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Improve the Detection of Wireless Sensor Networks in an IoT Based Forest Monitoring System

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***Abstract*- Wireless sensor networks (WSNs) are used for various applications such as habitat monitoring, automation, agriculture, and security. Since numerous sensors are usually deployed on remote and inaccessible places, the deployment and maintenance should be easy and scalable. Wireless sensor network consists of large number of small nodes. The nodes then sense environmental changes and report them to other nodes over flexible network architecture. Sensor nodes are great for deployment in hostile environments or over large geographical areas. This article presents the design of a system for detection of temperature and humidity and smoke for the prevention of forest fires using wireless sensor networks to prevent a disaster (forest fire) that could lead to loss of a significant number of natural resources. In this project, several tests had been conducted in order to prove the viability of the system. Test results indicated that the reliability of the system in propagating information directly to the base station could be gained excellently in various conditions.**

Index terms **– Wireless Sensor Networks, IoT, Raspberry Pi, Gas Sensors, Humidity Sensor**.

I INTRODUCTION

WSNs consist of distributed sensors used to remotely collect physical or environmental information. Four key characteristics of sensor networks are to continuously monitor forest surroundings, trigger any alerts based on circumstances occurring, and provision of information "on demand". Some of the information collected by sensor is: temperature level [4,5], humidity level, fire level, gas level, the presence or absence of certain kind of objects, mechanical stress levels on attached objects, and speed/direction/size of an object. We found temperature monitoring sensor system to be very common for temperature regulations purposes or detecting fires.

The physical protection of devices in WSNs is critical because the nature of the system is a machine-to-machine sensor communication. Meaning, sensor devices do not require user interaction and go unattended for months or even years. If the sensor device is not tamper resistant then the overall security of the WSN is broken.

II WORKING PROCEDURE

This paper presents a system that can be used to monitor the forest environment. The temperature sensor is used to monitor the temperature level, humidity sensor is used to measure the cooling level, gas sensor is used to measure the any abnormal odor in surrounding[1-2]. If any person faces the abnormal situation, it uploads the data with GPS location to the cloud. All sensors are connected on the raspberry pi controller and the status of the sensors is uploaded to the cloud continuously. The values of sensors are displayed on LCD. GPS is used here to get locations of the abnormal such as fire occurs. The buzzer is used to make sound to alert the people.

III RASPBERRY PI

Specifications: The Raspberry Pi 3 is the third generation Raspberry Pi. It replaced the Raspberry Pi 2 Model B in February 2016. Compared to the Raspberry Pi 2 it has:
A 1.2GHz 64-bit quad-core ARMv8 CPU
802.11n Wireless LAN
Bluetooth 4.1
Bluetooth Low Energy (BLE)
Like the Pi 2, it also has:
1GB RAM
4 USB ports
40 GPIO pins
Full HDMI port
Ethernet port
Combined 3.5mm audio jack and composite video
Camera interface (CSI)
Display interface (DSI)
Micro SD card slot (now push-pull rather than push-push)
Video Core IV 3D graphics core
The Raspberry Pi 3 has an identical form factor to the previous Pi 2 (and Pi 1 Model B+) and has complete compatibility with Raspberry Pi 1 and 2.

IV Raspberry PI pin configuration:

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Several generations of Raspberry Pi have been released. The first generation (Raspberry Pi 1 Model B) was released in February 2012. It was followed by a simpler and inexpensive model Model A. In 2014, the foundation released a board with an improved design in Raspberry Pi 1 Model B+. These boards are approximately credit-card sized and represent the standard *mainline* form-factor. Improved A+ and B+ models were released a year later. A "compute module" was released in April 2014 for embedded applications, and a Raspberry Pi Zero with smaller size and reduced input/output (I/O) and general-purpose input/output (GPIO) capabilities was released in November 2015 for US$5. The Raspberry Pi 2 which added more RAM was released in February 2015. Raspberry Pi 3 Model B released in February 2016 is bundled with on-board Wifi, Bluetooth and USB Boot capabilities[4]. As of January 2017, Raspberry Pi 3 Model B is the newest mainline Raspberry Pi. Raspberry Pi boards are priced between US$5–35. As of 28 February 2017, the Raspberry PI Zero W was launched, which is identical to the Raspberry PI Zero, but has the Wi-Fi and Bluetooth functionality of the Raspberry PI 3 for US$10.

All models feature a Broadcom system on a chip (SOC), which includes an ARM compatible central processing unit (CPU) and an on-chip graphics processing unit (GPU, a Video Core IV). CPU speed ranges from 700 MHz to 1.2 GHz for the Pi 3 and on board memory range from 256 MB to 1 GB RAM. Secure Digital (SD) cards are used to store the operating system and program memory in either the SDHC or Micro SDHC sizes. Most boards have between one and four USB slots, HDMI and composite video output, and a 3.5 mm phone jack for audio. Lower level output is provided by a number of GPIO pins which support common protocol like I²C. The B-models have an 8P8C Ethernet port and the Pi 3 and Pi Zero W have on board Wi-Fi 802.11n and Bluetooth.

V PROCESSOR

The Broadcom BCM2835 SOC used in the first generation Raspberry Pi is somewhat equivalent to the chip used in first generation smartphones (its CPU is an older ARMv6 architecture),[4] which includes a 700 MHz ARM1176JZF-S processor, Video Core IV graphics processing unit (GPU),[15] and RAM. It has a level 1 (L1) cache of 16 KB and a level 2 (L2) caches of 128 KB. The level 2 cache is used primarily by the GPU. The SoC is stacked underneath the RAM chip, so only its edge is visible.The Raspberry Pi 2 uses a Broadcom BCM2836 SoC with a 900 MHz 32-bit quad-core ARM Cortex-A7 processor (as do many current smartphones), with 256 KB shared L2 cache.[6]

The Raspberry Pi 3 uses a Broadcom BCM2837 SoC with a 1.2 GHz 64-bit quad-core ARM Cortex-A53 processor, with 512 KB shared L2 cache.Most authors will be able to prepare images in one of the allowed formats listed above. This section provides optional, additional information on preparing PS, EPS, and TIFF files. No matter how you convert your images, it is a good idea to print the files to make sure nothing was lost in the process.

VI Performance

The Raspberry Pi 3, with a quad-core Cortex-A53 processor, is described as 10 times the performance of a Raspberry Pi 1.[17] This was suggested to be highly dependent upon task threading and instruction set use. Benchmarks showed the Raspberry Pi 3 to be approximately 80% faster than the Raspberry Pi 2 in parallelized tasks.[18]

While operating at 700 MHz by default, the first generation Raspberry Pi provided a real-world performance roughly equivalent to 0.041 GFLOPS.[20][21] On the CPU level the performance is similar to a 300 MHz Pentium II of 1997–99. The GPU provides 1 Gpixel/s or 1.5 Gtexel/s of graphics processing or 24 GFLOPS of general purpose computing performance. The graphical capabilities of the Raspberry Pi are roughly equivalent to the performance of the Xbox of 2001.

The LINPACK single node compute benchmark results in a mean single precision performance of 0.065 GFLOPS and a mean double precision performance of 0.041 GFLOPS for one Raspberry Pi Model-B board.[22] A cluster of 64 Raspberry Pi Model B computers, labelled "Iridis-pi", achieved a LINPACK HPL suite result of 1.14 GFLOPS (n=10240) at 216 watts for c. US$4000

BLOCK DIAGRAM FOR FOREST MONITORING SYSTEM

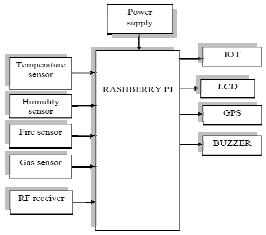

Figure 1 – Block diagram

VII EXISTING SYSTEM

The sensors with the protocol standard have a high cost and still lack popularity in forest WSN in IOT environment.

Demerits

There is Zigbee system for data transfer.It is not possible to monitor there sources high cost and more time consumption[3,5].

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VIII PROPOSED SYSTEM

The design and implementation of a WSN data acquisition interface, which can be used for forest environmental monitoring. Uploaded data to the cloud using IoT.

Advantages

Easy to monitor environment such as pollution, fire and humidity. Helpful to maintain the resources and easy to maintain data.

SENSORS

A.TEMPERATURE SENSOR

The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in ⁰ C).The LM35 - An Integrated Circuit Temperature Sensor

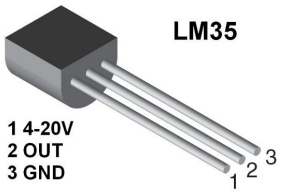

Figure 2 – Temperature Sensor

The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in °C).It can measure temperature more accurately than a using a thermistor. The sensor circuitry is sealed and not subject to oxidation. The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified. The LM35 has an output voltage that is proportional to the Celsius temperature. The scale factor is .01V/°C.There are two transistors in the centre of the drawing. One has ten times the emitter area of the other. This means it has one tenth of the current density, since the same current is going through both transistors. This causes a voltage across the resistor R1 that is proportional to the absolute temperature, and is almost linear across the range. The "almost" part is taken care of by a special circuit that straightens out the slightly curved graph of voltage versus temperature.

B. HUMIDITY SENSOR

Humidity is the amount of water vapor in the air. Water vapor is the gaseous state of water and is invisible. Humidity indicates the likelihood of precipitation, dew, orfog. Higher humidity reduces the effectiveness of sweating in cooling the body by reducing the rate of evaporation of moisture from the skin. This effect is calculated in a heat index table.

This DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component, and connects to a high-performance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost-effectiveness. Each DHT11 element is strictly calibrated in the laboratory that is extremely accurate on humidity calibration. The single-wire serial interface makes system integration quick and easy.

C. GAS SENSOR

Theory of operation

The gas diffuses into the sensor, through the back of the porous membrane to the working electrode where it is oxidized or reduced. This electrochemical reaction results in an electric current that passes through the external circuit. In addition to measuring, amplifying and performing other signal processing functions, the external circuit maintains the voltage across the sensor between the working and counter electrodes for a two electrode sensor or between the working and reference electrodes for a three electrode cell. At the counter electrode an equal and opposite reaction occurs, such that if the working electrode is an oxidation, then the counter electrode is a reduction.

D. MAX 232

The MAX232 is a dual driver/receiver that includes a capacitive voltage generator to supply RS 232 voltage levels from a single 5v supply. Each receiver converts RS-232 to 5v TTL/CMOS levels. Each driver converts TLL/CMOS input levels into EIA-232 levels. The P3_0 (RX) and P3_1 (TX) pin of controller is connected to the max 232 driver and the TX and RX pin of max 232 is connected to the GSM modem or PC.

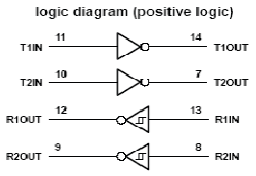

Figure 3 – MAX232 pin out

In this circuit the microcontroller transmitter pin is connected in the MAX232 T2IN pin which converts input 5v TTL/CMOS level to RS232 level. Then T2OUT pin is connected to reviver pin of 9 pin D type serial connector which is directly connected to PC.

In PC the transmitting data is given to R2IN of MAX232 through transmitting pin of 9 pin D type connector which converts the RS232 level to 5v TTL/CMOS level. The R2OUT pin is connected to receiver pin of the microcontroller. Likewise the data is transmitted and received between the microcontroller and PC or other device vice versa.

E. GPS

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The **Global Positioning System** (**GPS**) is a U.S. space-based global navigation satellite system. It provides reliable positioning, navigation, and timing services to worldwide users on a continuous basis in all weather, day and night, anywhere on or near the Earth. GPS satellites circle the earth twice a day in a very precise orbit and transmit signal information to earth. GPS receivers take this information and use triangulation to calculate the user's exact location. Essentially, the GPS receiver compares the time a signal was transmitted by a satellite with the time it was received. The time difference tells the GPS receiver how far away the satellite is. Now, with distance measurements from a few more satellites, the receiver can determine the user's position and display it on the unit's electronic map.

F. BUZZER

Buzzers like the TMB-series are magnetic audible signal devices with built-in oscillating circuits. The construction combines an oscillation circuit unit with a detection coil, a drive coil and a magnetic transducer. Transistors, resistors, diodes and other small devices act as circuit devices for driving sound generators. With the application of voltage, current flows to the drive coil on primary side and to the detection coil on the secondary side. The amplification circuit, including the transistor and the feedback circuit, causes vibration. The oscillation current excites the coil and the unit generates an AC magnetic field corresponding to an oscillation frequency.

IX RF TRANSMITTER

The TWS-434 transmitter accepts both linear and digital inputs can operate from 1.5 to 12 Volts-DC, and makes building a miniature hand-held RF transmitter very easy. The P2_0, P2_1, P2_2 and P2_3 pin of controller is assumed as data transmit pins. The DATA_OUT pin of encoder is connected to the DATA_IN pin of RF Transmitter and then the RF Transmitter transmits the data to the receiver.

Encoder

The HT-640 IC encodes 12-bits of information and serially transmits this data on receipt of a Transmit Enable and a LOW signal on pin-14 /TE. Pin-17 the D_OUT pin of the HT-640 serially transmits whatever data is available on pins 10, 11, 12 and 13, or D0, D1, D2 and D3 to D7.

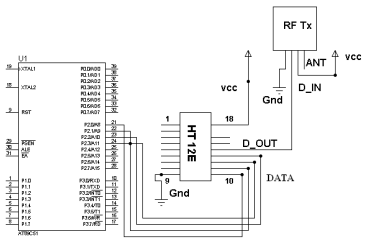

Figure 3 – RF transmitter

X RF RECEIVER

The receiver also operates at 433.92MHz, and has a sensitivity of 3uV. The TWS-434 receiver operates from 4.5 to 5.5 volts-DC, and has both linear and digital outputs. The P2_0, P2_1, P2_2 and P2_3 pin of controller is assumed as data transmit pins. The DATA_OUT pin of RF Transmitter is connected to the DATA_IN pin of DECODER and then the data is processed by the decoder.

Decoder

The 212 series of decoders are capable of decoding information's that consist of N bits of address and 12_N bits of data. Of this series, the HT12D is arranged to provide 8 address bits and 4 data bits, and HT12F is used to decode 12 bits of address information. The VT, or valid transmission pin of the HT-12D could signal the microcontroller to grab the 4-bits of data from the data output pins.

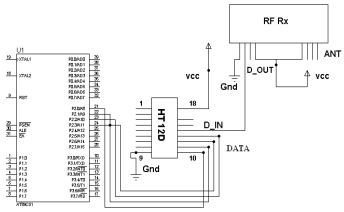

Figure 3 – RF transmitter

XI IMPLEMENTATION

Internet of Things (IOT) is an environment in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. IOT board featured with SIM900 GPRS modem to activate internet connection also equipped with a controller to process all input UART data to GPRS based online data. Data may be updated to a specific site or a social network by which the user can able to access the data.

PHYTHON

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics.

Its high-level built in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together.

CONCLUSION

It has been evaluated the detection of WSN in an IoT based forest monitoring systems by using our own implementation of a secure temperature, humidity, fire, gas monitoring and the readings are automatically uploaded on the IoT. The GPS location can be pointed if any abnormally occurs. Future directions of our work are to evaluate other common MCU such as AVR and ARM.

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REFERRENCES

[1] Roman, Rodrigo, Cristina and Lopez, Javier. "A survey of cryptographic primitives and implementations for hardware constrained sensor network nodes." Mobile Networks and Applications 12.4 (2007) 231-244.

[2] Akyildiz, Ian F. Sankarasubramaniam, E. and Cayirci "Wireless sensor networks: a survey." Computer networks 38.4 (2002) 393-422.

[3] Boonsawat, V. Ekchamanonta, J. and Bumrungkhe, K. "XBee wireless sensor networks for temperature monitoring." the second conference on application research and development (ECTI-CARD 2010), Chon Buri, Thailand. 2010.

[4] Risteska, Stojkoska B. Andrijana, Popovska A. and Periklis, Chatzimisios. "Application of wireless sensor networks for indoor temperature regulation." International Journal of Distributed Sensor Networks 2014, (2014).

[5] Mon, Yi-Jen. Chih-Min, Lin. and Imre, Rudas J. "Wireless Sensor Network (WSN) Control for Indoor Temperature Monitoring." Acta Polytechnica Hungarica 9.6 (2012): 17-28.

[6] Karlof, Chris. Naveen, Sastry and David, Wagner. "TinySec: a link layer security architecture for wireless sensor networks." Proceedings of the 2nd international conference on Embedded networked sensor systems. ACM, 2004. February 2016.