects robustly against noises and environment. In this paper, we propose VLSI implementation of moving object with adaptive block partitioning method. The ABPD algorithm includes a data controller, RGB to gray-level , a sub-block difference module, and an edge detector. The tangible of this paper is to perform an efficient enactment of the object detection using Xilinx ISE and Modelsim. The video is taken as a input using MATLAB functions, video is converted into frames, frames into text values these text values are processed to detect an object. By making use of MATLAB function we reduce the circuit complexity. Difference between background frame and current frames calculated in order get adoptive threshold. The proposed method results in power reduction and also complexity is reduced as compared with the existing systems.

Keywords—Very large-scale integration (VLSI), block partition, edge detection, video processing, image processing and object detection.

I. INTRODUCTION

Object detection procedures have turned out to be more extensive. The applications of object detection give capable answers for checking continuously, screening for investigation. For example as high-definition LCD displays , high definition video monitoring systems, intelligent surveillance systems, closed-circuit television (CCTV), smart camera system, high-definition road visual surveillance , wireless sensor and actual networks (WSAN), etc., the usage of the object detection technique is increasing rapidly. As the interest for high quality video displaying , to develop 2D or 3D object detection technologies by means of the VLSI strategy for identifying objects continuously has turned into a noteworthy pattern. Current methodologies ([1][2] [3][4][5] [6][7] [11] [9][10]) to object location can be arranged by top down, bottom up or blend of the two. Best down methodologies frequently incorporate a preparation stage to acquire class-specific demonstrate includes or to define object configurations.

To accomplish object detection technique we realize ABPD algorithm by utilizing a VLSI procedure. Also, each block can be balanced by the predefined judgment conditions to expand the exactness of the proposed ABPD calculation. We propose a method for detecting an objects, which includes a data controller, RGB to Gray level converter, a sub-block difference module and an edge detector. The edge detector is designed for discovering edges in images using an efficient edge-catching technique. To detect the specific moving objects only, it is important to eliminate the environmental disturbances such as light scattering, leaves, birds and so on from input image.

II. WORKING PRINCIPLE

Flowchart of the proposed ABPD algorithm is shown in the Fig 1. Initially, video is taken as input by using MATLAB function video reader, the background and input images are in red, green and blue (RGB) format are converted into images in a gray-level format. Second, the block differences between the current frame and background frame are calculated. An object detected image was produced according to the adoptive block partition decision. Next number of pixel values in detected regions is counted, depending on number of pixel values an alert signal will be triggered, only when the sum is above the threshold, otherwise current frame will be updated.

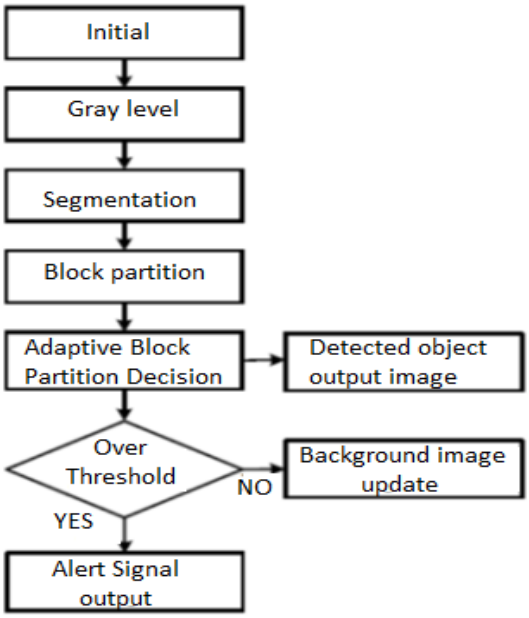

Fig.1 Flowchart of the proposed ABPD algorithm.

III. ARCHITECTURE OF THE PROPOSED SYSTEM

Fig.3 shows the VLSI architecture of proposed system, which includes a data controller, a gray-level generator, a sub-block difference module, and an edge detector.

A. DATA CONTROLLER

Since the background and foreground frames are stored in frame memories, a data controller is designed in such way that it has to control the read/write mode and produce addresses to access through the memory device. since, the proposed object detection algorithm depends on regional-based method, which implies that the gray level generator fetches data in block format. Consequently, the data controller is important to accomplish read/write operation.

B. SUB-BLOCK DIFFERENCE GENERATOR

Each block is divided into four sub-blocks(d1,d2,d3,d4) and difference between each block is calculated. The block difference is compared with a cumulative value called threshold to detect an object. It is necessary to calculate sum of absolute difference between each sub-block for the automatic warning system and block partition, it can be calculated by

$$\text{Bdi(d1)} = \sum_{a=1}^{p/2}\sum_{b=1}^{p/2}[F(a,b) - B(a,b)]$$

$$\text{Bdi(d2)} = \sum_{a=1}^{p/2}\sum_{b=p/2}^{p}[F(a,b) - B(a,b)]$$

$$\text{Bdi(d3)} = \sum_{a=p/2}^{p}\sum_{b=1}^{p/2}[F(a,b) - B(a,b)]$$

$$\text{Bdi(d4)} = \sum_{a=p/2}^{p}\sum_{b=p/2}^{p}[F(a,b) - B(a,b)]$$

Total difference is given by the equation

$$\text{TD} = \sum_{i=1}^{N}(background\ frame - current\ frame)$$

Finally, an alert signal generated by ABPD Method is given by

$$\text{S} = \begin{cases} 1, & Td > Tw \\ 0, & otherwise \end{cases}$$

C. EDGE DETECTOR

In order to make the proposed system cost effective, high efficiency edge detecting method is introduced in ABPD algorithm, which provides the information about the edges in the image.

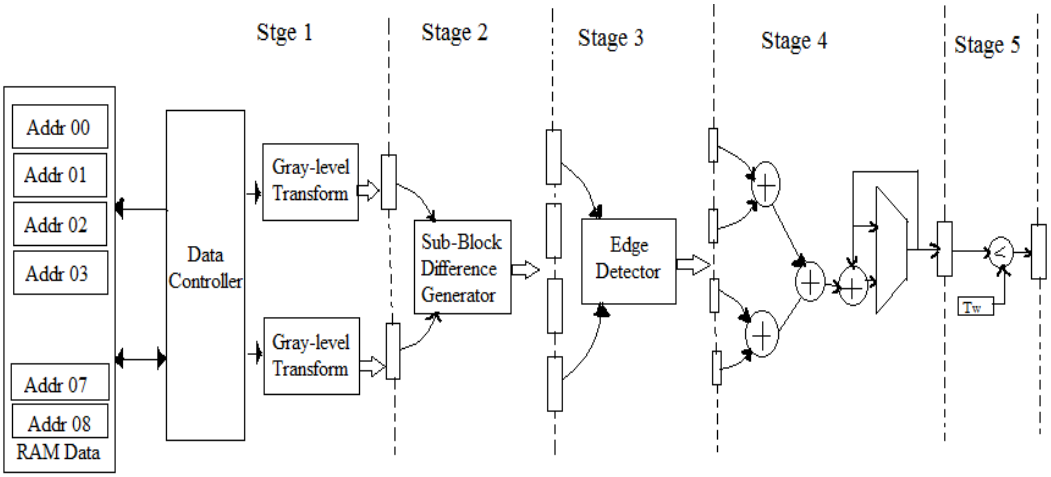

Fig 2 The proposed ABPD object detection circuit

IV. IMPLEMENTATION RESULTS

The proposed object detection architecture uses an adaptive block partition to detect an object from an image effectively. The object detected using proposed architecture is compared with existing architectures.

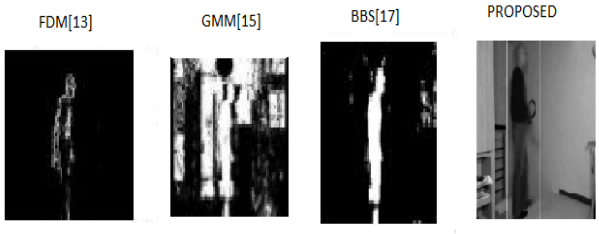

Fig. 3 Output Image Comparison for existing and proposed Moving Object Detection.

Fig. 3 shows the comparison for existing and proposed system. The input video is processed using MATLAB functions. These processed values imported in mentor graphics for comparing block difference value with threshold value and produces corresponding result, if BD is greater than threshold value the output is one if it is less than threshold value output is zero. This is shown in Fig. 4 and shows simulation results of the detected object which comprises of input clock, frame values and resultant output.

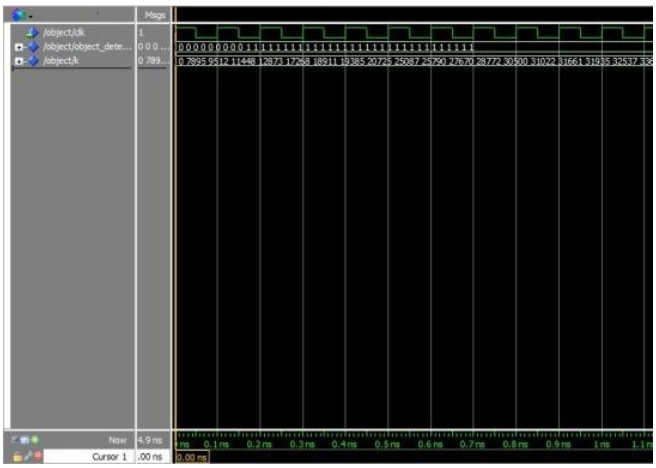

Fig. 4 Modelsim simulation result

Table.1 Comparison of various Performance Parameters

	Existing [25]	Conventional Method	Proposed Method
Algorithm	GMM	ABPD	ABPD
Vendor	Xilinx	Xilinx	Xilinx
Device	Virtex 6	Virtex 6	Virtex 6
LUT	788/46560	511/46560	351/46560
Process	0.09um	0.09um	180nm
Cell Area	21,847	17484	11541
Power	49.4 pJ/pixel	6.27pJ/pixel	0.054872mw

Table 1 shows the Performance Comparison of various object detection VLSI designs. The comparison table shows the reduction in power and complexity as compared with the existing systems.

V. CONCLUSION

The object detection is essential to detect a person in real time applications. We proposed VLSI implementation of object using adaptive block partition decision. Input image and reference images are passed through each stage in VLSI architecture. The modified BBS is used to detect an object. The final object is obtained depending on the number of one's. The performance parameters are better in the proposed architecture compared to existing architectures in-terms of simulation results. The proposed methodology achieved higher adaptability and object similarity than did in the previous studies. This method gives a low complexity and high speed object detection VLSI implementation.

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