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AUTONOMOUS NETWORKED ROBOTS THROUGH WIRELESS AD-HOC COMMUNICATION FOR EMERGENCY SCENARIOS

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Abstract- Nowadays, the surveillance of a single robot can be controlled by a single base station. Here we designed a networked robots consists of one base station and two surveillance robots. If one of the surveillance robots (slave) exceed the coverage range of the base station, then the nearest robot acts as a base station (master) with their authentication. If the nearest robot unable to acts as a base station then the request from slave robot cannot be accepted, then the slave robot does not exceed the coverage range of base station. By using these Ad hoc networked robots, we can detect bomb, land mines, gas, and fire using different kinds of sensors. In our research, we have used proximity sensors, PIR sensor, gas sensors, and fire sensors. The created networked robots are connected via RF protocol and monitored using TV output. The network could be used to accommodate real-time VoIP or live video-streaming connection, and environmental or biomedical sensor data, so that the rescuers can better assess the condition of the civilians and plan their own actions accordingly. These capabilities cannot be provided with the traditional whistle or personal emergency devices, but an actual network is needed. With recent advances in small-size robotics and wireless communications, emergency response robots can also be used to form ad hoc networks.

Keywords – *Robots*, Network, Sensors, adhoc networks, wireless communications

I. Introduction

During a disaster, emergency response processes can benefit from the instituting of a wireless ad hoc network. We developed the use of autonomous networked adhoc robots that move inside a disaster area and create a network for two way communications between trapped civilians with uncertain locations and an operation center. Till now, the Robots used for emergency scenarios are not network connected and also it has single control over base station. Generally the Robots Loose its connectivity and Information when they went out of the coverage area. Our aim is to maximize the number of civilians connected to the network. We present a distribution which involves clustering adhoc network according to their expected shortfall; clustering facilitates both connectivity within groups of civilians and exploration that is based on the uncertainty of these locations.To achieve efficient allocation in terms of time and energy, we also develop a modification according to which the robots consider the graph that the cluster centers form like master and slave. The Master and slave are monitored and controlled using microcontroller AT89S52 8051 and PC. The command is given from Base station only for both robots. Movement of Robotics depends upon the DC motor and it includes both its riding purpose and wrist usage purpose. In this research, master contains arm setup, it is used to pick and Drop the obstacle things on its way. We conduct simulations and discuss the efficiency and appropriateness of different situations. Mobile robots are routinely used in disaster management operations to reach areas that are inaccessible to humans. Usually, they are designed to search for victims, inspect the structural integrity of buildings, or detect hazardous materials, but with recent advances in small size robotics and wireless communications, emergency response robots can also be used to form ad hoc networks. The network could be used to accommodate real-time VoIP or live video-streaming connection, and environmental or biomedical sensor data, so that the rescuers can better assess the condition of the civilians and plan their own actions accordingly. These capabilities cannot be provided with the traditional whistle or personal emergency devices, but an actual network is needed. This adhoc networked robots not only provides master/slave connection but also helpful in increase connectivity protocol.

II. Hardware

1. AT89S52 8051 Microcontroller
2. Wireless Camera
3. RF Transciever 433 MHZ
4. Robot ARM setup Model

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5. DC Motors

6. Max232

7. Proximity, Fire and Gas Leakage Sensor

8. L298

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard MCS-51 instruction set. By combining a versatile 8-bit CPU with Flash on a monolithic chip, the Atmel AT89C2051 is a powerful microcomputer which provides a highly-flexible and cost-effective solution to many embedded control applications. Wireless security cameras (Lorex HD 1080p 12MP) are closed-circuit television (CCTV) cameras that transmit a video and audio signal to a wireless receiver through a radio band. The RF 433MHZ module, as the name suggests, operates at Radio Frequency. The corresponding frequency range varies between 30 kHz & 300 GHz. In this RF system, the digital data is represented as variations in the amplitude of carrier wave. This kind of modulation is known as Amplitude Shift Keying (ASK). Transmission through RF is better than IR (infrared) because of many reasons. Firstly, signals through RF can travel through larger distances making it suitable for long range applications. L298 is a dual H-Bridge motor driver, So with one IC we can interface two DC motors which can be controlled in both clockwise and counter clockwise direction and if you have motor with fix direction of motion the you can make use of all the four I/Os to connect up to four DC motors. L298 has output current of 600mA and peak output current of 1.2A per channel.

III. Software

Embedded C programming is different from developing applications on a desktop computers which is used in this research. Key characteristics of an embedded system, when compared to PCs, are as follows:

- Embedded devices have resource constraints (limited ROM, limited RAM, and limited stack space, less processing power).
- Components used in embedded system and PCs are different; embedded systems typically uses smaller, less power consuming components.

Embedded systems are more tied to the hardware. Two salient features of Embedded Programming are code speed and code size. Code speed is governed by the processing power, timing constraints, whereas code size is governed by available program memory and use of programming language. Goal of embedded system programming is to get maximum features in minimum space and minimum time.

Keil software provides the premier 8051 development tools to industry .The keil software comprises of different tool kits. A tool kit consist of several application program that we can use to create our 8051 application .When we use keil software for our project the development cycle is some what similar to a software development project .It consist of creating source file in C or assembly language compiling or assembling the source files debugging error in the source file, linking file from complier and assembler and finally building a project linking all the files and testing the linked application.

All the files are created through the micro vision integrated development environment are then passed to the C51 compiler or A51 assembler. The compiler and assembler process source files and create relocatable object files. Object files created by the compiler or assembler may be used by the library manager to create a library. A library is a specially formatted, ordered program collection of object modules that linker can process. When the linker processes a library, only the object modules in the library necessary for program creation are used. Object files created by the compiler and assembler and library files created by the library manager are processed by the linker to create an absolute object module. An absolute object file or module is an object file with no relocatable code. All the code in an absolute object file resides at fixed locations.

IV. Block Diagram

The base station is used to control the two robots which is connected using adhoc networks as shown in figure 1. The reserve station for robot 1 contains ARM module and locomotive function using L298 driven by DC motors as shown in figure 2. The another reserve section robot 2 was only actuated with L298 driven by DC motors and without ARM setup as shown in figure 3.

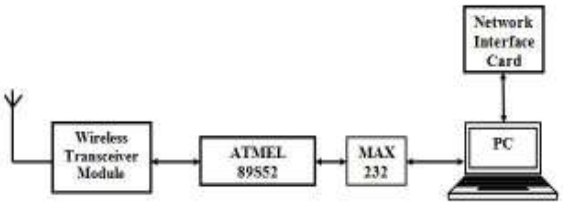

Figure 1. Base Station

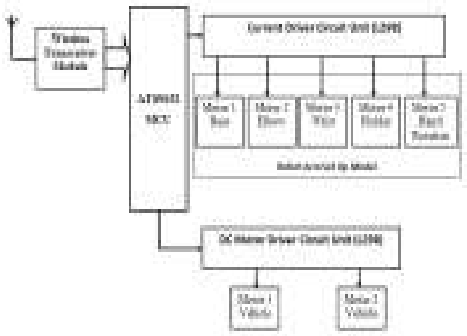

Figure 2. Reserve Station (Robot 1)

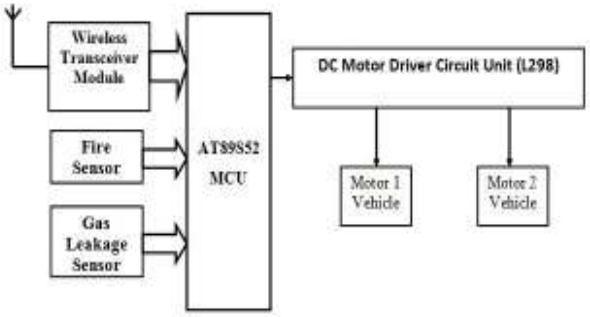

Figure 3. Reserve Station (Robot 2)

V. Implementation

The circuit diagram of designed base station is shown in figure 4.

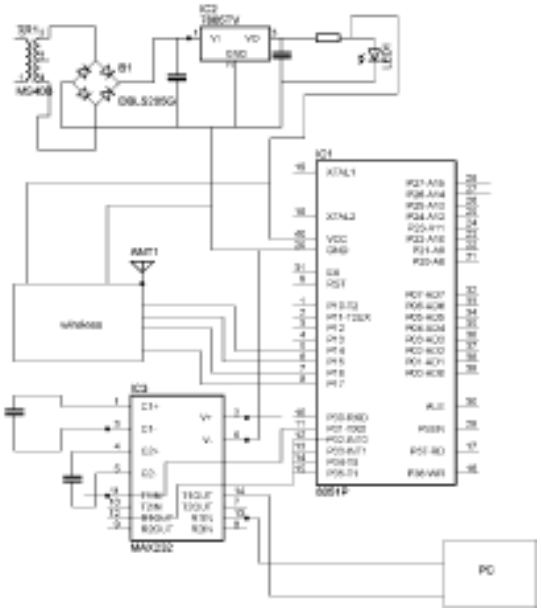

Figure 4. Circuit diagram (base station)

The circuit diagram of designed master section (Robot 1) is shown in figure 5.

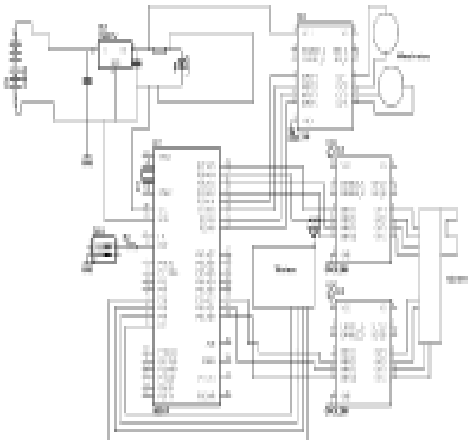

Figure 5. Circuit diagram (Master section)

The circuit diagram of designed slave section (Robot 2) is shown in figure 6.

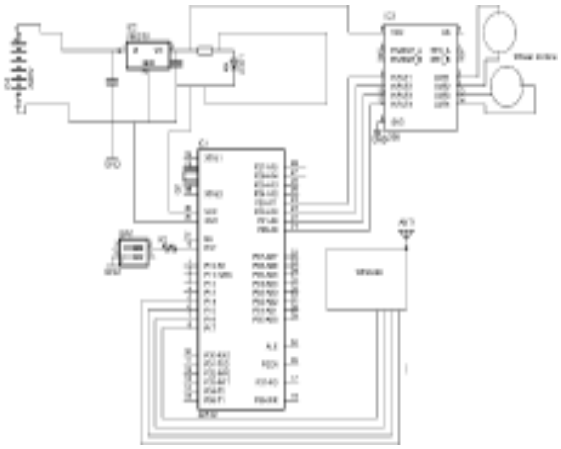

Figure 5. Circuit diagram (Slave section)

The commands were designed as A (front), B (back), C (right), D (left) for master robot which controlled by PC section base station. The commands were designed as P (front), Q (back), R (right), S (left) for slave robot which controlled by PC section base station. Inside the rescue zone, both robots were actuated in after connected to base station.

Once both robots gets authenticated by the base station, their real time visual intereprtation was viewed in LCD TV using wireless camera embedded in thr both robots. As per the transceiver ability, both robots were controlled inside 300 metres. Now the thing is, when any one of the robot exceeding the 300 metres limit, it will lose its connectivity from the base station leads to retrieval error of obtained data. So it is urgent scenario to make lost robot in action again by making the nearby robot as a

master. Now nearby robot acts as a base station which can able to track and retrieve inside 300 metres. Henceforth, the command from base station to lost robot was given to master robot which will transfer the command to slave robot as like we defined in the programming options.

This mean, commands P, Q, R, S cannot be proceesed by master robot because it is defined to receive A,B,C,D only, therefore it transmits the unrecognized commands which easily received by nearby lost robot(slave). Now again both robots got activation again by the base station without losing connectivity and also by increasing range of connectivity.

VI. Conclusion

The adhoc based networked robots were implemented successfully. The adhoc networked robots not only created the clustering connection between the multiple robots, but aloso improved the rnge of connectivity higher without making change in the transceiver protocol. These kinds of mobile robots will be handy inside the rescue zone. Usually, they are designed to search for victims, inspect the structural integrity of buildings, or detect hazardous materials.With recent advances in small-size robotics and wireless communications, emergency response robots can also be used to form ad hoc networks. The adhoc network used to accommodate real-time VoIP or live video streaming connection, and environmental or biomedical sensor data, so that the rescuers can better assess the condition of the civilians and plan their own actions of robots accordingly.

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