IMPLEMENTATION OF LOW COST REMOTE-OPERATED UNMANNED GROUND COMBAT VEHICLE USING RELAY COMMUNICATION

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ABSTRACT

This paper represents the design, development and validation of metal based autonomous robotic system for military application. Security is the first priority in today's unsecured life. In existing system used to design a robotic system for military applications using Bluetooth technology, but in this paper to control, monitoring and detecting objects by using zigbee technology. Here in this paper robot is controlled through PC. The purpose of the paper is to implement a system in military areas and also to monitor the locations by using cam which is connected to robot. In this paper consists of two sections one is transmitter section and other one is receiver section. When unmanned ground combat vehicles (UGCVs) are used for surveillance, information must often be transmitted to a base station in real time. However, limited communication ranges and the common requirement of free line of sight may make direct transmissions from distant targets impossible. This problem can be solved using relay chains consisting of one or more intermediate relay UGCVs. This leads to the problem of positioning such relays given known obstacles, while taking into account a possibly mission-specific quality measure. The maximum quality of a chain may depend strongly on the number of UGCVs allocated. Therefore, it is desirable to either generate a chain of maximum quality given the available UGCVs or allow a choice from a spectrum of Pareto-optimal chains corresponding to different trade-offs between the number of UGCVs used and the resulting quality. We show how sets of Pareto-optimal chains can be generated using graph search and present a new label-correcting algorithm generating such chains significantly more efficiently than the best-known algorithms in the literature. Finally, we present a new dual ascent algorithm with better performance for certain tasks and situations.

Keywords: *PIC controller, Personal computer, sensor interface devices, zigbee module, Relay Communication.*

I. INTRODUCTION

Unmanned Ground Combat Vehicle are meant to perform the operation of intelligence; surveillance and reconnaissance. The control and co-ordination between these vehicles and ground station is performed using a custom interface and piloting mechanism. An unmanned vehicle, like UGCV, are autonomous or wirelessly controlled vehicle without a human pilot on board, having motion controlled either autonomously by computers in the vehicle, or under the remote control of a pilot on the ground or in another vehicle. The presented system in this research, consists of an Unmanned Ground Combat Vehicle (UGCV), and a Base Station with laptops and communication devices.

Unmanned system based surveillance requires long range operation and data transmission. As RF modules provide a reliable method of communication, it is used between the above discussed systems. The whole mission plan includes the implementation of UGCV as the launch vehicle and a relay with repeater on it. As during the mission, the operation is to be performed for a range of 1 Km, the wireless RF module available in India was not of desired range to control the

UGCV directly from base station, thus a relay circuit consisting of two RF modules were used on the UGCV. The task was accomplished by deploying the UGCV up to the 500m range after which, the near UGCV was moved from it. These vehicles together, in a system, present various civilian and military applications in the field of surveillance and reconnaissance with a video camera and sensors equipped on both the vehicles.

A. Communication

Communication refers to the sending, receiving and processing of information by electric means. As such, it started with wire telegraphy in the early 80's, developing with telephony and radio some decades later. Radio communication became the most widely used and refined through the invention of and use of transistor, integrated circuit, and other semi-conductor devices. Most recently, the use of satellites and fiber optics has made communication even more wide spread, with an increasing emphasis on computer and other data communications.

In sensor networks, the transmission power dissipated by a sender node to transmit each bit of data to a receiver node is given by $\alpha + \beta d^m$, where α and β are distance-independent constants, d is the distance between sender and receiver and m is the path loss index such that $2 \leq m \leq 4$. This cost model makes direct communication between two distant nodes much more energy consuming than communicating via a multi-hop path with smaller hop distance. The effect of multi-hop communications in sensor networks have been studied in many research papers in the past few years, on both flat and hierarchical architecture of sensor networks.

Although multi-hop communication may reduce overall energy consumption, some nodes can be overloaded and drain out their energy more quickly (and die), as compared to some other nodes in the network. This may produce undesirable effect on the functionality of the networks, even causing the network to become inoperable. Many studies have been conducted to address this problem and various methods have been proposed to minimize the effect produced by the death of such burdened nodes. One of the techniques that has been proposed to reduce the burden on the overloaded nodes is to deploy some special nodes, known as relay nodes, within the network so that they can share some of the load with the overloaded nodes. In addition to load sharing, effect of the deployment of relay nodes in sensor networks, along with their placement problem in both flat and hierarchical architecture, has also been studied in different publications. These studies have focused on achieving varieties of objectives, including balanced data gathering within the networks, maximizing the lifetime of the networks and making a sensor network fault tolerant. Some authors have also proposed higher energy provisioning of the relay nodes and used them as cluster heads in a hierarchical architecture.

B. Project Overview

A modern communications system is first concerned with the sorting, processing and storing of information before its transmission. The actual transmission then follows, with further processing and the filtering of noise. Finally we have reception, which may include processing steps such as decoding, storage and interpretation. In this context, forms of communications include radio, telephony and telegraphy, broadcast, point to point and mobile communications (commercial and military), computer communications, radar, radio telemetry and radio aids to navigation. It is also important to consider the human factors influencing a particular system, since they can always affect its design, planning and use.

In this paper "Robot is controlled through system using Zigbee technology", like the title indicates the controlling action of Robot is done through the PC. The robot is kept some other place and we can operate the robot by sitting in front of the PC through the 2.4 GHz RF communication i.e. Zigbee.

ZIGBEE is a new wireless technology guided by the IEEE 802.15.4 Personal Area Networks standard. It is primarily designed for the wide ranging automation applications and to replace the existing non-standard technologies. It currently operates in the 868MHz band at a data rate of 20Kbps in Europe, 914MHz band at 40Kbps in the USA, and the 2.4GHz ISM bands Worldwide at a maximum data-rate of 250Kbps.

The ZIGBEE specification is a combination of Home RF Lite and the 802.15.4 specification. The specification operates in the 2.4GHz (ISM) radio band – the same band as 802.11b, Bluetooth microwaves and some other devices. It is capable of connecting 255 devices per network. The specification supports data transmission rates of up to 250 Kbps at a range of up to 30 meters. ZIGBEE's technology is slower than 802.11b (11 Mbps) and Bluetooth (1 Mbps) but it consumes significantly less power.

C. Objectives of Project

The project consists of mainly 2 parts:

- Buggy Unit
- Army Base Unit

I Buggy Unit:

This section consists of dc motor based vehicle carrying a metal detector for detecting mines and sensors. This vehicle will scan a per-determined area under consideration. As soon as any mine is detected the buggy stops and sounds an alarm indicating the presence of buggy. Then the buggy logs the longitude and the latitude of that place from GPS to get the exact location of mine and then it transmits these co-ordinates wirelessly through Zigbee.

II Army Base Unit:

This section receives the co-ordinates and sends it to pc. On pc we have .net software which is a graphical user interface. The s/w then displays these co-ordinates on the map. We use encryption-decryption technique to make the data transmission secure.

II.PROPOSED METHOD

In the proposed system we have implemented a new technique to for overcoming the human loss. We have planned of implementing a Robot in the place of humans. It means that the military fully will not as Robot. Only in the boarders we will place the Robots. We use camera, DC motor, laser, Zigbee, Pc, Robot.

We guys are concentrating to secure our place from intruders first and sometimes used as an attacking those intruders. Now days the intruders have a chance to enter our place easily or by using some techniques to enter easily, so we will place the camera in all the boarder lines and also along with the robots. In Pc we will be having all the data base of the military people. The camera will be monitoring all the places. If any new face is emerged the camera will send the image of the person to the Pc and will check in the data base. If he is new person then the Zigbee which is connected to the controller will send the information to another side of the Zigbee, then the DC motor will be initialized and make the Robot to move towards the person and attack them using the LASER.

Here we have used two way of Mode automatic mode and Manual mode. If the computer operator used the auto mode then the robot will taking an action independently. If he gives manual mode the camera will analyse the person and send information to Pc and check the data base, if so he is new person the microcontroller will send information to Zigbee, the Zigbee will send information to the other side microcontroller then Robot will be initiated and the Robot will get the command from the commander and act according to the command. This robotic technology will be very useful for army of every country so that the lives of many army men/women's are protected. The remote control station and the robot play very important role in the future military operations.

A. Receiver Section

This Paper mainly consists of Power Supply section, Microcontroller section, Zigbee transreceiver, H-bridge, dc motor, PC. In this paper work the micro-controller is plays major role. Micro-controllers were originally used as components in complicated process-control systems. However, because of their small size and low price, Micro-controllers are now also being used in regulators for individual control loops. In several areas Micro-controllers are now outperforming their analog counterparts and are cheaper as well to allow compatibility among data communication equipment made by various manufactures, and interfacing standard called RS232 was set by the Electronic Industries Association (EIA). This RS-232 standard is used in PCs and numerous types of equipment .However, since the standard was set long before the advent of the TTL logic family, its input and output voltage levels are not TTL compatible. In RS-232 ,a 1 is represented by -3 to -25V,while a 0 bit is +3 to +25V,making -3 to +3 undefined. For this reason, to connect any RS-232 to a microcontroller system we must use voltage converters such as MAX232 to convert the TTL logic levels to the RS-232 voltage levels and vice versa. So here we are using this MAX-232 to have compatibility between the Zigbee and microcontroller.

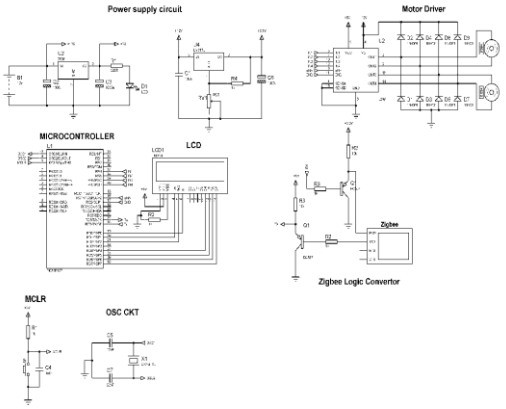

Fig 1. Block Diagram of Receiver Section

B. Transmitter Section

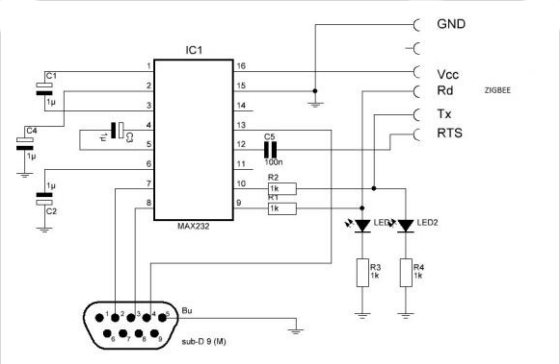

Fig 2. Block Diagram of Transmitter Section

ZIGBEE MODULE: ZIGBEE is the only wireless standards-based technology that addresses the unique needs of remote monitoring and control, sensory network applications. Sensors and controls don't need high bandwidth but they do need low latency and very low energy consumption for long battery lives and for large device arrays. There are a multitude of standards that address mid to high data rates for voice, PC LANs, video, etc. However, up till now there hasn't been a wireless network standard that meets the unique needs of sensors and control devices. There are a multitude of proprietary wireless systems manufactured today to solve a multitude of problems that also don't require high data rates but do require low cost and very low current drain.

This network has large number of nodes when compared to other technologies. It is easy to deploy and configure i.e., if any new node enters into the network it automatically senses and configure it. The Zigbee device is interoperable.

C. Application

1. Military applications
2. Industrial applications
3. Mines
4. Fire detection

D. Advantages

1. High secure
2. Fast response
3. Save human life's in wars

III. RESULT

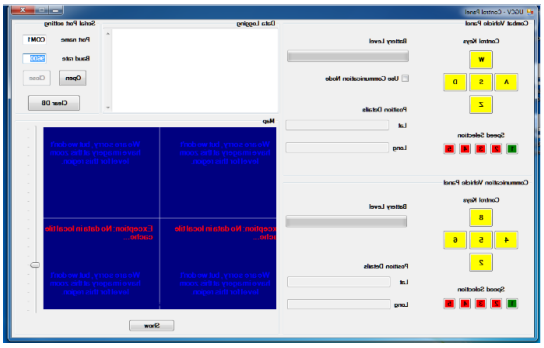

Fig 3. Monitoring and Control Application

Fig 4. Robotic System

- If there is no any obstacles in front of moving robot then it is sensing information to PC

- If any obstacles occurred in front of the moving vehicle then it is send information to PC and display on LCD.

IV. CONCLUSION

The paper "Implementation of Low Cost Remote Operated Unmanned Ground Combat Vehicle Using Relay Communication" Successfully designed. It has been developed by integrating features of all the hardware components used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Here using highly advanced IC's and with the help of growing technology the paper has been successfully designed.

V. FUTURE SCOPE

The paper " Implementation Of Low Cost Remote-Operated Unmanned Ground Combat Vehicle Using Relay Communication" By connecting a wireless camera to the Vehicle, then we can know the status of the Vehicle in our personal computers and also android mobile phones using Wi-Fi, GPRS technologies. We can use this Vehicle at so many fields and we can use to handle so many situations in real time.

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