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AN INTELLIGENT ROBOT FOR SMART HOME SECURITY BY USING WIRELESS SENSOR NETWORK

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ABSTRACT: Smart home environments have evolved to the point where everyday objects and devices at home can be networked to give the inhabitants new means to control them. Advances in digital electronics have enable the development of small in
size and communicate in short distances sensor nodes.They are low-cost, low-power and multifunctional. The sensor nodes consist of sensing, data processing, and communication components, leverage the idea of Wireless Sensor Networks (WSN) based on collaborative effort of a large number of nodes. There are a large number of reseaches dealing with WSN applications, but it is still possible to explored in WSN development and maintenance. This paper examines the possibility of integration WSN andthe service robots into a smart home application. The service robots can be considered to be mobile nodes that provide additional sensorial information, improve/repair the connectivity and collect information from wireless sensor nodes. On the other hand, the WSN can be considered as an extension of the sensorial capabilities of the robots and it can provide a smart environment for the service robots.

Keywords:*Microcontroller, Sensors, Camera, Zigbee Robot, Gprs.*

I. INTRODUCTION

A smart environment is a physical world that is interconnected through a continuous network abundantly and invisibly with sensors, actuators and computational units, embedded seamlessly in the everyday objects of our lives .A smart home is a residence in which computing and information technology apply to expect and respond to the occupants' needs and can be used to enhance the everyday life at home. Potential applications for smart homes can be found in these categories: welfare, entertainment, environment, safety, communication, and appliances .Wireless Sensor Networks (WSNs) have become an attractive technology for the research community, particularly with the proliferation in Micro-ElectroMechanical Systems technology which has facilitated the development of smart sensors . Typically, a WSN is a distributed system that is composed of autonomous units with sensing capabilities (sensor nodes), interconnected by wireless communication system. This network offers potentially low-cost solution to several problems including military target tracking, health care monitoring, environment control systems, animal monitoring, and Smart Homes .The WSN is built of sensor nodes, from a few to several thousands, where each node is connected to one or several sensors.

I. THE HARDWARE SYSTEM

Micro controller: This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

ARM7TDMI: ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

Liquid-crystal display (**LCD**) is a flat panel display,

electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

I. Design of Proposed Hardware System

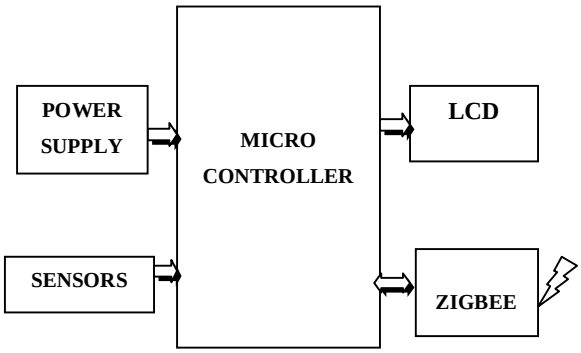


Fig.1.Block diagram

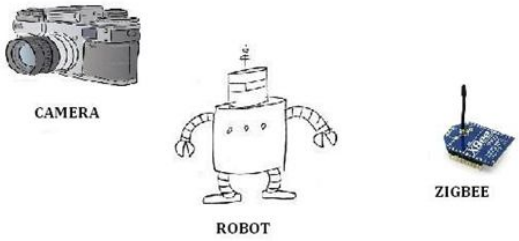


Fig.2.Block diagram

In this work we use WSN to create a smart environment. The wireless sensor Nodes can be embedded into the smart devices, and they can communicate each other by wireless. By placing slave sensor nodes everywhere in the house, the temperature, illumination, fire, gas leakage, water leakage, intruders detect information can be passed to a PC collecting the information from the master node. Whenever, the critical condition arises, a buzzer will alert the user to take required action through the PC. The service robot in the smart home environment has the following key functionalities: navigation, object picking and object Handling. To execute the functions, a classical robotic platform should be equipped with sensors such as Temperature sensor, an ultrasonic sensor, a LDR sensor, humidity sensor or a camera as well is fitted on its top.

I. Board Hardware Resources Features

Zigbee

Zigbee modules feature a UART interface, which allows any microcontroller or microprocessor to immediately use the services of the Zigbee protocol. All a Zigbee hardware designer has to do in this ase is ensure that the host's serial port logic levels are compatible with the XBee's 2.8- to 3.4-V logic levels. The logic level conversion can be performed using either a standard RS-232 IC or logic level translators such as the 74LVTH125 when the host is directly connected to the XBee UART. The below table gives the pin description of transceiver. Data is presented to the X-Bee module through its DIN pin, and it must be in the asynchronous serial format, which consists of a start bit, 8 data bits, and a stop bit. Because the input data goes directly into the input of a UART within the X-Bee module, no bit inversions are necessary within the asynchronous serial data stream. All of the required timing and parity checking is automatically taken care of by the X-Bee's UART

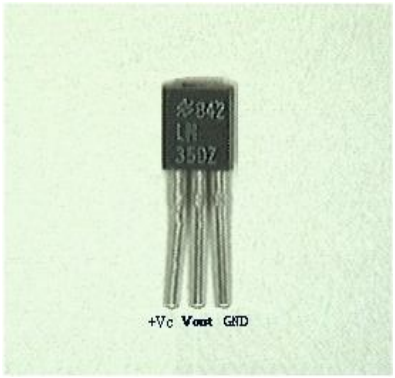
Co Sensor:

They are used in gas leakage detecting equipments in family and industry, are suitable for detecting of LPG, i-butane, propane, methane, alcohol, Hydrogen, smoke.

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 ^{o}C) .The LM35 - An Integrated Circuit Temperature Sensor .You can measure temperature more accurately than a using a thermistor.

The sensor circuitry is sealed and not subject to oxidation, etc. The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified.

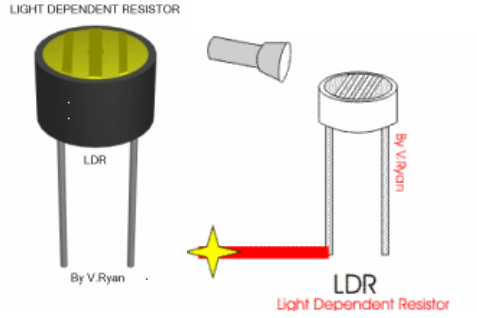


Humidity:

Humidity is the amount of water vapor in the air. In daily language the term "humidity" is normally taken to mean relative humidity. Relative humidity is defined as the ratio of the partial pressure of water vapor in a parcel of air to the saturated vapor pressure of water vapor at a prescribed temperature. Humidity may also be expressed as absolute humidity and specific humidity. Relative humidity is an important metric used in forecasting weather. Humidity indicates the likelihood of precipitation, dew, or fog. High humidity makes people feel hotter outside in the summer because it reduces the effectiveness of sweating to cool the body by preventing the evaporation of perspiration from the skin. Absolute humidity is the quantity of water in a particular volume of air. The most common units are grams per cubic meter, although any mass unit and any volume unit could be used.

Light Dependent Resistors*:*

LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically.



The general purpose photoconductive cell is also known as LDR – light dependent resistor. It is a type of semiconductor and its conductivity changes with proportional change in the intensity of light. The complete principle of an LDR is as follows. In a semiconductor an energy gap exists between conduction electrons and valence electrons. As an LDR is also known as semiconductor photo-conductive transducer, when light is incident on it, a photon is absorbed and thereby it excites an electron from valence band into conduction band. Due to such new electrons coming up in conduction band area, the electrical resistance of the device decreases.

I. CONCLUSION

In this paper we describe the architecture and implementation of a smart environment with WSN and service robot, in which the home server acts as an intelligent collaborator between our mobile service robot and the environment. To demonstrate the practicability of a WSN and service robot assisted smart home environment, we came up with devices required to provide reliable services, developed them, and implemented software for management and control. The goal of our project is to show the usability of the service robots in our daily lives by constructing the smart environment for the service robots. This attempt is expected to enable humans to focus on the important tasks by liberating ourselves from unpleasant daily chores with the help of services robots. Future work will focus on improvement of above proposed work and adding features to make a reliable smart home system.

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