A Smart Survival Detector to Detect Human using Internet of Things

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Abstract - *The unprecedented number and scales of natural and human-induced disasters in the past decade has urged the emergency search and rescue community around the world to seek for newer, more effective equipment to enhance their efficiency. Search and rescue technology to-date still rely on old technologies such as search dogs, camera mounted probes, and technology that has been in service for decades. Intelligent robots equipped with advanced sensors are attracting more and more attentions from researchers and rescuers. This paper presents the design and application of a distributed wireless sensor network based on the RSSI (Received Signal Strength Indicator) prototyping system for tracking the humans, who are alive and need emergency help. The system can navigate autonomously into the underground and to search for living human body heat using its PIR sensor and Dead Bodies using an IR sensor. The wireless sensor network helps to track the location of the system by analyzing signal strength. Design and development of the network and the physical robot prototype are described in this paper.*

Key Words: Internet of things, Intelligent Robots RSSI, PIR Sensors, IR sensors, Wireless Sensor Network.

1.INTRODUCTION

Developments in wireless technology and sensors have resulted in a range of new applications for Wireless Sensor Networks (WSNs). One such type of WSNs is the Built Environment Networks (BENs) which can be deployed in a wide variety of applications such as environmental monitoring, surveillance and healthcare applications. WSNs are characterized by having a large number of devices(motes) with sensing capabilities, limited processing capability and wireless connectivity to other devices. The wireless capability allows the sensors to be deployed close to the phenomenon being observed while their limited memory and processing capabilities result in low cost; this allows the deployment of a large number of such devices. The motes used in WSNs usually contain a micro-controller, RF chip, sensors and often use low level operating systems such as TinyOS or Contiki When deploying a wireless network within a building, it is vital to have an understanding of how the transmitted signals are affected through obstacles and with distance. The channel between transmitter and receiver may be a line of sight (LOS), but more likely the presence of objects such as office furniture, lab equipment and people will create obstructions and provide multiple paths (multipath) for the waves to reach the receiver. Diffraction, reflection and scattering are main causes of multipath and fading. Multipath and fading are the dominant effects on the channel as the transmitted signal propagates through the media to the receiver. The ideal antenna radiation pattern for a mote is symmetric in all directions and would result in constant radio range and performance in a spherical radius of the mote. In reality this uniform transmission pattern does not exist and failure to understand a mote antenna transmission pattern and how it can be affected by the environment can result in network reliability issues and/or inappropriate placement of motes. There are numerous papers that investigate the relationship between signal attenuation and building materials and software packages that simulate the radio frequency (RF) attenuation within buildings using ray tracing techniques . Little attention has, however, been given to the effects that antenna pattern irregularity and human presence can have on the signal strength and reliability of even a small-scale network when it has been deployed. This paper provides measurements of Received Signal Strength (RSS)

.2. Existing System

Localization methods can be classified into two types: model-based methods and mapping-based localization methods.

- **Model-based:** Methods of this type are composed of two steps. First, based on RSSI, TOA, TDOA and AOA information, model-base methods are utilized to obtain distance estimation results. Then, one of the localization calculation algorithms (including trilateral, maximum-likelihood, min- max, weighted min-max and other related algorithms) can be employed to obtain the localization results. The advantage of methods of this type is that they are flexible, i.e., they can be applied in arbitrary unknown environments.
- **Mapping-based**: Due to the uncertainty of the RSSI, TOA, TDOA, AOA and distance estimation models, the distance estimation accuracy and localization accuracy are very low. To obtain satisfying distance estimation and localization results, mapping-based methods have been proposed. E.g., a existing work presented a mapping-based distance estimation method and validation of the method in real localization environments, and an improved version for achieving

higher efficiency. In addition to the static distance estimation, a mapping-based dynamic distance is also considered. The DDEUDC method can obtain an accurate estimation efficiently. For obtaining localization results, the RADAR mapping-based method was presented. The ARIADNE algorithm utilizes a search strategy to achieve higher efficiency.

DISADVANTAGES OF EXISTING SYSTEM:

- However, because the distance estimation model is difficult to implement accurately in practice.
- The distance estimation accuracy and localization accuracy are very poor.
- The localization accuracy is not adequate.

3.Proposed System

We present a mapping-based localization method via uncertain data processing. The technical contributions are as follows.

- We consider the uncertainty in the RSSI values and evaluate and express the uncertainty in terms of interval data.
- To improve the localization accuracy, we utilized a strategy that incorporates uncertain data clustering during the matching.
- To improve the localization efficiency, we determine the location of an unknown node directly using a mapping-based uncertain data matching algorithm.

ADVANTAGES OF PROPOSED SYSTEM:

- Accurate RSSI-based localization.
- Distribution-based mapping is utilized to overcome the uncertainty in RSSI values.
- Mapping-based localization method.

3.1 Block Diagram

The block diagram explain about presents the design and application of a distributed wireless sensor network based on the RSSI (Received Signal Strength Indicator) prototyping system for tracking the humans , who are alive and need emergency help. The robotic system can navigate autonomously into the underground and to search for living human body heat using its PIR sensor and Dead Bodies using an IR sensor. The wireless sensor network helps to track the location of the robot by analyzing signal.

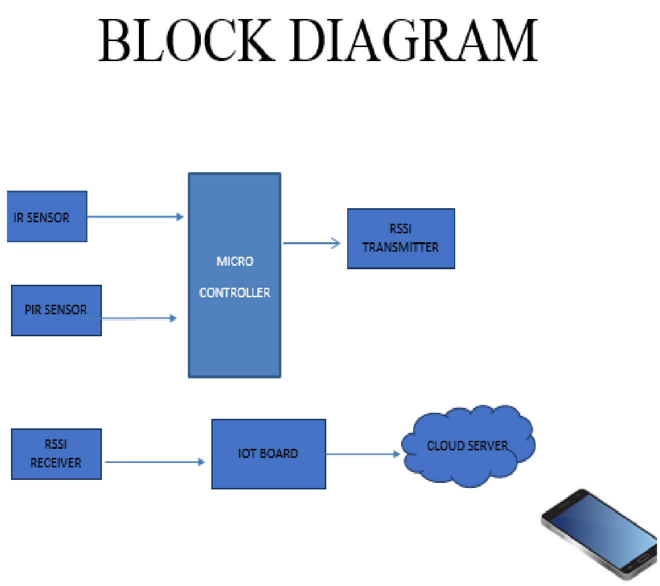

Fig -1: Block Diagram of the Proposed System

4. Hardware Components

4.1Received Signal Strength Indicator (RSSI)

- RSSI, or "Received Signal Strength Indicator," is a measurement of how well your device can hear a signal from an access point or router.
- It's a value that is useful for determining if you have enough signal to get a good wireless connection.
- Because an RSSI value is pulled from the client device's WiFi card (hence "received" signal strength), it is not the same as transmit power from a router or AP.
- RSSI vs dBm. dBm and RSSI are different units of measurement that both represent the same thing: signal strength. The difference is that RSSI is a relative index, while dBm is an absolute number representing power levels in mW (milliwatts).
- RSSI is a term used to measure the relative quality of a received signal to a client device, but has no absolute value. The IEEE 802.11 standard (a big book of documentation for manufacturing WiFi equipment) specifies that RSSI can be on a scale of 0 to up to 255 and that each chipset manufacturer can define their own "RSSI_Max" value. Cisco, for example, uses a 0-100 scale, while Atheros uses 0-60. It's all up to the manufacturer (which is why RSSI is a relative index), but you can infer that the

higher the RSSI value is, the better the signal is.

- Since RSSI varies greatly between chipset manufacturers, Meta Geek software uses a more standardized, absolute measure of signal strength: received signal power, which is measured in decibels, or dBm on a logarithmic scale. There's a lot of math we could get into, but basically, the closer to 0 dBm, the better the signal is.
- To help leverage your signal strength measurement most effectively so you can make channel planning decisions, in SSIDer Plus displays signal strength in two ways.

RSSI Specification

Signal Strength	TL;DR		Required for
-30 dBm	Amazing	Max achievable signal strength. The client can only be a few feet from the AP to achieve this. Not typical or desirable in the real world.	N/A
-67 dBm	Very Good	Minimum signal strength for applications that require very reliable, timely delivery of data packets.	VoIP/VoWiFi, streaming video
-70 dBm	Okay	Minimum signal strength for reliable packet delivery.	Email, web
-80 dBm	Not Good	Minimum signal strength for basic connectivity. Packet delivery may be unreliable.	N/A

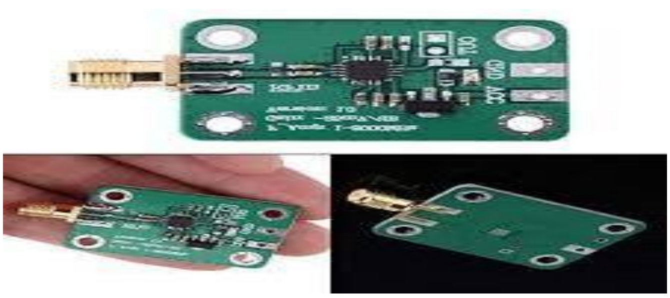

Fig -2: RSSI

4.2 IR SENSOR

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor.

Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, The resistances and these output voltages, change in proportion to the magnitude of the IR light received.

IR Sensor Circuit Diagram and Working Principle

An infrared sensor circuit is one of the basic and popular sensor module in an electronic device. This sensor is analogous to human's visionary senses, which can be used to detect obstacles and it is one of the common applications in real time. This circuit comprises of the following components

Application:

- Flame Monitors
- Moisture Analyzers
- Gas Analyzers

Fig -3: IR SENSOR

4.3 PIR SENSOR

- Passive infrared sensor (PIR sensor) is an electronic sensor
- That measures infrared (IR) light radiating from objects in its field of view.
- They are most often used in PIR- based motion detectors PIR sensors are commonly used in security alarms and automatic lighting applications.

- PIR sensors detect general movement, but do not give information on who or what moved. For that purpose, an active IR sensor is required.

Operation of PIR

A PIR sensor can detect changes in the amount of infrared radiation impinging upon it, which varies depending on the temperature and surface characteristics of the objects in front of the sensor. When an object, such as a person, passes in front of the background, such as a wall, the temperature at that point in the sensor's field of view will rise from room temperature to body temperature, and then back again. The sensor converts the resulting change in the incoming infrared radiation into a change in the output voltage, and this triggers the detection. Objects of similar temperature but different surface characteristics may also have a different infrared emission pattern, and thus moving them with respect to the background may trigger the detector as well.

Application:

- All outdoor Lights
- Lift Lobby
- Multi Apartment Complexes
- Common staircases
- For Basement or Covered Parking Area

Fig -4: PIR SENSOR

4.4 IoT BOARD

IoT has evolved from the convergence of wireless technologies, micro- electromechanical systems (MEMS) and the Internet. The concept may also be referred to as the Internet of Everything. The internet of things (IoT) is the internetworking of physical devices, vehicles, buildings and other items— embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data.

A thing, in the Internet of Things, can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built- in sensors to alert the driver when tire pressure is low -- or any other natural or man- made object that can be assigned an IP address and provided with the ability to transfer data over a network.

Fig -5: IoT BOARD

5. RESULTS AND DISCUSSION

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. The IoT allows objects to be sensed and/or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. IoT board featured with SIM900 GPRS modem to activate internet connection also equipped with a controller to process all input.

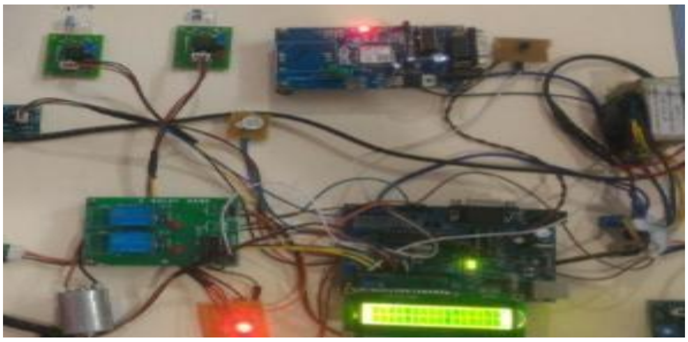

Fig - 6: WORKING ENVIRONMENT OF SURVIVAL DETECTOR

6. CONCLUSIONS

This paper has provided an insight into the deployment of a real WSN in a typical office environment. The results presented demonstrate the effects of the mote placement and radiation patterns on RSS and signal propagation. For example, a one metre move in the placement of a mote can vary the RSS by up to 20dBm. The placement of motes close to large metal objects such as filing cabinets or equipment racks can have unpredictable effects on the signal propagation. Therefore, before deploying motes within a network it is critical to both understand the radiation pattern of the motes and the building layout. This information should then be used when positioning motes to ensure that their orientation effectively utilises any directional feature.

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