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"Wireless sensor network for habitant monitoring and early forest fire detection"

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ABSTRACT

As humans advanced in technology and innovation, manmade and natural disasters are increasing exponentially. One of the most happening is the forest fire. Forest fire destroys trees which give us oxygen and balances the eco-system we know it is very difficult to stop a forest fire spreading if it is not detected early. Our method is to detect the forest fire as early as possible and, send the required alert to the necessary people so that prompt action can be taken before the fire destroys and spreads over a large area. The other problems are deforestation where humans cut the trees from restricted areas and so the wild animals from the forest enter the human habitation and cause problems. In this paper we discuss the solutions to overcome these problems.

Keywords: Fire Detection, Intruder Detection, temperature sensor, smoke senor, humidity sensor

I. INTRODUCTION

Several million acres of forest are destroyed every year due to forest fire. Forest fire not only destroys many valuable trees but also destroys the vegetation in that area and extinct of wild species. The fire will burn the trees and, destroys the fertility of the soil, and so many acres of land become water repellant. Forest fire is one of the major causes of global warming as tones of greenhouse gases are emitted into the atmosphere and depletion of the ozone layer. Nowadays the detection mechanisms used are watching towers, satellite imaging, long distance video recording, etc. But these do not provide quicker response which is most important in forest fire detection. Video surveillance is a low-cost system but it produces false alarm due to environmental condition like fog, clouds, dust and human activities. Another method uses visual camera to take snapshot of the forest. This camera is placed on towers so that a maximum area of the forest is covered. A motor is used to rotate the camera 360˚ so that we get a full view of the forest. The images obtained using these cameras are processed using a program or a MATLAB code. These images are used to find forest fire by comparing it with the normal images. The advantage of this method is that the system can be programmed to take into considerations of the environmental conditions and the effect of fog or clouds can be eliminated. The serious

disadvantage is that it may sometime do not predict the fire considering the signals are due to environmental conditions. We also need to build towers to place the camera at a higher position and this may increase the cost of the system. A good and effective method is the use of wireless sensor networks.

In this method the sensor module is deployed in the forest manually or through ahelicopter. The sensor module consists of multiple sensors like temperature sensor, humidity sensors, smoke sensors, etc. They collect the forest area environment information and continuously transfer it to the control center where the necessary process is carried out. Sensor nodes are less costly and even if it gets damaged in fire itwon't be a great loss. In this method we use Zigbee technology. The exact location of the fire can beobtained, and the nearest fire service can be informed. To detect the entry of humans into the restricted areas of the forest and the entry of wild animals into the villages we use IR or laser transmitter and receiver and solve the human animal conflict in the forest areas during normal time and forest fire detection.

II. RELATED WORK

2.1 Vipin V [1] in his paper says that "In this research work a rule based color model for forest fire pixel classification is proposed. The proposed color model makes use of RGB color space and YCbCr color space. From this a set of seven rules were defined for the pixels to be classified as fire pixel. The performance of the proposed algorithm is tested on two sets of images; one containing fire and the other with no- fire images. The proposed model achieves 99% flame detection rate and 14% false alarm rate. The arithmetic operations of this model are linear with the image size. Also, the algorithm is cheap in computational complexity. This makes it suitable to use in real time forest fire monitoring system."

2.2 U Arun Ganesh[2] in his paper states the following "An advanced system for Forest Fire Detection was developed which overcomes the demerits of the Existing technologies of Forest Fire Detection. It can be ensured that the system developed can be implemented on a large scale due to its promising results. Mechanical modeling for accessible and inaccessible areas helps in the easy implementation of the Forest Area modules. The system can also be upgraded with low-power elements, higher versions of Zigbee and a novel, high-efficiency MPPT Algorithm in order to make the system run for longer periods with increased efficiency."

III. PROPOSED WORK

3.1 Working model

The setup for the computer vision includes a PIC Micro controller in all the nodes, an LCD display to see the output and sensors to sense the fire.

PIC Micro controller is been dumped with the code of ADC converter and then allowed to connect to the output for the results.

As the vary in temperature or smoke level, there will be change in the value of voltage, which leads to the output.

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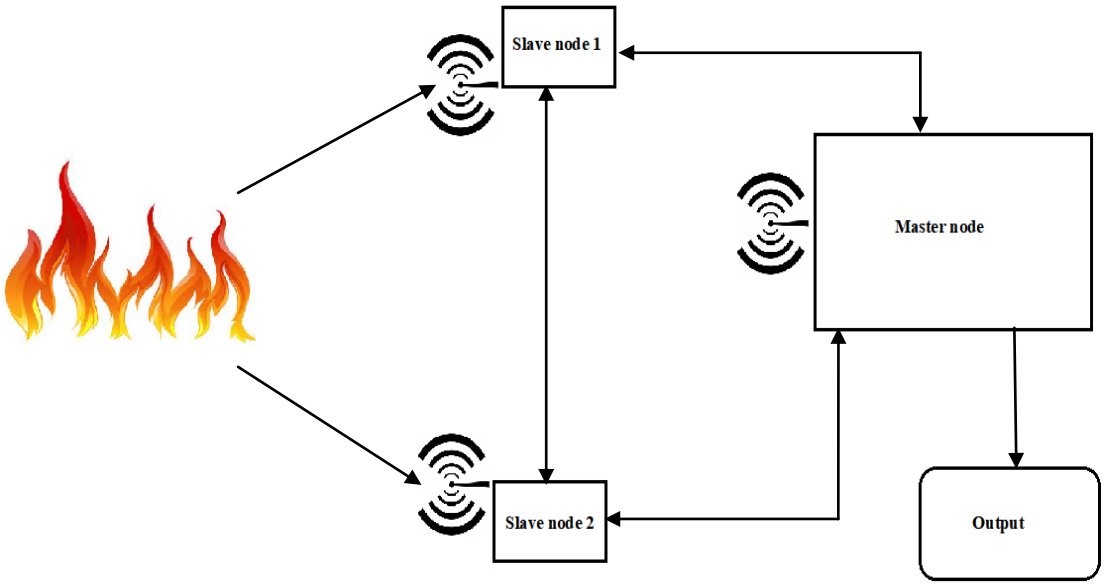

Fig 1. Overview of operation

3.2 THE HARDWARE SETUP

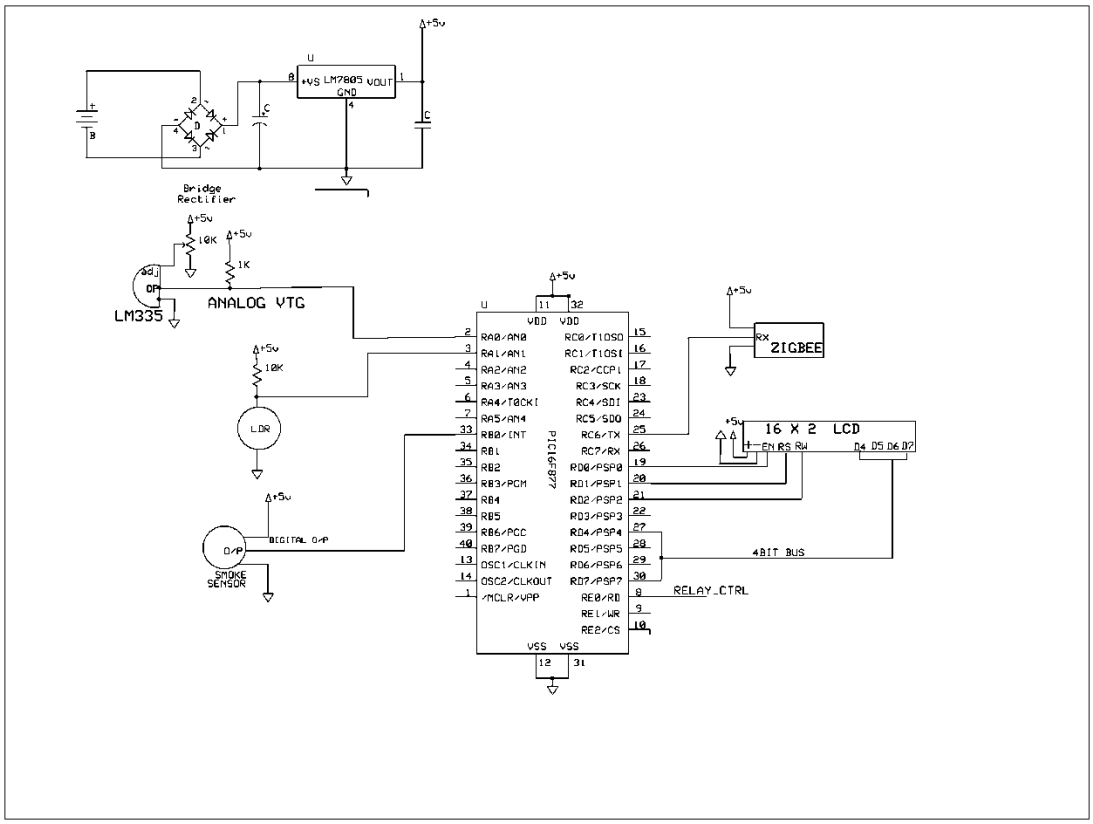

Fig 2. Hardware setup of slave node

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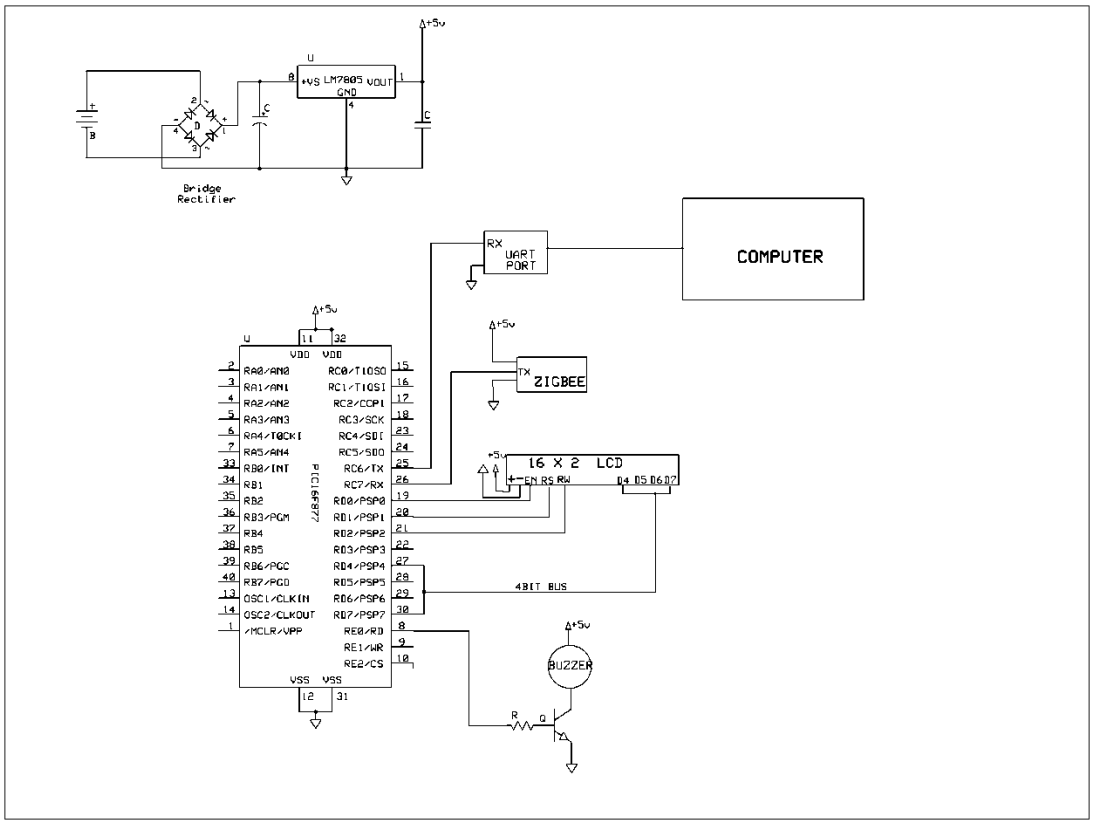

Fig 3. Hardware setup of master node

IV. HARDWARE AND SOFTWARE REQUIREMENTS

Table:4.1

HARDWARE REQUIREMENT	SOFTWARE REQUIREMENT
1. PIC 16f877a. 2. Lm335 temp sensor. 3. Smoke sensor MQ2. 4. ZigBee cc2500. 5. 16x 2 LCD. 6. LDR sensor. 7. Laser light. 8. Buzzer.	1. MPLAB IDE 2. CCS Compiler 3. PIC BOOTPLUS 4. Embedded C

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V. CONCLUSION

Through this paper we aim to achieve all of our specified goals in implementing it. The gordian knot that we wish to accomplish is multi fold. On one hand we have devised a method to ensure the safety of wildlife, especially from the clutches of human intervention, and at the same time addressing the issue of hazardous forest fires. Both these goals are interrelated and finally help in the development of the environment as a whole. The details expressed in this paper can be implemented in real life scenarios which not only address everyday problem but are guaranteed to overcome them too. A handful of roadblocks may be faced with respect to the utilization of GSM technology for communication as well as minor issues with respect to the sensor modules present in natures. To tackle the issues related to GSM we are going to implement the project using Zigbee technology. Hence, these issues can be overcome with ease and without compromising the integrity of our end agenda.

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