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Simulation to maximize retransmission of packets in WMSN

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Abstract: It has been a center of research in a wide variety of areas including digital signal processing, communication, networking and control systems. Wireless multimedia sensor networks (WMSN)[1] consist of minute camera nodes, which combine the image sensor, embedded processor, and wireless transceiver. Because of its distinctive features of rapid deployment, flexibility, low maintenance cost, and robustness, WMSN have developed as a new technology with a number of potential applications, ranging from security to monitoring. A wireless sensor network consists of sensor nodes that are powered by small irreplaceable batteries. Habitat monitoring, in-door monitoring, target tracking and security surveillance are some of the applications where WSNs can be used. WSNs have some problems to be overcome such as energy conservation, congestion control, reliability data dissemination, security and management of a WSN itself. These problems often take part in one or more layers. To make reliable, energy efficient wireless network systems and to develop this system architecture we work from the high level application requirements down through the low-level hardware requirements. In this paper, we have focused to adjust the maximum number of retransmission packets using a wireless network technology and developed algorithm for energy efficient and reliable WSN system.

I. INTRODUCTION

A wireless sensor network based architecture designed for the purpose of image transmission the protocol IEEE 802.15.4 is used to transmit images accurately to the monitoring section. Wireless multimedia sensor networks (WMSN) [1] consist of tiny camera nodes, which integrate the image sensor [2], embedded processor, and wireless transceiver. Because of its unique features of rapid deployment, flexibility, low maintenance cost, and robustness, WMSN have developed as a new technology with a number of potential applications, ranging from security to monitoring to tele-presence as given in [1]. Compared to traditional communication systems, WMSN operates under a set of unique resource constraints, including limited energy supply, on-board computational capability, and transmission bandwidth.

II. ABOUT WMSN

A. Enlarging the view

Viewpoints from multiple cameras can provide a close-up view of an event either through the images captured by a camera nearer the scene or by engaging a node with a more advanced camera such as a pan-tilt-zoom (PTZ) camera. In such a system, an event detected by a node with a lower resolution camera can signal another node with a PTZ camera to detect and track the event.

B. Providing multiple viewpoints for the same event

When a single camera is considered for a surveillance application, the coverage of the application is only limited by the FOV of a fixed camera or the field of regard (FOR) of a PTZ camera. The layout of a typical WMSN is shown in Figure 1.1. The network typically consists of a large number of sensor nodes deployed in a region of interest and one or more base stations. The energy consumed for communication is much higher. The concept of wireless sensor networks is based on a simple equation:

Sensing + CPU + Radio = Thousands of potential applications

As soon as people understand the capabilities of a wireless sensor network, hundreds of applications spring to mind. We use this set of application classes to explore the system-level requirements that are placed on the overall architecture.

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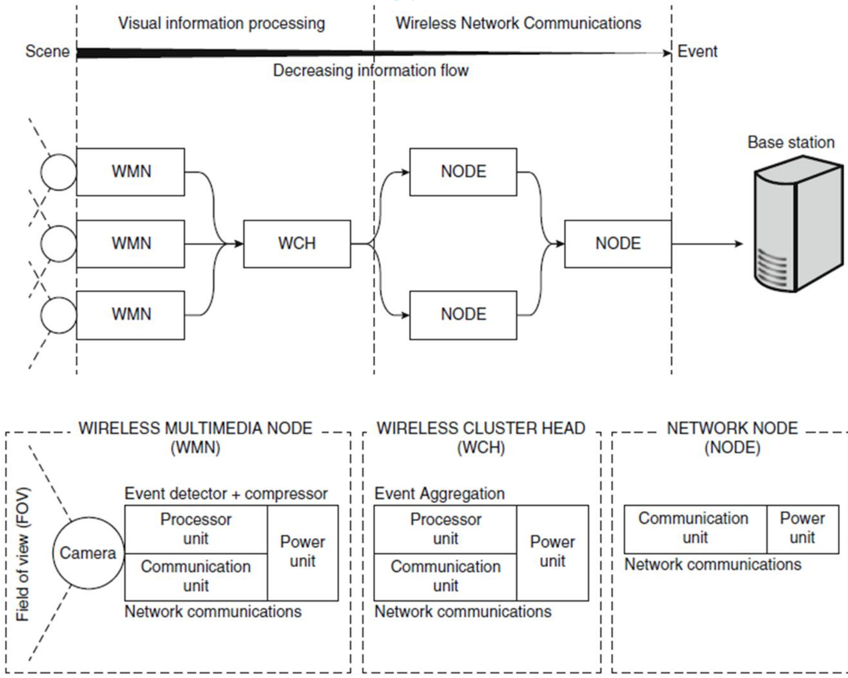

Figure 1.1: The layout of a typical WMSN

Wireless Multimedia Sensor Networks (WMSN), with the large volume of the multimedia data generated by the sensor nodes, both processing and transmission of data leads to higher levels of energy consumption than in any other types of wireless sensor[3] networks (WSN. In addition, the algorithm encodes the information separately which is divided accord to the frequency after wavelet transform, in order to relieve the load of the cluster head and prolong the network life time. A sensor network with both standard data sensors and video sensors, as illustrated in Fig. 1.2, is suitable for a variety of sensing applications, including surveillance [10]–[14]. The data sensors sense motion, sound, heat, or light to initially identify and locate the target. The video sensors may be triggered by the data sensors to provide video of the target, or may operate independently, to sense and transmit video of the environment. Our focus in this survey is on the mechanisms for encoding the video at the video sensors and the real-time transport of the encoded video from the sensors to the base station (sink).

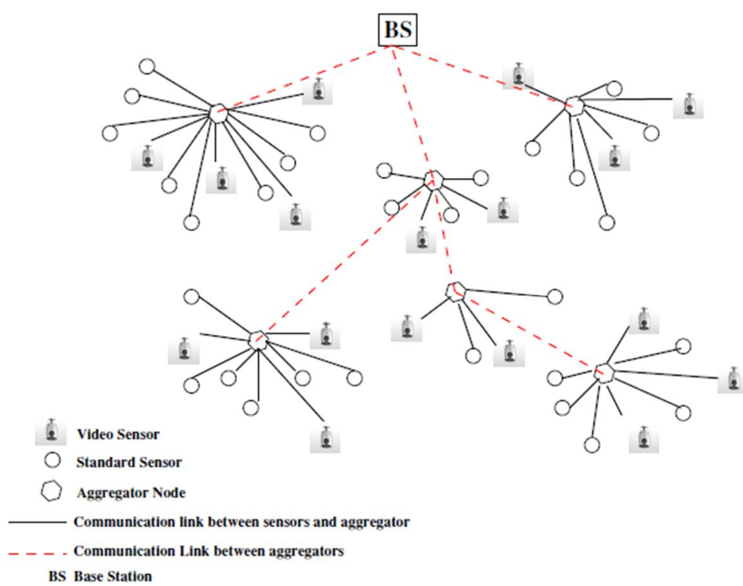

Figure.1.2: Illustration of hierarchical wireless video sensor network structure

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C. Wireless Network Node

The WNN performs the same role as for a traditional wireless sensor network and consists of a communication unit and power unit. The communication unit relays the data from node to node until it arrives at the base station.

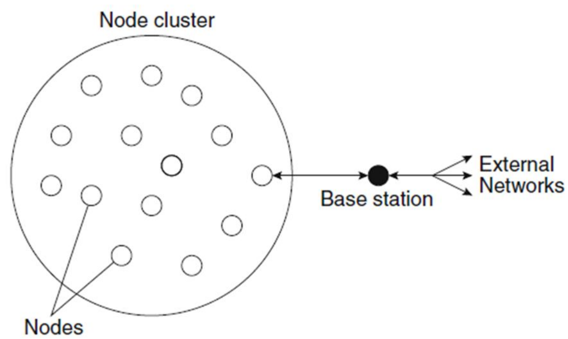

Figure 1.3: General Structure of a WMSN

1) ***Structure of a WMSN Network:*** Figure 1.3 shows a general structure of a WMSN consisting of four main components: wireless multimedia node (WMN), wireless cluster head (WCH), wireless network node (WNN) and base station. The primary theme for both upper and lower network [4] levels is to achieve energy efficiency within the constraints of the battery-powered nodes.
2) ***Wireless Multimedia Node:*** The WMNs form the end points of the network. Each WMN consists of a camera or audio sensor, processing unit, communication unit and power unit. A captured scene is called an image frame. The processing unit performs the visual processing to reduce the high amount of scene data. The communication unit transmits the compressed data to other nodes. Each WMN receives its power supply from a power unit which is mostly battery-powered.

D. WMSN Node Technology

The primary challenge for the WMSN hardware architecture and its components is the need to support the higher bandwidth and processing requirements needed for audio sensors such as microphones and low-resolution and medium-resolution image sensors.

1) ***Image Sensor:*** The image sensors found on WMSNs are typically CMOS sensors. Figure 1.5 shows the structure for a (Bayer pattern) CMOS sensor. These CMOS sensors are produced in the same manner as computer-integrated circuits. BSI technology involves turning the image sensor upside down and applying colour filters and micro-lenses to the backside of the pixel so that light is collected through the backside of the sensor. It reverses the arrangement of layers so that metal and dielectric layers reside below the sensor array, providing the most direct path for light to travel into the pixel, which optimises the fill factor.

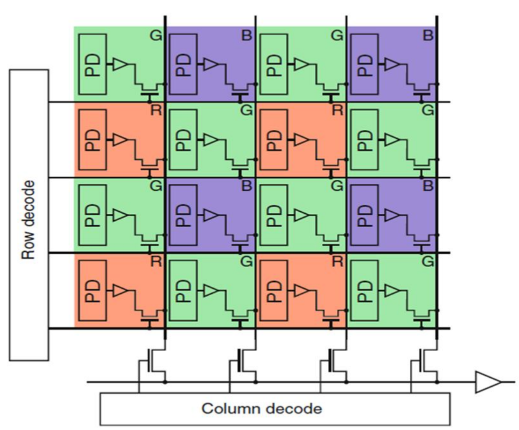

Figure 1.5: A typical CMOS sensor arrangement (Bayer pattern filter)

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Allowing delivering best-in-class low-light sensitivity, image quality and coloring reproduction. This approach differs from conventional front side illumination (FSI) architectures, where light travels to the photosensitive area through the front side of the pixel. This requires the light to first pass through transistors, dielectric layers and metal circuitry, which can block or deflect it into neighboring pixels, causing a reduced fill factor and additional problems such as cross talk between pixels.

III. LITERATURE

The large volume of the multimedia data is given by the sensor nodes, both processing and transmission of data leads to higher levels of energy consumption than in any other types of wireless sensor networks (WSN). This requires the designing of energy aware multimedia processing algorithms and energy efficient communication [1, 2] in order to maximize network lifetime while meeting the QoS constraints. A few protocols have been proposed to achieve image transmission over WSN [1]–[12].

It is given by **I. F. Akyildiz, T. Melodia, and K. R. Chowdhury**, in [2] to design most reliable, synchronous transport protocol (RSTP), with connection termination analogous to TCP, but does not consider the resource limitations of WSN. In this paper, it is also given an energy-efficient and reliable transport protocol (ERTP) with hop-by-hop reliability control, which adjusts the maximum number of retransmission of a packet.

J. H. Lee and I. B. Jung in [3] design another reliable asynchronous image transfer (RAIT) protocol. It applies a double sliding window method, whereby network layer packets are checked and stored in a queue, to prevent packet loss. Still in this protocol erroneous packets at the application layer can still be forwarded to the base station, requiring retransmission and associated energy cost

Zhiqi Wang and Fengqi Yu in [4] provide a flexible and reliable traffic control protocol. According to the packet priorities, sensor nodes in one collision area can adjust their sending states adaptively. Variable retransmission tactics are provided for the packets with different priorities. This paper focuses on the video monitoring. First of all, the real time is an obvious requirement for the network. In this paper, they propose a flexible and reliable traffic control protocol (FRTC) for wireless multimedia sensor networks.

IV. PROPOSED WORK

A. Problem Formulation

Wireless sensor networks are used to increase the data transmission speed. The main obstacle to communicating images over wireless sensor networks has been the lack of suitable processing architecture and communication strategies to deal with the large volume of data. High packet error rates and the need for retransmission make it inefficient in terms of energy and bandwidth. This paper gives information about architecture and protocol for energy efficient image processing and communication over wireless sensor networks. In Wireless Multimedia Sensor Networks (WMSN), with the large volume of the multimedia data created by the sensor nodes has to be processed and transmitted over wireless network leads to higher levels of energy consumption than in any other types of wireless sensor networks (WSN). This requires the development of energy aware multimedia processing algorithms and energy efficient communication in order to maximize network lifetime while meeting the required constraints.

B. Image transmission Protocol

The image is converted into packets and each packet has unique id and number. This protocol allows only one node to transmit packets to the base station. In Figure 1.8, when the base station starts an image transmission, first it broadcasts START-OF TRANSMISSION message to all nodes in the network. This design uses queue control strategy significantly reduces Packet-Error-Rate (PER) and increases data throughput for multi-hop communications. Clearly, small sized packets exhibit better performance (throughput) than large sized packets.

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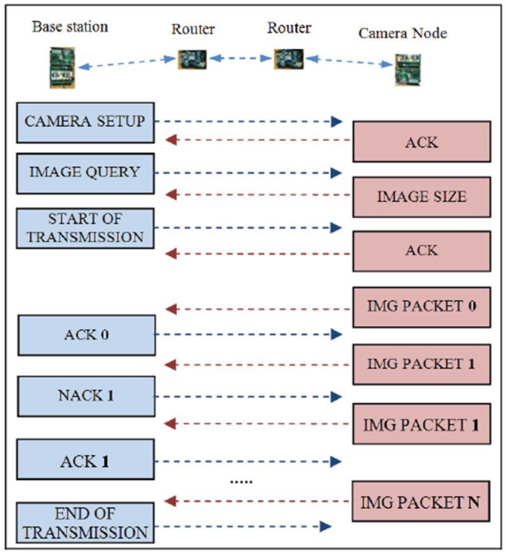

Figure 1.8: Efficient image transmission protocol for WMSN

C. Coding

```
module tb_WMSN;
	// Inputs
	reg [7:0] data_in;
	reg [7:0] threshold;
	reg clk;
	reg rst;
	reg clock;
	reg write;
	reg [4:0] ROW;
	reg [4:0] COLOUMN;
	reg process;
	reg oe;

	// Outputs
	wire tx;
	wire next;
	wire tx_done;
	// Instantiate the Unit Under Test (UUT)
	WMSN uut (
			.data_in(data_in),
			.threshold(threshold),
			.clk(clk),
			.rst(rst),
			.clock(clock),
			.write(write),
			.ROW(ROW),
			.COLOUMN(COLOUMN),
			.process(process),
			.oe(oe),
```

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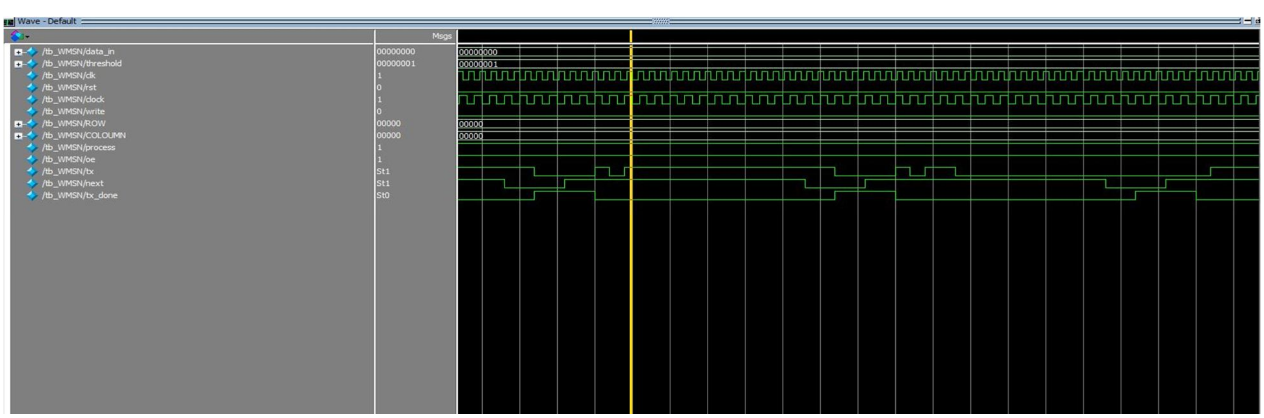
```
                .tx(tx),
                .next(next),
                .tx_done(tx_done)
      );
initial
 begin
 #40 $readmemb("Binaryimage_64.txt", uut.Image_processing_block.IMG_in_Mem.mem);
 end
      initial begin
                // Initialize Inputs
                data_in = 0;
                threshold = 1;
                clk = 0;
                rst = 0;
                clock = 0;
                write = 0;
                ROW = 0;
                COLOUMN = 0;
                process = 0;
                oe = 0;
  #10 rst = 1;
  #30 rst = 0;
  #50 process = 1;
  #20 oe = 1;

      // Wait 100 ns for global reset to finish
                #100
                // Add stimulus here
      end
always #15 clk = ~clk;
always #20 clock = ~clock;
endmodule
```

D. Simulation Results

The inputs for existing circuit are threshold, clock, process, row column, reset and oe and they are in vector array forms are defined in register using (REG) commands.



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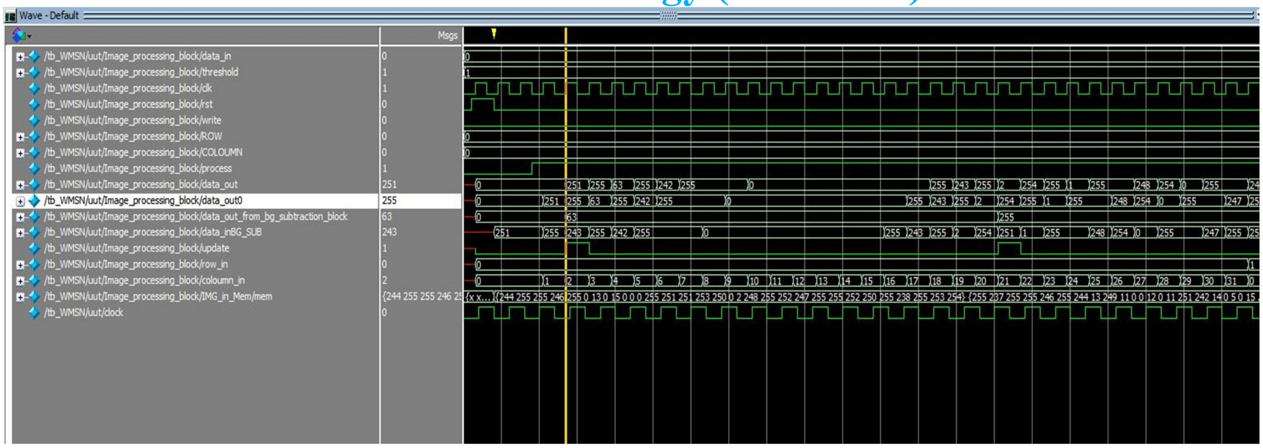

Figure 1.9: Output waveform

The initial values of these inputs are given and coding for this existing circuit is done in verilog tool.

Simulation Results

For network processor, the maximum no. of retransmission packets has been adjusted. For this FIFO is used to store packets for transmission as well as for receiver. For correct results, CRC checker is implemented. And image extraction is same as for base paper.

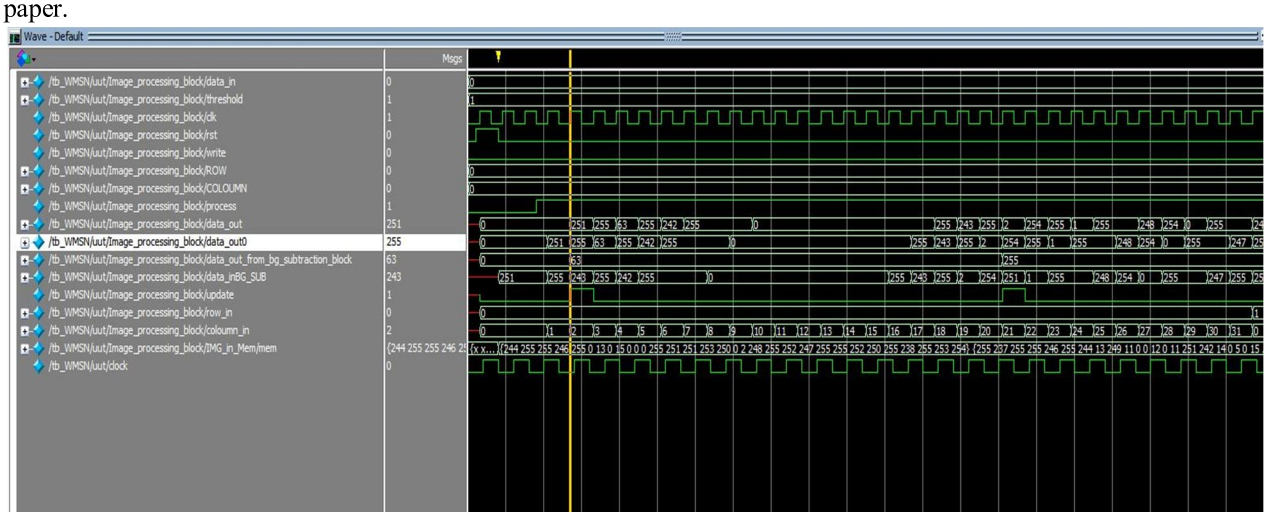

Figure 1.10: Output waveform for proposed work

V. CONCLUSION

The coding of existing and proposed work has been done in the Xilinx tool. The inputs are threshold, clock, process, row column, reset and they are in vector array forms are defined in register using (REG) commands. The initial values of these inputs are defined. The various commands like wait, always with given time are used to execute the coding. The outputs are defined by wire keywords. The simulated waveform for base paper is shown in Figure. 1.9. The threshold level of pixels is defined by CPU, and this threshold value of current pixel is obtained and compared by this set value. The change is detected during object extraction in pixels of image and rest remains same. The proposed work shows that in network processor, number of maximum packets is considered. To improve number of packets, FIFO algorithm is used for transmission and reception. CRC checker is used for verification of results.

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