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Tactical Information Management System for Manned Ground Vehicles

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ABSTRACT: Manned Ground Vehicles (MGV) are playing a vital role in Military Services. The main abstract of this project is proposed for provide a Tactical information Management system for manned Ground Vehicles using Vehicular ADHOC Networks (VANET). VANET is a perfect option for vehicle to vehicle communication to share the Information with each other. An Information Control Unit will be attached inbuilt with all manned ground vehicles to share the information. An Information Control unit consists of RSSI module in each of the tanker vehicle. The communication is enabled between the two tankers with the help of RSSI module and also the two tankers can communicate with the server simultaneously. When a failure detected in an manned Ground vehicle due to the enemy attack, the tactical information will be shared with the neighbored MGVS among the VANET about the status of failed MGV. The damaged MGV will be replaced immediately with the neighbor to fill up the gap using the Tactical information shared using the RSSI receiver and transmitter. The main theme of the project is that the tankers will be able to communicate independently with the other without any interference.

KEYWORDS: VANET, Inter Vehicle Communication, MGV.

I. INTRODUCTION

The project is mainly used for independent communication system for army tankers. The system consists of two parts, one is base station and the other is tanker nodes. There are about two nodes which shares their information independently. In addition to this, the main server can also be able to monitor the independent nodes. Since it is a manned ground vehicle, we are going to operate the vehicles manually from the base station. The information shared between these two tankers are, the distance between the two tankers and the destruction details. Every independent tanker will instantly share their information to one another and also to the base station.

The information can be sent and received using the RSSI module placed in the each of the tankers and also in the base station too. Each RSSI module consists of a transmitter and a receiver which sends and receives the signals respectively. Both the transmission and receiving process is done simultaneously.

If anyone of the tankers gets destroyed by the enemy (out of the topology), then the other tanker will get the information that the tanker is destroyed. This process occurs at a single instance.

II. RELATED WORK

The constraints on vehicle movements, varying driver behavior, and high mobility cause rapid topology changes, frequent fragmentation of the network, a small effective network diameter, and limited utility from network redundancy. These changes have implications for the IVC architecture at the physical, link, network, and application layers. Rapid changes in the Inter Vehicle Communication (IVC) network topology are difficult to manage. Unlike the redundancy in other MANETs, the redundancy in IVC networks are severely limited both in time and in function. The IVC network has an even smaller effective network diameter under source-generated routing P[1]

Vehicular ad hoc network (VANET) is an emerging type of networks which facilitates vehicles on roads to communicate for driving safety. The basic idea is to allow arbitrary vehicles to broadcast ad hoc messages (e.g. traffic accidents) to other vehicles. However, this raises the concern of security and privacy. Messages should be signed and verified before they are trusted while the real identity of vehicles should not be revealed, but traceable by authorized party. Existing solutions either rely heavily on a tamper-proof hardware device, or cannot satisfy the privacy requirement and do not have an effective message verification scheme. P[2]

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System which is carried out in a way that communication system in a manned ground vehicle is only using walky-talkies and the communication cannot be made within the tankers, communication can only made between the base station and the tankers. So in a battle when a tanker get destroyed or if any damages occurred the other tankers cannot able to know the current scenario of the other tankers. If the base station gets destroyed then the whole system gets collapsed Communication cannot be made independently. Time space is very high. If any of the tanker gets destroyed then the information of the tanker will be sent to the base station only, then from the base station only the other tankers able to know the status of the destroyed tankers. And so there will be no independent communication between the tankers. Since the communication takes many processes, the time taken for the response of the tankers gets increased.

III. METHODOLOGY

In this project, we proposed that, When the Radar is detecting a manned Ground Vehicle (MGV) by sending and receiving the reflection pulse from the MGV, the tactical information can be shared between the vehicles. Each vehicle will be monitoring by the neighboring nodes. The Scientific importance of the project is analyzing the performance of RSSI in ranging and detecting the neighboring vehicle, computation and Communication system with the RSSI output will be displayed in the base station and the LCD display which is placed inside the tanker.

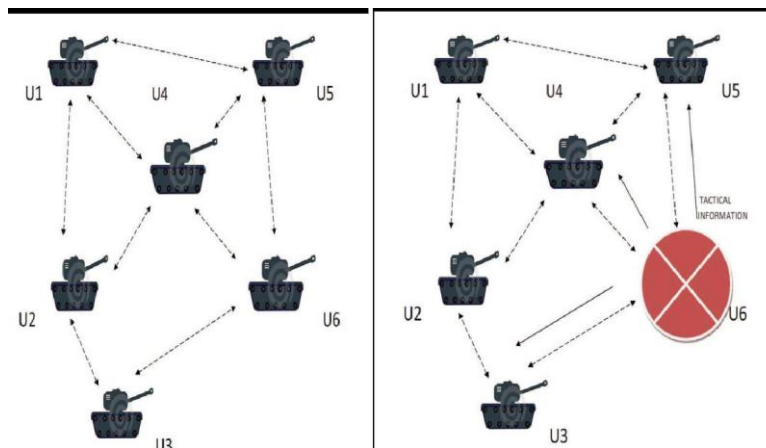


Fig.1 Node Topology

In this system we are introducing a network topology and make all the system connected to each other using RSSI module. In the RSSI module we have a transmitter and a receiver which will make communication between all the nodes independently. In this method all the tankers can individually share the messages and error reports between them and they can share all those information to the base station simultaneously.

Using this method we can able to act instantly when other tankers get destroyed the nearby tanker will automatically cover the place the destroyed tanker. A RSSI module is kept in the each tanker and all the system will be communicating independently. Each RSSI will transmit and receive the data from the other tankers. Using the base station or server we can able to control the all the nodes and the information of all the nodes will be displayed in the base station monitors simultaneously.

In these ROBOTS (Tankers) we have UART communication that will transmit and receive the information between the base station and the tankers simultaneously. The LCD's placed in these tankers will display the distance and the destruction details using RSSI module. The server is known as the base station for all the tankers which are connected in private topology. Since it is a manned ground vehicles, they are operated from the base station manually.

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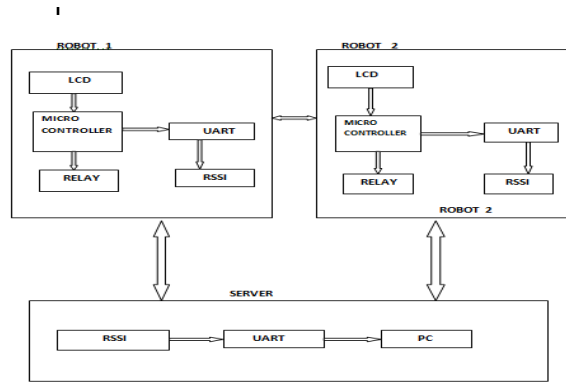


Fig.2 Block Diagram

AT89s52 MICRO CONTROLLER

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 80C51 instruction set and pin out. 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 non-volatile memory technology and is compatible with the industry-standard 80C51 instruction set and pin out. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes.



Fig.3 AT89s52 MICRO CONTROLLER

UART

A universal asynchronous receiver/transmitter is a type of "asynchronous receiver/transmitter", a piece of computer hardware that translates data between parallel and serial forms. UARTs are commonly used in conjunction with other communication standards such as EIA RS-232. A UART is usually an individual (or part of an) integrated circuit used for serial communications over a computer or peripheral device serial port. UARTs are now commonly included in microcontrollers. The Universal Asynchronous Receiver/Transmitter (UART) controller is the key component of the serial communications subsystem of a computer. The UART takes bytes of data and transmits the individual bits in a sequential fashion. At the destination, a second UART re-assembles the bits into complete bytes. Serial transmission of digital information (bits) through a single wire or other medium is much more cost effective than parallel transmission through multiple wires. A UART is used to convert the transmitted information between its sequential and parallel form at each end of the link.

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MAX232:

The MAX232 is an integrated circuit that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals.

The drivers provide RS-232 voltage level outputs (approx. ± 7.5 V) from a single +5 V supply via on-chip charge pumps and external capacitors. This makes it useful for implementing RS-232 in devices that otherwise do not need any voltages outside the 0 V to +5 V range, as power supply design does not need to be made more complicated just for driving the RS-232 in this case. The receivers reduce RS-232 inputs (which may be as high as ± 25 V), to standard 5 V TTL levels. These receivers have a typical threshold of 1.3 V, and a typical hysteresis of 0.5 V. The later MAX232A is backwards compatible with the original MAX232 but may operate at higher baud rates and can use smaller external capacitors – 0.1 μ F in place of the 1.0 μ F capacitors used with the original device.

RSSI

In wireless sensor networks (WSN) there are three main principles of measurement that can be used to obtain distances and to measure distance is necessary to obtain the position of the sensor node.

Three main principles are given below :

- Angle of Arrival
- Propagation Time Based.
- It includes - { Time of Arrival
 { Round Trip - Time - of - Flight
 { Time Difference of Arrival

Characteristics of RSSI

1. Received signal strength indication is a measurement of the received signals power.
2. Radio frequency signals: Power decreases with the distance. $\text{loss(dB)} = 20\log(d) + 20\log(f) + 32.45$, $d = \text{km}$, $f = \text{MHz}$.
3. It contains some cryptic macros so that it can work correctly with chips that use either the CC2420 or CC1000 radio.
4. It always forward the messages but modifies the payload by include the RSSI

Intercept Base

It is a modified version of the Base station component that provides the Intercept interface to allow the user application to inspect and modify radio and serial messages before they are forwarded to the other link and to decide whether they shall be forwarded or not.

Sending Node

Sending Node is the application to be put in the node that sends the message whose RSSI will be ready by the base. It contains a simple logic to periodically send a RSSI Msg.

Advantages of RSSI Method at Localisation

Various advantages of RSSI Method are:

1. No directional sensor like ultrasonic systems. Indoor and Outdoor usage.
2. Data communication and sensor usage at the same hardware.

UPPER LAYERS (ZigBee)

Above the physical and MAC layers defined by 802.15.4, the ZigBee standard itself defines the upper layers of the system. This includes many aspects including the messaging, the configurations that can be used, along with

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security aspects and the application profile layers. There are three different network topologies that are supported by ZigBee, namely the star, mesh and cluster tree or hybrid networks. Each has its own advantages and can be used to advantage in different situations.

The star network is commonly used, having the advantage of simplicity. As the name suggests it is formed in a star configuration with outlying nodes communicating with a central node. Mesh or peer to peer networks enable high degrees of reliability to be obtained. They consist of a variety of nodes placed as needed, and nodes within range being able to communicate with each other to form a mesh. Messages may be routed across the network using the different stations as relays. There is usually a choice of routes that can be used and this makes the network very robust. If interference is present on one section of a network, then another can be used instead.

Finally there is what is known as a cluster tree network. This is essentially a combination of star and mesh topologies. Both 802.15.4 and ZigBee have been optimized to ensure that low power consumption is a key feature. Although nodes with sensors or control mechanisms towards the center of a network are more likely to have mains power, many towards the extreme may not. The low power design has enabled battery life to be typically measured in years, enabling the network not to require constant maintenance.

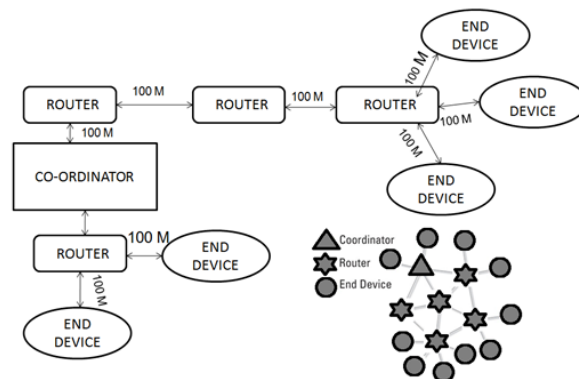


Fig 4.The ZigBee Network

KEIL Compiler Software

The **Cx51** Optimizing C Compiler is a complete implementation of the American National Standards Institute (ANSI) standard for the C language. **Cx51** is not a universal C compiler adapted for the 8051 target. It is a ground-up implementation dedicated to generating extremely fast and compact code for the 8051 microprocessor. **Cx51** provides the flexibility of programming in C and the code efficiency and speed of assembly language.

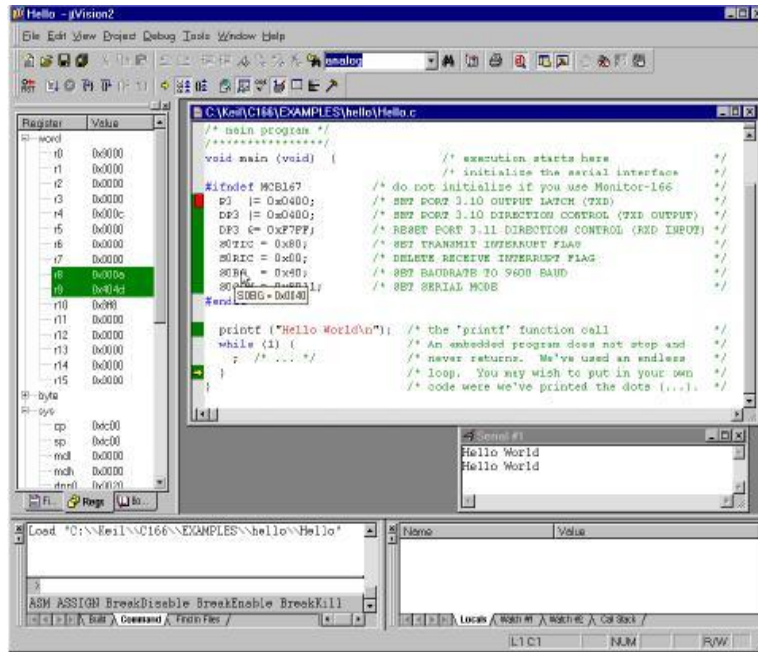
Since **Cx51** is a cross compiler, some aspects of the C programming language and standard libraries are altered or enhanced to address the peculiarities of an embedded target processor. The 8051 Family is one of the fastest growing Microcontroller Architectures. More than 400 device variants from various silicon vendors are today available. New extended 8051 Devices, like the Philips 80C51MX architecture are dedicated for large application with several Mbytes code and data space. For optimum support of these different 8051 variants, Keil provides the several development tools that are listed in the table below. A new output file format (OMF2) allows direct support of up to 16MB code and data space. The CX51 compiler is a variant of the C51 compiler that is design for the new Philips 80C51MX architecture.

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IV IMPLEMENTATION

In this project, we proposed that, When one MGV is detecting another Manned Ground Vehicle (MGV) by sending and receiving the reflection pulse (RSSI) from the MGV, the tactical information can be shared between the vehicles. Each vehicle will be monitoring by the neighbour nodes. The Scientific importance of the project is analyzing the performance and detecting the neighbour vehicle, computation of distance and Communication system with the neighbour node will be displayed in the Network Display Unit (LCD). The scientific Research will be developed to replace the fault Manned ground vehicle immediately using the tactical information shared with each other to attack the enemies without leaving any gap between the Manned ground vehicles.

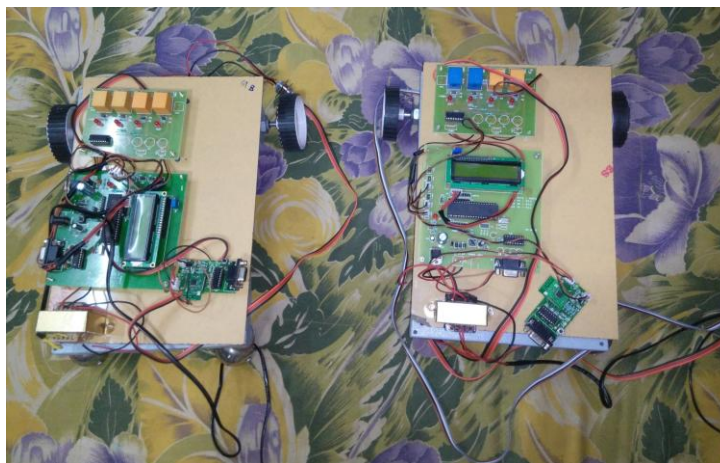


Fig .5 Hardware Image

When the Vehicular adhoc network formed, each node will be monitoring by the neighbour nodes. Each node will be communicating with each other with the help RSSI MODULES. Each node will be detecting the target by sending and

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receiving the radio pulse using RSSI modules. The LCD display unit will displays the information such as destruction and distance between the two neighbour nodes.

When a Manned ground vehicle is attacked by the enemies, the tactical information will be shared within the neighbour nodes. Immediately, the damaged vehicle gap will be replaced by the nearest node to avoid lagging and attacking the enemies without interference.

V. CONCLUSION

This paper provides more security and information sharing. The well-equipped RSSI module placed in the each of the node will be sending and receiving the signals and so the neighbour nodes will be easily detected by the other. And also the information such as distance and the destruction details of the other nodes will be displayed through the LCD display unit without the interference of the server. The main theme of this project is to reduce the time space between the MGV's and to enable a quick response against the others. Project can be used to make the tankers to communicate independently. By this we can make possible instant actions between the tankers. Since if any of tanker gets destroyed, it can be replaced by the new tanker in the existing node. Enemy tankers will not be able to interfere our systems as we are in our private topology. Future enhancement of our project is that we can make manned ground vehicles as unmanned ground vehicles. Man power will be considerably decreased by improvising in future. And so artificial intelligence will be having dominating future.

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