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WAREHOUSE MONITORING AND MANAGEMENT WITH THE HELP OF WSNs & SOLAR ENERGY

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Abstract

In present situation every technology is changing their faces into wireless technology. This paper is concerned with management and maintenance of warehouse with the help of Wireless sensor networks (WSN) and solar energy as an alternate power source. Using Wireless sensor networks one can monitor temperature, air pressure, humidity, and presence of animals in the warehouse. Usually Wireless sensors networks consume more energy for communication purpose. Especially when the monitored data type is audio, the lifetime is very short due to a huge amount of data transmission. So now I am implementing Wireless sensor networks with solar energy which is an alternative along with battery. Actually solar powered sensor networks are better than battery powered sensor networks and they work efficiently. By combining these two popular technologies we can control the uncontrollable issues present in the warehouse.

Index Terms: *Wireless sensor network, Solar Energy, Static network, Battery pit, Animal detection*

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1. INTRODUCTION

Wireless sensor network (WSN) provides communication medium among the distributed wireless sensor nodes, whose role is monitoring and collecting data from various geographical terrains. These networks combine wireless communication and minimal computation facilities with sensing physical phenomenon which can easily embedded in our physical environment [9]. They are useful in various fields ranging from environment monitoring, indoor climate control, ambient air monitoring, emergency response, security applications and disaster management. [1]Sensor networks are typically characterized by limited power supplies, low bandwidth, small memory size and limited energy. By using this type of network we can monitor large area with low cost. The challenge in this area is that audio signal processing and requires a large amount of memory for performing computations accurately [10]. Different families of living animals make different, unique sounds. The same is true for animals belonging to the same family but of a different species or genus. In this technique, the detected sounds are first processed at the sensor node to extract that the spices that is present in single or groups with recorded fundamental frequencies. Then the sensor determines to alert the user for giving the information about detection of animals.

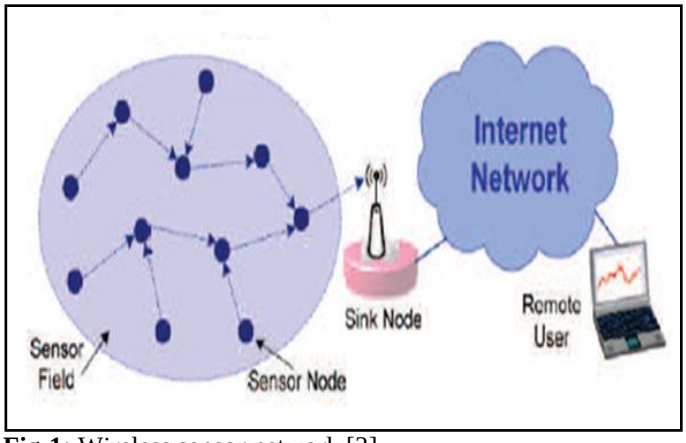

Fig-1: Wireless sensor network [3]

Solar energy, a system is based on the ability of certain material to convert the radiant energy of the sun into electrical energy. Much of the world's required energy can be supplied directly by solar power. It also became more attractive

recently because of its environmental benefits. As it is derived from renewable resources, it is non-toxic in nature. Renewable energy is the energy derived from sources that are being

replaced by nature, such as water, wind, solar or biomass [2]. Heating is the business for which solar energy is best suited. Solar heating requires almost no energy transformation, so it has a very high efficiency.

2. EXISTING SYSTEM

In present warehouses are maintained manually. A warehouse consists of products in quantity of tons. The selected products or goods should be stored in the warehouse for many months without causing any damage. Actually the damage was caused to products by animals (like rats, bats, squirrels), fungus or humidity formed on pesticides and emergency cases (fire existence) [6]. The killing stuff kept for the elimination of animals itself contain poison in it and if it is contaminated with the food or by chance of any damage for the packing then the product's quality may decrease and it may also be poisoned. Some other cases where manually we cannot detect the problem occurred to the product. Here power is also one of the main problems for maintaining the warehouse. Some product should be stored in freezers in summer. The temperature necessary for preservation depends on the storage time required and the type of product. In general, there are three groups of products, foods that are alive (e.g. fruits and vegetables), foods that are no longer alive and have been processed in some form (e.g. meat and fish products), and commodities that benefit from storage at controlled temperature (e.g. beer, tobacco).

3. INTRODUCING SYSTEM

Here I am proposing some of the sensor techniques.

3.1 Sound detection sensor

Humans can hear sounds with frequencies between 20 Hz and 20 kHz, but in practice most of us hear only up to 16 kHz. In contrast, animals commonly emit echolocation ultrasounds at frequencies between 12 kHz and 100 kHz. Some bat species can hear up to 160 kHz. Other animal species can hear a full octave (double the frequency) above humans, for example cats and dogs can hear up to 40 kHz. Some animal species can hear several octaves below humans. Moles, for example, can hear frequencies of an only a few hertz.

In this paper integrating wireless sensor network with solar energy. In this warehouse sensors are placed everywhere at communication range. By using the voice detection sensors we can detect the presence animals by their voice frequency. Voice sensors are placed at every corner of the warehouse.
A recent trend has been the use of auxiliary sensors to provide additional evidence of speech activity.

3.1.1 Advantages of voice sensors [7]

- Every low voice frequency generated in the warehouse can be detected by the sensors.
- They require low power, Voice sensors are easy to deploy and can function for weeks with no attention.
- They yield robust data: permanent record of data and location.

After the sensor's analyses the audio signal through its identification modules, if the signal is identified to be an animal sound, the extracted features of the audio signal are passed to the server for further recognition. Otherwise, if the signal is not required by the system, it will be discarded and not transmitted to the server. This in effect reduces the number of data transmissions in-network.

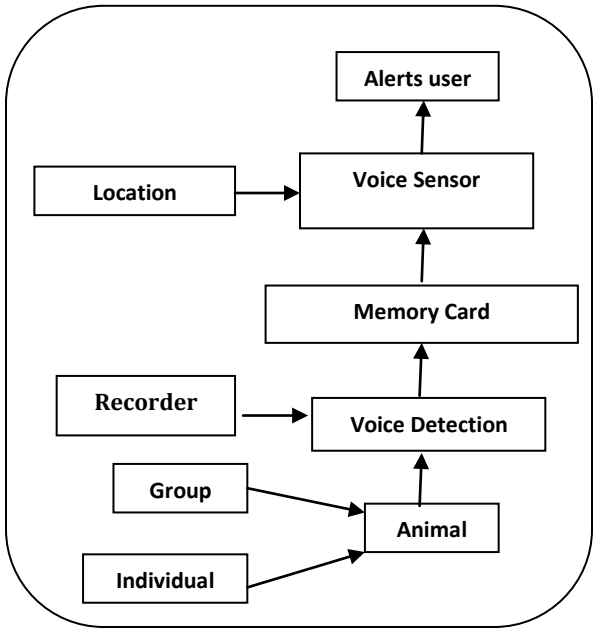

Fig2: Sample voice sensor

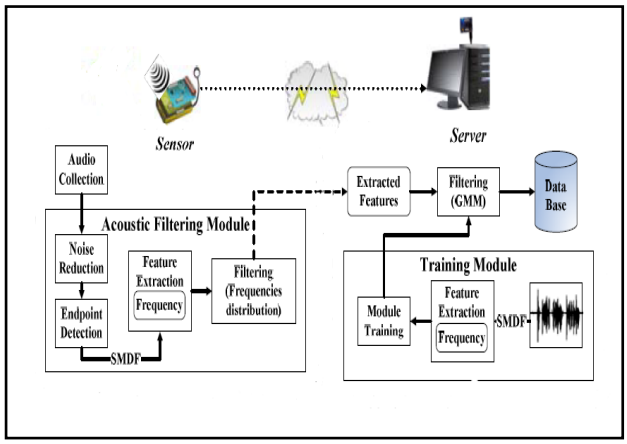

Fig 3: Animal noise detection system [8]

3.2 Detection of Fire existence in Warehouse

In our warehouse fire detection method, sensor nodes collect measurement data such as relative humidity, temperature, smoke all these factors are required for determining the warehouse fire danger rate.

Each node can generate three classes of data packets [5]

- Regular Report (RR)
- Query Response (QR)
- Emergence Report (ER)

Each node periodically collects sensing data and encapsulates them into a RR packet whose destination is the respective cluster head. The QR packet is only sent to the sink by part of nodes immediately after getting a query packet from the sink. A node that detected an abnormal event, e.g. smoke is detected, will immediately generate and send the sink an ER packet containing the information related to the abnormal event.

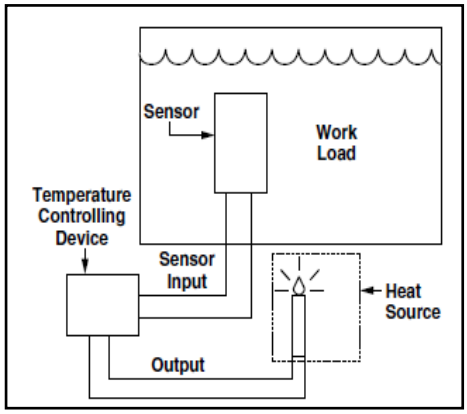

Fig 4: A simple Thermal system [8]

3.3 Humidity Sensor

The moisture detector sensor is designed to respond to the presence of water and other non flammable conductive liquids. The sensor units can be surface-mounted or floor-mounted beneath carpet for detection of increased moisture levels in basements and bathrooms, and leakage in air conditioning and sprinkler systems. The moisture detectors work with the 5501 Moisture Processor. Simply push the processor's test switch to simulate the presence of water and verify proper operation. The processor accommodates up to four detectors and works with solar power for long-life.

3.4 Solar energy for Warehouse

Because of the static nature of warehouse we can suggest solar energy as an alternative power source along with battery pit. Presently this paper consists of many wireless sensors that are under continuous work for the detection of many uncontrollable issues. Every sensor is trying to communicate with the master node for transferring data. So power is the main problem among the nodes, if power of one node goes down then the data from that area is not available to the master node. If the master node only goes down the area from all the nodes are not uploaded to the user. If the user is using battery power he must change the batteries when every the battery power is gone. So for this warehouse we are using solar power to the sensors. The sensors can communicate easily without dropout of power.

Two components are mainly required to have a functional solar energy generator. These two components are collector and storage unit. The collector simply collects the radiation that falls on it and a fraction of it to the other forms of energy. The storage unit is required because of the non-constant nature of solar energy. At night or during heavy cloud cover energy observed is very less.

Fig4: A warehouse with solar panels [4]

In practical, a backup power supply is used for storing more energy which was obtained from solar energy

3.5 Battery pit

This is mainly used for storing more energy. We consume solar energy only during the presence of sun. But during in the night time or in heavy cloudy day energy consumed from sun is less when compare to normal days. So here we are using battery pit for storing the energy which is consumed from the sun. Later we can transfer the stored energy to the sensors or to the operation of any electric devices present in the warehouse.

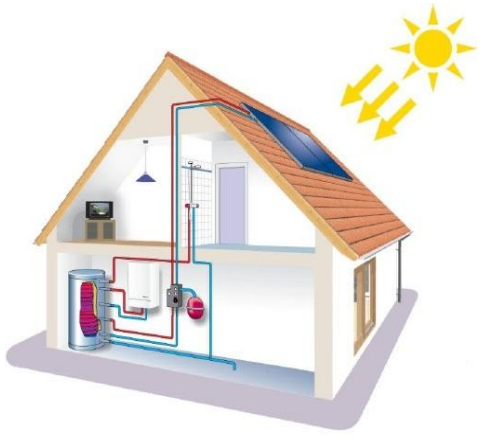

Fig5: A warehouse model with solar panels & Battery Pit [4]

4. 'SPOT' AND CONTINUOUS MONITORING

4.1 'Spot' Monitoring Systems

In 'spot' monitoring, moisture readings are taken one at a time with a Sensor Reader. In some instances the Reader is able to store the readings in memory for later retrieval. In order to obtain the detailed information data the user must perform many measurements as the only moisture value available is the one present at the time the sensor is read. The relatively low costs of 'spot' monitoring will allow for a greater number of monitoring sites, but monitoring resolution and the ability to analyse trends in water use will be limited by the time available to perform measurements.

4.2 'Continuous' Monitoring System

In 'continuous' monitoring systems, a Data Logger reads a sensor or number of sensors at set intervals and stores the values in memory for later retrieval. Sensors are read frequently and automatically, and some cases the 'read interval' is programmable. Data can be retrieved with a 'shuttle' storage device such as an MEA Retriever, by connecting a PC to the Logger with a cable, or via telemetry. Retrieved data is downloaded to a computer and can be viewed as a Table or a Graph allowing analysis of temperature use and grain moisture trends over time. Changes in grain moisture and other values such as rainfall can be easily and accurately monitored.

5. CONCLUSION

In this paper, we presented a technology for maintaining and monitoring the warehouse. The techniques in a fair manner, we propose spot and Continuous monitoring, so that the monitoring technique is user specific and situation demand.

6. ACKNOWLEDGEMENT

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