

Real Time Forest Anti-Smuggling Monitoring System based on IOT using GSM

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ABSTRACT

From many years we are getting news about smuggling of the trees such as sandal, Sagwan etc. These trees are very expensive and less obtainable in the market. To avoid such type of smuggling and to save and monitor the forests [1] around the globe some preventive systems need to be developed. We are forming a system which can be used to restrict this smuggling. The suggested system will consist of two modules which are described below, 1) Tree Unit 2) Main Server Unit (base station). Every tree will be having one small electronics division which will consist of Renesas controller, Sensors and Solar power. The data of different tree units is collected by these units. Each tree unit will give the information to base station using GSM module. At main server GUI using one authorized person who received the message and he/she will be taking action to provide security.

Key Words: GSM, Forest monitoring, Renesas, Illegal logging.

1. INTRODUCTION

We have designed a system which can be used to avoid the smuggling of the trees which would in turn stop the deforestation and uphold the Environmental stability, which would help to solve one of the issues with the Global Warming. Each tree is having with one electronic division, which consists of Raspberry pi, Micro Controller, Flex Sensor, accelerometer sensor, Fire sensor, and GSM/GPRS module. Forest trees cutting will be detected by accelerometer sensor [2]. Communication between the trees and server will be done by GSM/GPRS modules. The system consisting of TWO stages:

A. Tree unit B. Main server unit

The tree unit consists of three sensors: 1. Accelerometer Sensor 2. Flex Sensor 3. LM35 Sensor

Main server would consist of - 1. Storage Device 2. GSM/GPRS Modem

3. METHODOLOGY

The system consisting of two units: A. Tree unit B. Main server unit

3.1. TREE UNIT:

The Tree unit would be the primary unit for the implementation of the system. This unit would consist of three sensors to give the information of getting Cut Down the trees, Damage with fire, etc. The tree unit would be the primary unit for the implementation of the system.

The tree unit consists of three sensors: 1. Accelerometer Sensor. 2. Flex Sensor. 3. LM35 Sensor

3.2. MAIN SERVER UNIT:

This unit is responsible for sending the data that was transmitted from the Stage 1. The server will be having GSM module which sends the collected data via SMS to registered phone number and Email. The information consists of the location of smuggling, the ID of tree and surrounding temperature. After getting SMS on registered mobile phone which contains information regarding Area name, Tree Name, Longitude and Latitude of the tree location [5], from these information, the location of tree cut can be tracked and smuggling is restricted.





Figure 4.1: System Architecture

R5F100LEA microcontroller from Renesas RL78 series which is a 16-bit microcontroller is used to implement this project Shown in Fig (4.1). Microcontroller acts as the heart of this project, which controls the whole system. It contains of Flash ROM 64KB, RAM 4KB and Data Flash 4KB, and it has High speed on-chip oscillator, Self-reprogrammable under software control, 58 GPIO's, 3 UART's, Simplified I2C, 10 bit resolution ADC, 28 Interrupt Sources, ISP programming support etc.

Renesas microcontroller controls all the operations of the system & LCD display's operations inside the microcontroller and consists of three sensors to give the information about getting Cut Down the trees, Natural Disaster with fire etc [4]. The tree unit would be the primary unit for the implementation of the system. The tree unit consists of three sensors: 1. Accelerometer Sensor, 2. Flex Sensor, 3. LM35 Sensor

These sensors would be responsible to send the data to the controller on the tree unit which would be then transmitted to the next stage i.e. Server Unit which has GSM/GPRS module, for further processing to Base station. This is the second and last stage of the system which would be responsible for gathering the data. The tree unit 1 is responsible to host the information from multiple Tree Units. Tree cutting will be detected by accelerometer sensor and temperature sensor is used to send the surrounding of the temperature to controller unit. The server will be having GSM module. All the information is sent through SMS via GSM to registered phone number and Email. After getting SMS on registered mobile phone and email which contains information regarding Area name, Tree Name, Longitude and Latitude of the tree location[5], from these information, the location of tree cut can be tracked and smuggling is restricted.

4.1. Renesas Microcontroller



Figure 4.1.1: Renesas Microcontroller

Renesas microcontroller surpasses its predecessor i.e. 8051 family of microcontrollers, with various in-built features. The RL78 Family 16-bit microcontrollers are the convergence of the high CPU performance of the 78K0R and the superb on-chip functions of the R8C and the 78K, and offer a comprehensive lineup of 10-128 pin and 1-512 KB products for the 8/16-bit market. Realizing industry-leading low power consumption at 46 μ A/MHz consumption during normal operation and 0.57 μ A /MHz during clock operation, you can expect greatly improved power efficiency using RL78 microcontrollers. Built-in features such as a high-precision (±1%) high-speed on-chip oscillator, background operation data flash capable of 1 million rewrites, temperature sensor, and interface ports for multiple power supplies help reduce system costs and size. It has on-chip power-on-reset (POR) circuit and voltage detector (LVD) and also watchdog timer (operable with the dedicated low-speed on-chip oscillator). A few of the many features consists of -Minimum instruction time can be changed from ultra-low speed (30.5us) to high speed



(0.03125us). It has 16 to 512KB of ROM and 2 to 32KB of RAM depending upon the series and number of pins. Cost of Renesas microcontroller is comparatively less. It operates with 5v power supply

4.2. Output and Future work

When system starts, it initializes the GSM and SMS will be sent regarding Tree cut down by illegal logging.[3] or other activity detected by the system shown in Figure (4.2).



Figure 4.2.1 Main server output

In future the system can be implemented using Wireless Fidelity support which will be extended scalability upto 5 km radius in the Forest Area. This Work can also be extended by new research area as video processing with the help of Infrared Cameras and Arial Surveillance using UAV.

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