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A Wireless Approach towards Medical Surveillance System

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Abstract: Here this system comes with new point of view towards surveillance system, which is multifunctional wireless medical surveillance system using very useful device FPGA. This system mainly based on radio frequency, GSM, wireless communication protocol and FPGA. This system accepts real time parameters like temperature, Pressure, heart beat pulses. It can be transmitted through base station to community hospital or expert system. Doctor can also touch up with help of web or PDA. At every moment it is not possible for patient to go to the hospital and take a service. Here we are introducing a system that helps in taking care of patient by them as well as doctor. Here not only patient can measure parameters related to body but also they can see it with help of internet. At the same interval hospital and doctor can also touch up with patients' health updates and they can give related instruction after they come to dignose. The system which we have made helps patients to take care of them. Here in this project we are using sensor that is heart beat sensor to sense heart beat pulses. Output of the sensor is given to ADC from where we get digital output for our FPGA. Here FPGA is heart of this system which takes data, analyze it, process it, calculate result and also display the same. It can take corrective action in case of output when it is above and below threshold. FPGA output is connected to wireless transmitter which is RF module transmitter with encoder. In our receiver section we have used wireless receiver whose output is connected to ARM and from there it is given to GSM modem from where message is send to doctor. When doctor is out door then with the help of GSM modem he or she can get message on the mobile. In our model we have used one heart beat sensor whose output is given to transmitter section and at the other end at the receiver we get messages on the mobile related to our heart bit sensor's output.

Keywords: GSM, Wireless, RF, FPGA.

I. INTRODUCTION

Following Figure 1 shows the block diagram of FPGA based multifunction wireless medical surveillance system. Different types of sensors can be connected to human body which senses the human body and produces the analog output. This analog output is connected ADC. Heart beat sensor in the system is connected to one of the input of ADC to perform the analog to digital conversion and then digital data is given to the FPGA.

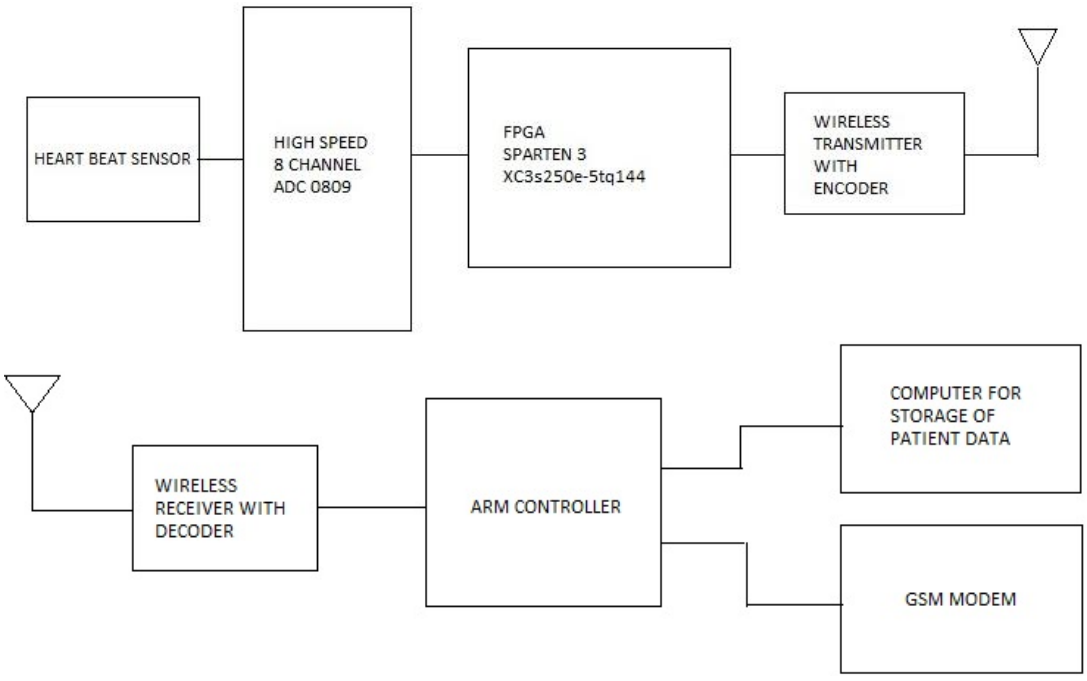

Figure 1 Block diagram of surveillance system transmiter and receiver

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The principle on which the heart beat sensor operates is that it produces digital output of heart beat when finger is placed on it. This digital output of the sensor connected to FPGA which measures the Beats per Minute rate. ADC 0808 converts the analog input of sensor into digital form. This 8 bit output of ADC given to the FPGA for further processing. FPGA collects all the data at high rate, performs high speed operations and verifies the digital data and stores the same. It compares data with the threshold values with help of artificial intelligence. RF transmitter with encoder transmits the encoded data wirelessly to RF receiver with decoder with the help of FPGA. After decoding, receiver send received information to arm processor. Processor collects all the data from receiver, recognizes it and sends it to computer. GSM module is used to send updates of patient as well as emergency message to the doctor. This message is sent on the doctor's mobile so that quick service is given to the patient. Staff of hospital can see data on server and they can give updates to doctor in case of any emergency. You can see different symbols on the Hyper Terminal of the server.

II. DETAILS OF TRANSMITTER AND RECEIVER

Fig 2 shows detail view of transmitter section. Data of sensor which is analog signal given to ADC for digital conversion. One data is incoming data. Two data's are predefined for aged person and child. For this we have used MUX. Artificial intelligence collects it, recognizes and gives accurate results. This output of data sent to encoded transmitter.

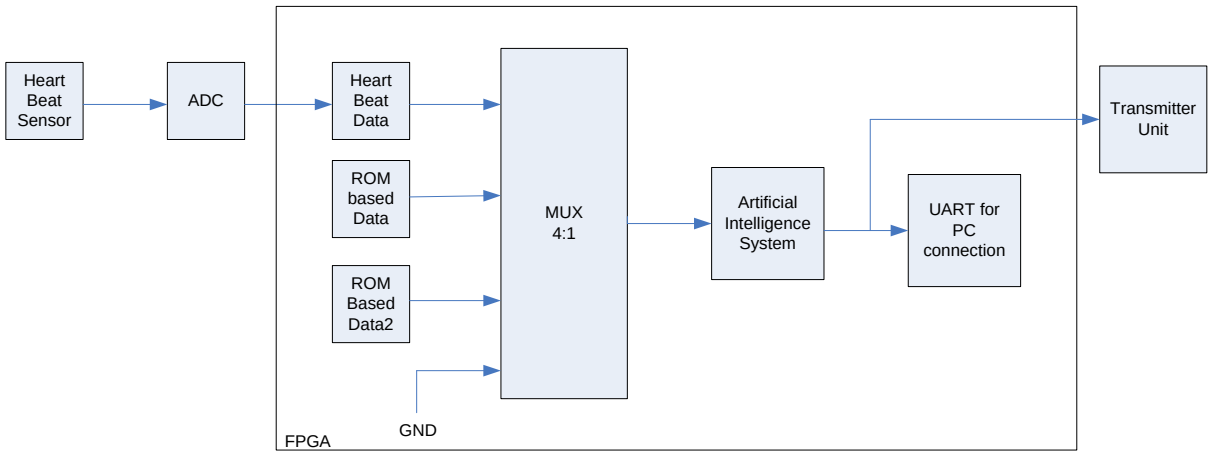

Fig 2.1 Transmitter of surveillance system

Fig 2.1 shows receiver which get encoded data and decodes it. This is given to ARM processor it compares data and sends to GSM unit, from where message is send to particular mobile number which is already feed in programming.

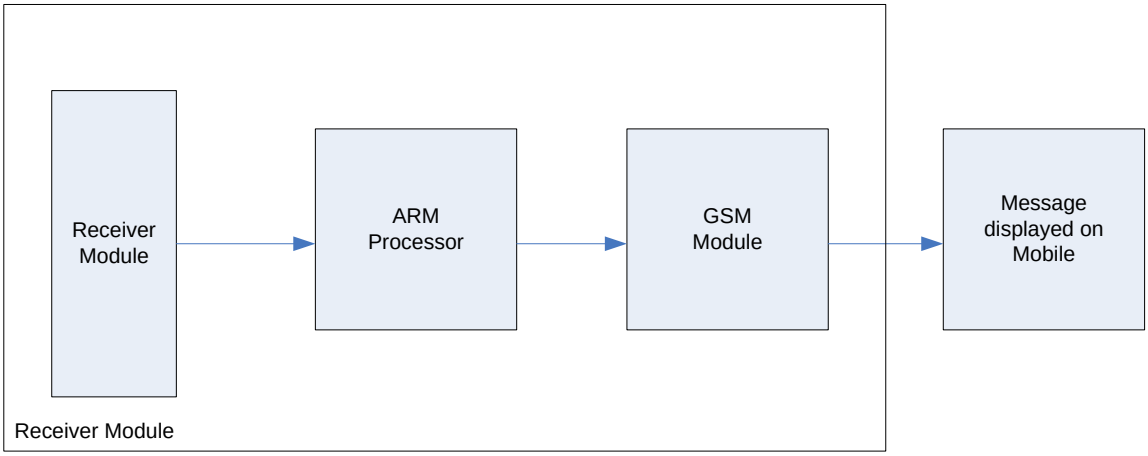

Fig 2.2 Receiver of surveillance system

III. RESULTS

1 DISCUSSION ABOUT SIMULATION

Simulation waveform for ADC and UART are shown in Figure 5.1 and 5.2 respectively. The simulation results are obtained using ModelSim.

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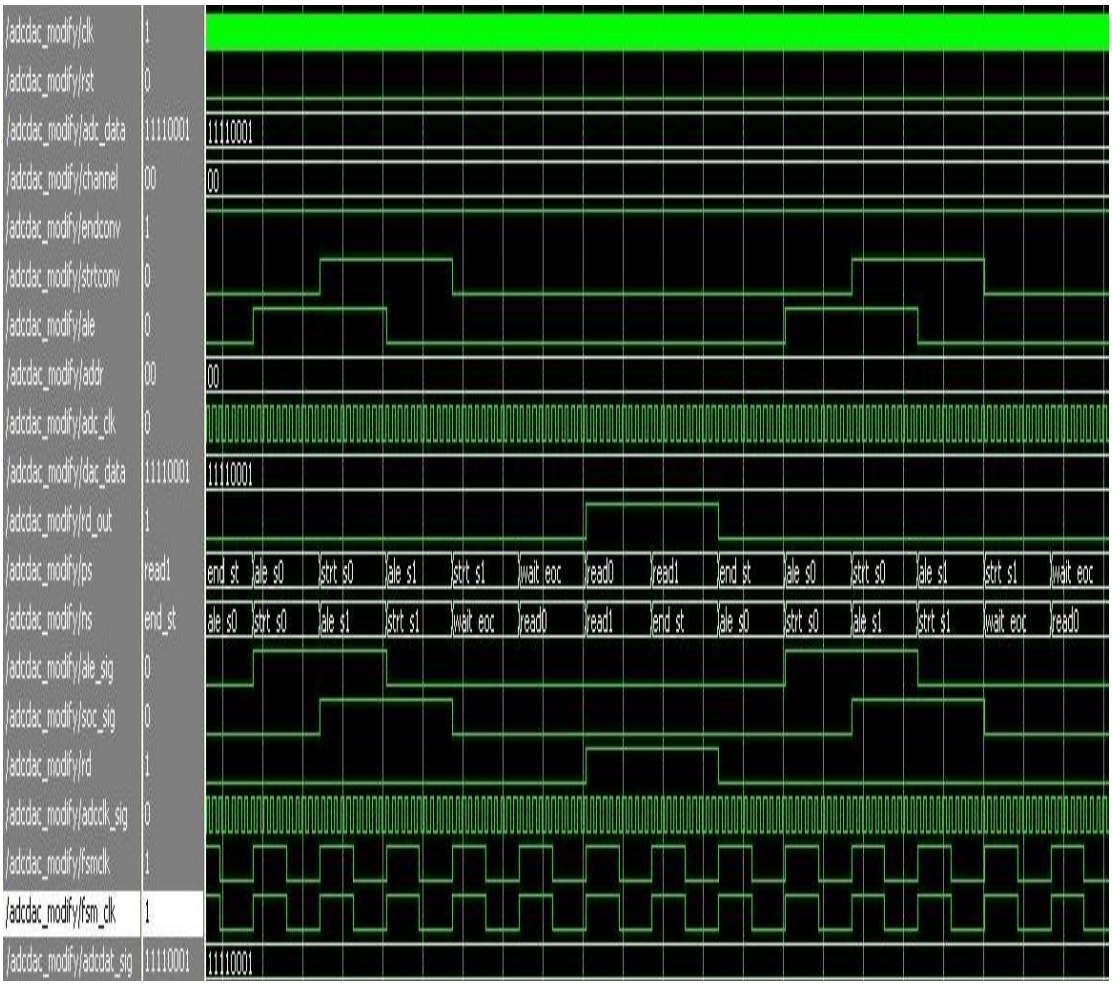

Figure 3.1 Simulation waveform for ADC

As shown in Fig 5.1 this ADC simulation process we will force input clock signal with period=100 and duty=50. Input signal 'reset' is initially made high so that all the internal registers are loaded with initial data. Input signal 'addr' is set equals to value 00, with this selected address value the ADC will take the data from heart beat sensor. After some clock cycles 'reset' signal is set to value zero. Once 'reset' is made zero, the ADC process will start.

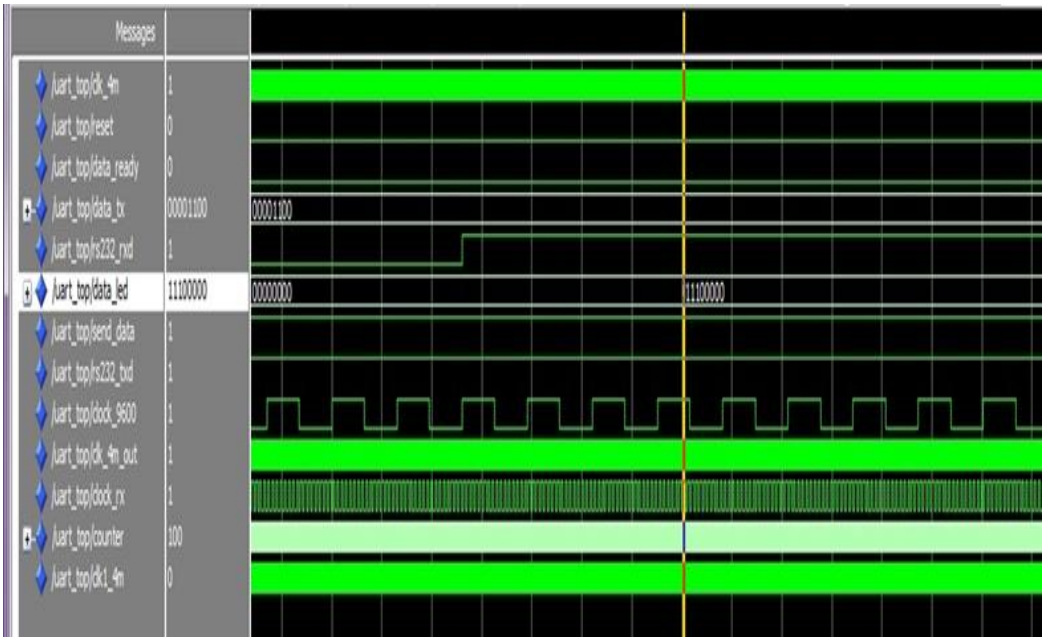

Figure 3.2 Simulation waveform for UART module

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As shown in Figure 5.2 this UART simulation process we will force input clock signal with period=100 and duty=50. Initially, input signal 'reset' is made high so that all the internal registers are loaded with initial data. Data to be transmitted is given to the 'data in' signal. Signal 'RS232_RXD' is initially made high. After some clock cycle 'reset' is made low, this will generate 'baud clock' which is given to the enable module. The diagram above shows the simulation results. Here we are getting results as per our requirement. Figure 5.3 shows the actual hardware implementation on Spartan 3E, TQ144 FPGA board.

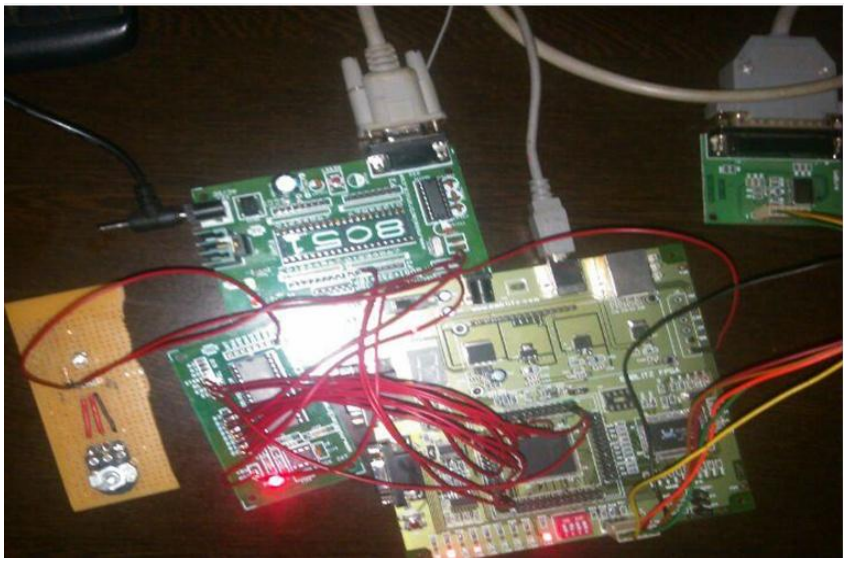

Figure 3.3: Hardware implementation on FPGA

2 RESULTS ON HYPERTERMINAL

Server is the place where we can see data sent by transmitter. The patient's data can be seen on hyper terminal which is shown in the Figure 5.4 where data symbol changes according to person changes. It gives different symbols for normal person, for aged person and for children. The data changes as we change switches combination on FPGA. Transmitter side change occurs at the receiver with the help of RF modules with encoder and decoder. This operation is done wirelessly. The figure 5.4 shows data for normal person on hyper terminal where output symbols can be seen.

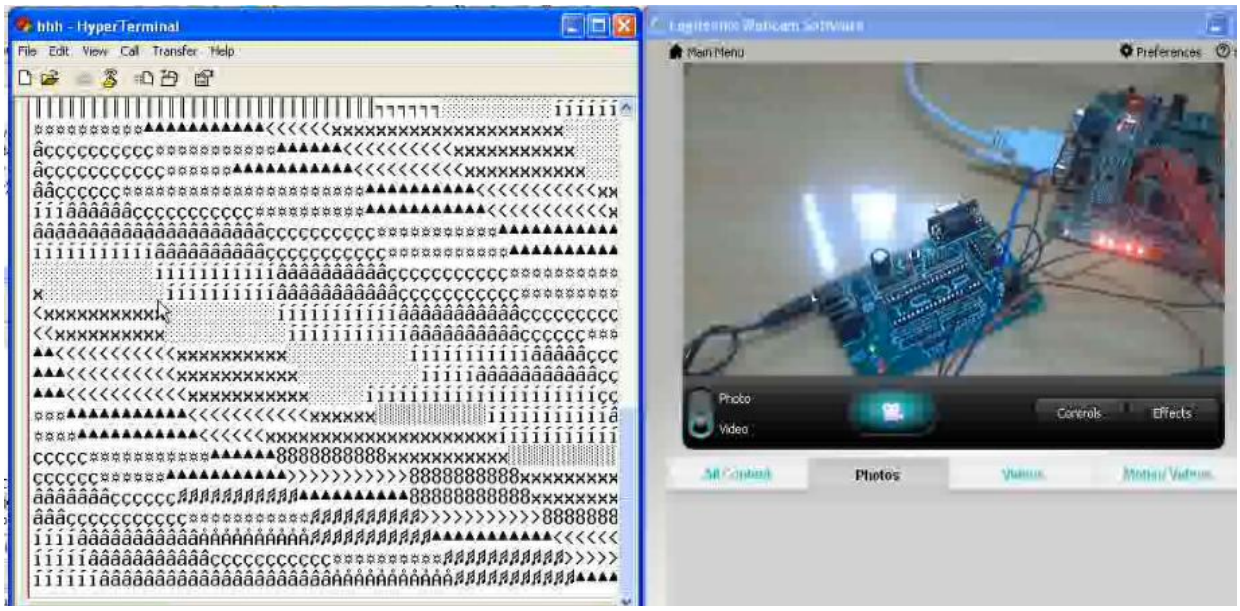

Figure 3.4 Patient data displayed for normal person on Hyper Terminal

Doctor can see data of patient on his mobile when he is out of hospital through the message. The snap shot below shows message of data on mobile. The first message shows that the heart beat monitoring system is started its operation. Second message shows that the heart beat of aged person which are above threshold.

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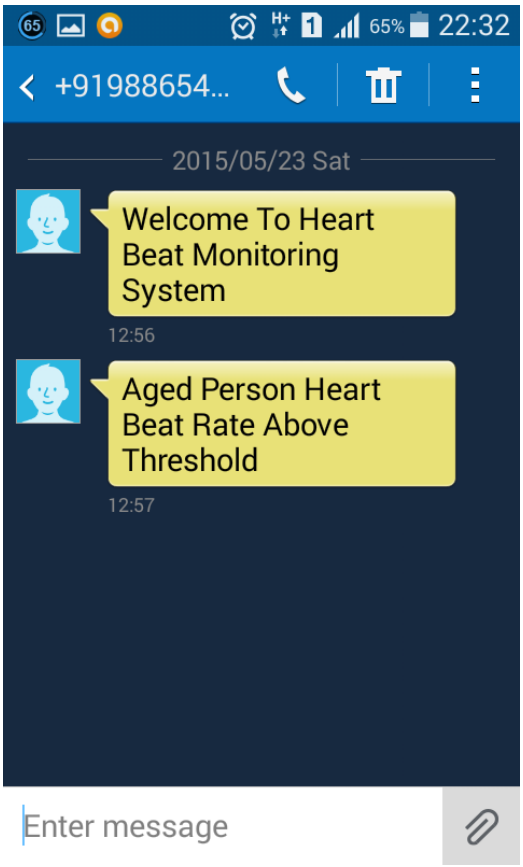

Figure 3.5 Message displayed on mobile

IV. CONCULSION

1. CONCLUSION

This project introduced a new scheme which is very useful to take care of patient by themselves as well as by doctor. This wireless medical surveillance system gives accurate readings to server as well as to doctors on their mobile. Experimental results show that the system gives excellent performance and lot of benefits. This is just start of improvement in the current medical conditions. The patients who are aged person and live alone for them system is very much beneficial. This scheme is a very good solution for taking care of the old people and ideal for wireless transmission.

2. FUTURE SCOPE

In future for day to day life everyone can use the system to take care of them. They can measure live data, send it to their doctor and they can receive instant reply about "what they have to do next". Life of people will be saved by giving primary help to them through message. Since FPGA is used we can connect more sensors without changing hardware. System will be used for industrial purpose in plants to control operation by using temperature sensor, Pressure sensor etc. This system will change the view of medical as well as industrial field. Implementation on FPGA will give us benefits of small chip with lot of advantages in coming years. We will improve same system for big hospitals using biomedical sensors with high accuracy and using high end ADC.

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