A Survey on various Sensors used in Greenhouse

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Abstract— Wireless sensor network can be described as a network of node that cooperatively sense and may control the environment enabling interaction between persons or computers and surrounding environment through wireless link. Sensors are used for the sense the data and send it to sink. A greenhouse is an indoor covered place in which plants, crops are grown. For the increase production of crops it should be take care of crops from light, Temperature, Humidity etc. Conditions, for this sensor are used in greenhouse. In the greenhouse most used sensors like Temperature, Humidity, and Light Sensors.

Key words: Sensors, Greenhouse, wireless sensor network, temperature, light, humidity

I. INTRODUCTION

The need to monitor and measure various physical phenomena (e.g. temperature, fluid levels, vibration, strain, humidity, acidity, pumps, generators to manufacturing lines, aviation, building maintenance and so forth) is common to many areas including structural engineering, agriculture and forestry, healthcare, logistics and transportation, and military applications. Wired sensor networks have long been used to support such environments and, until recently, wireless sensors have been used only when a wired infrastructure is infeasible, such as in remote and hostile locations. But the cost of installing, terminating, testing, maintaining, trouble-shooting, and upgrading a wired network makes wireless systems potentially attractive alternatives for general scenarios.

Recent advances in technology have made possible the production of intelligent, autonomous, and energy efficient sensors that can be deployed in large numbers to form self-organizing and self-healing WSNs in a geographical area. Moreover, the dramatic reduction in the cost of this wireless sensor technology has made its widespread deployment feasible, and the urgent need for research into all aspects of WSNs has become evident. The WSN has great, long-term potential for transforming our daily lives, if we can solve the associated research problems.

The sensors that, when distributed in the environment, comprise WSNs include cameras as vision sensors, microphones as audio sensors, and those capable of sensing ultrasound, infra-red, temperature, humidity, noise, pressure and vibration. Although the individual sensor's sensing range is limited, WSNs can cover a large space by integrating data from many sensors. Diverse and precise information on the environment may thus be obtained. Sensor networks are an emerging computing platform consisting of large numbers of small, low-powered, wireless motes each with limited computation, sensing, and communication abilities. It is still a challenge to realize a distributed WSN comprising: small and cost effective sensor modules high speed, low latency and reliable network infrastructures software platforms that support easy and efficient installation of the WSN and sensor information processing technologies.

WSNs could potentially become a disruptive technology, for example because of social issues such as security and privacy, but the technological vision is for new and diverse types of applications for the social good. The environment can be monitored for fire-fighting, to detect marine ground floor erosion, and to study the effect of earthquake vibration patterns on bridges and buildings. Surveillance of many kinds can be supported, such as for intruder detection in premises. Wireless sensors can be embedded deeply within machinery, where wired sensors would not be feasible because: wiring would be too costly could not reach the deeply embedded parts would limit flexibility would represent a maintenance problem or would prevent mobility. Mobile items such as containers can be tagged, as can goods in a factory floor automation system. Smart price tags for foods could communicate with a refrigerator. Other classes of application include car-to-car or in-car communication. [1]

II. WIRELESS SENSOR NETWORKS

A WSN is a collection of millimeter-scale, self-contained, micro-electro-mechanical devices. These tiny devices have sensors, computational processing ability (i.e. power), wireless receiver and transmitter technology and a power supply. In a WSN a large number of sensor nodes usually span a physical geographic area. For example, the prototype of a future sensor node (mote) in the Smart Dust project [5] performs the wireless communication function, the sensor function, the power supply unit, and the information processing function on the MEMS (Micro Electro Mechanical System) chip, which has a scale only of several millimeters.

Typical WSNs communicate directly with a centralized controller or a satellite, thus communication between the sensor and controllers is based on a single hop. In future, a WSN could be a collection of autonomous nodes or terminals that communicate with each other by forming a multi-hop radio network and maintaining connectivity in a decentralized manner by forming an ad hoc network. Such WSNs could change their topology dynamically when connectivity among the nodes varies with time due to node mobility. But current, real-world deployment usually consists of stationary sensor nodes.

WSNs are intelligent compared with traditional sensors, and some WSNs are designed to use in-network processing, where sensed data can be gathered in situ and

transformed to more abstract and aggregated high-level data before transmission. The combination of processing power, storage and wireless communication also means that data can be assimilated and disseminated using smart algorithms. The vast number of sensor nodes planned for many applications also implies a major portion of these networks would have to acquire self-organization capability.

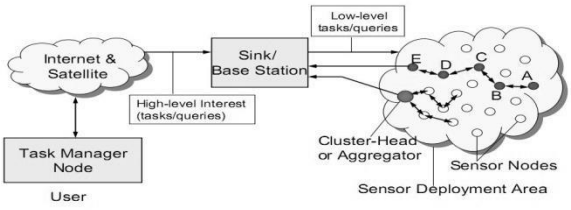

Fig. 1: WSN overview [1]

Intuitively, a denser infrastructure would create a more effective sensor network. It can provide higher accuracy and has more energy available for aggregation. If not properly handled, a denser network can also lead to collisions during transmission, and network congestion. This will no doubt increase latency and reduce efficiency in terms of energy consumption. One distinguishing characteristic of WSNs is their lack of strong boundaries between sensing, communication and computation. Unlike the Internet, where data generation is mostly the province of end points, in sensor networks every node is both a router and a data source. [1]

III. GREEN HOUSE

A greenhouse is an indoor covered place in which plants are grown. It is also called as glasshouse.

There are some important parameters that should be monitored at a greenhouse in order to achieve good results at the end of the agricultural production. [3]

Greenhouse playing a significant role in the production of out-of-season fruits, flowers, and vegetables as well as high value and sensitive plants like capsicum.

The Purpose of greenhouse environmental control is to get the best climatic conditions for crop growth, improved quality of crops, and regulated growth cycle of crops. [4]

Fig. 2 Greenhouse Setup [6]

Greenhouse can be commonly divided into two categories:

1) Glass Greenhouse
2) Plastic Greenhouse

A. *Glass Greenhouse*

Commercial glass greenhouses are often high-tech production facilities for vegetables or flowers.

The glass greenhouses are filled with equipment such as screening installations, heating, cooling and lighting and may be automatically controlled by a computer.

B. *Plastic Greenhouse*

Plastics mostly used are polyethylene film and multiwall sheets of polycarbonate material.

IV. SENSORS USED IN GREENHOUSE

In the Greenhouse there are mainly used sensors are Temperature, Humidity, Light Sensors and other sensors are also used.

A. *Temperature Sensor: LM35*

Fig. 3: LM35 Temperature Sensor [2]

The Temperature sensor LM35 is as shown in figure 3. The LM35 series are precision integrated temperature sensor, whose output voltage is linearly proportional to Celsius temperature. The LM35 has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain its equivalent centigrade scaling. The LM35 does not require any external calibration or trimming to provide accuracy of +/- 25C at room temperature.

Features:

1) Calibrated directly in Celsius.
2) Low impedance output.
3) Suitable for remote application [2]

B. *The Light Sensor: LDR*

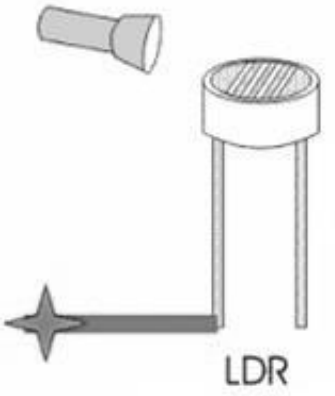

Fig. 4: Light Dependent Resistor Light Sensor [2]

The light sensor is made using an LDR (Light Dependent Resistor).The resistance of the LDR varies according to intensity of light falling on the surface. When the torch is turned on, the resistance of the LDR falls, allowing current to pass through it as shown in figure 4.

Features:

1) Wide spectral response.
2) Low cost.
3) Wide ambient temperature range. [2]

C. Humidity Sensor: SY-HS-220

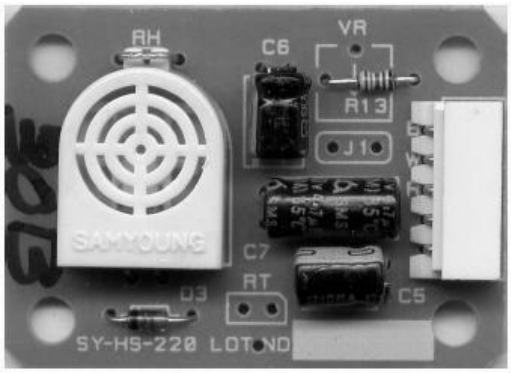

Fig. 5: SY-HS-220 Humidity Sensor [7]

The humidity sensor SY-HS-220 can operate up to the range of 95% RH (Relative Humidity). Humidity sensor module itself contain the signal conditioning unit and the voltage out can take out through the connectors. We know that the level of humidity in the air is also a function of temperature. Excess humidity can cause growth of fungus. Too little humidity can cause static discharge or accumulation of unwanted dust, contributing to allergies. Here a humidity sensor known as SY-HS-2 and the module is SY-HS-220 series which produces more accurate and linear voltage output. This is a polymer humidity sensor.

Features:

1) Humidity sensor module with voltage output
2) Wide temperature compensation range
3) High reliability and long term stability
4) Linear dc voltage output for humidity range
5) High sensitivity and low hysteresis
6) Compact size and cost effectiveness [2]

V. CONCLUSION

For the increase production of crops it should be take care of crops from light, Temperature, Humidity Weather etc. Conditions. Sensors are used for the sense the data like temperature, light, humidity etc. So, various sensors are used in greenhouse. In the greenhouse most used sensors like Temperature, Humidity and Light Sensors.

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