

ULTRASONIC RADAR NAVIGATION BY USING ULTRASONIC SENSOR

¹Dhanlakshmi C. Hedgire, ²S. S. Killarikar

¹M. E. Student, ²Professor

¹Department of Electronics and Communications Engineering,
¹M. S. Bidve Engineering College, Latur, Maharashtra

Abstract— Nation's security is an important factor in today's enemy warfare. To improve the war technique and reduce the man power this work is proposed. This paper is based on Ultrasonic radar navigation system. The important and vital role is played by military based surveillance radar which is implemented using ARM7 board. This paper deals with an idea of detecting the incoming object whether it is enemy or friendly using encryption and decryption techniques and if the detected object is enemy then it destroys the object. The ARM7 board is used for the reason of its low cost. The ultrasonic radar system continuously scans and detects object. It also determines the incoming object is friend or enemy using RC4 algorithm which is implemented in ARM7. RC4 is preferred due to its simplicity and speed and it can be efficiently implemented in hardware as well as software. Wireless IR transceiver module is used for security data transfer between transmitter and receiver.

Index Terms—ARM 7, RC4 algorithm, Ultrasonic Radar model, IR module, Ultrasonic Sensor, Visual basic (VB) software .

I. INTRODUCTION

Radio detection and Ranging (RADAR) are remote sensing system used in different applications such as commercial, scientific and military. Radar uses radio waves to determine the range, altitude, direction, or speed of objects in object detection system. Navigation is related to the process of monitoring and controlling the movement of a craft or vehicle from one place to another. Navigation plays very important role in border security system. The field of navigation includes categories like land navigation, marine navigation, aeronautics navigation and space navigation.

It is important to develop a complete independent system that will automatically recognize, track and destroy the incoming object in predefined area under surveillance which can also work in adverse environmental conditions where it is hard for a human soldier to fight with enemy. Entry restricted areas such as Line of Control need to be safe from enemies.

Cryptography is very important in border security system and it keeps every data confidential between sender and receiver so as data is more secured and no one can hack this data easily. In defence system to detect object accurately the combination of navigation technique and cryptography concept is used. For effectiveness of the system target accuracy is a critical factor. Encryption key is used for Encryption and this specifies how message is to be encoded. An authorized party is able to decode this encoded message using decryption algorithm, which can be only decoded with a secret decryption key.

II. BACKGROUND AND RELATED WORK

In paper [1], the objects can be detected, tracked and destroyed by capturing an image with the camera kept in some fixed suitable place, from which complete and clear view of the area under surveillance. It is very difficult to detect an object with the camera in adverse environmental conditions and in night situations. In paper [2], it detects exact kind of obstacles and its count by means of camera and image processing, the fundamental principles of radar and image processing are used in combination to make a system which prevent terrorism.

In paper [3], The RC4 algorithm is better than AES. The RC4 algorithm is well suited for real time processing because it is faster, easier than AES and energy efficient for encryption and decryption.

In paper [4] [5], the position of missile navigates as per the user's requirement by sending the co-ordinates through pc based server on the base station. For security purpose encryption is done with RC4 algorithm and pic microcontroller is used. It uses Human Computer Interaction and Visualization technology. The most important factor is security of data for military applications and it is done by entering the position, an angle of missile and giving directions such as forward/ reverse, left/ right directions of missile onto user interface. For secured data transfer zigbee module is used [6].

In paper [7], the distance is measured between ultrasonic transmitter and receiver units mounted at a small distance by using ultrasonic sensors and microcontroller. Ultrasonic sensor is having low cost hence it is used for measuring the distance. Ultrasonic sensor transforms an electrical signal into ultrasonic waves and vice versa, same sensor can be used for transmitter part as well as receiver part [8]. Ultrasonic sensor is applicable in many areas like in private housing, health care, defence system. RADAR are remote sensing system with military, scientific and commercial applications, EM waves are sends by the Radio detection and ranging. Some developments of radar are Radar networks, Security and privacy, Navigation and positioning (localization), In-network information processing, Target detection and tracking and other various applications [9].

III. PROPOSED SYSTEM

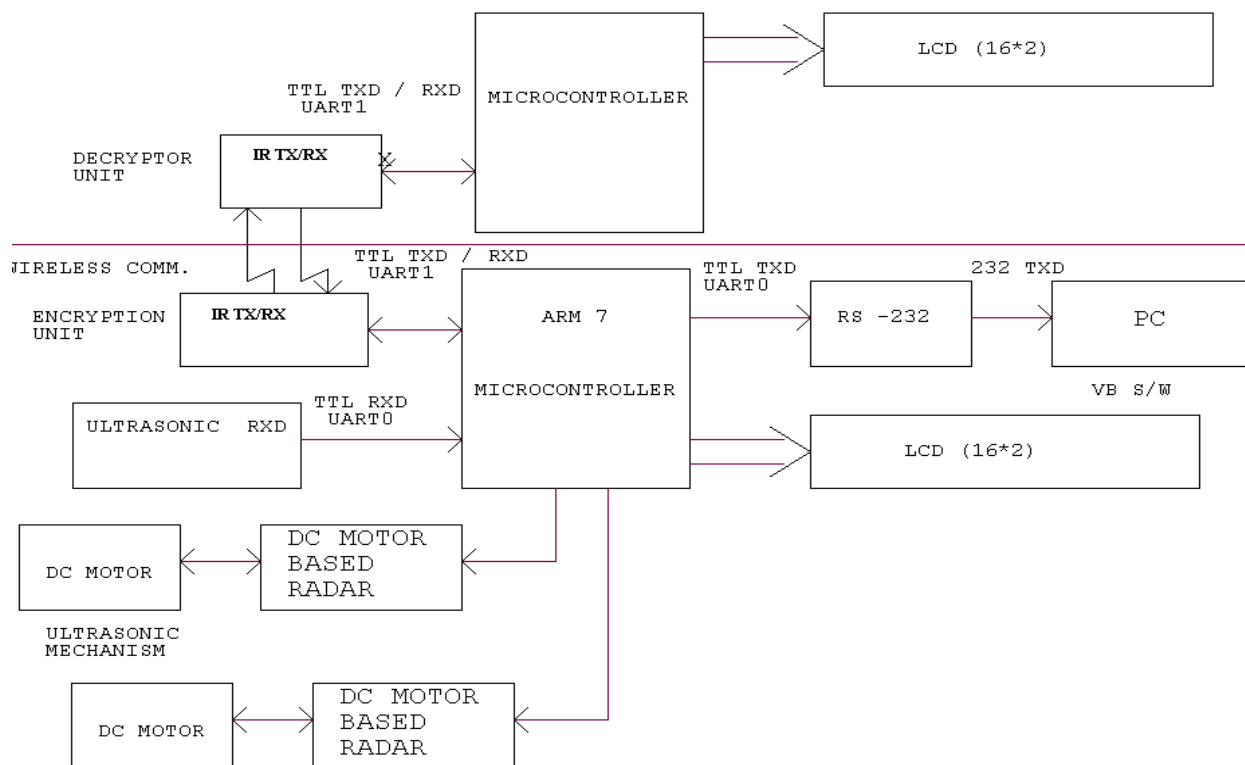


Fig. 1 Block Diagram of the system

The above Fig. 1 shows the block diagram of proposed system in which lower part of the diagram is transmitter side and the upper part of diagram is receiver side.

IV. HARDWARE DESCRIPTION

The hardware can be described in 3 units.

Tank unit:

Here we are making a robotic tank unit which is having 2 DC motor based tires and which helps to move the radar in forward, reverse, left and right direction.

Ultrasonic based Unit:

Here we are developing a radar unit which will have a DC motor and which will rotate in 360 degrees in clockwise as well as anticlockwise direction. The DC motor continuously rotate the whole mechanism containing the ultrasonic radar model and ultrasonic sensor will continuously send and receive the ultrasonic waves (of 40 KHz). The Doppler effect is used to calculate the distance and measured distance is directly given to the ARM μ C. The ARM μ C receives the distance from ultrasonic sensor serially and transmits it to on board PC. The PC is having VB software used to show the position of the incoming object graphically and it will continuously monitor the obstacles distance, distance and angle reading can be viewed on it send by the μ C. The μ C will then calculate the distance and display the object distance on LCD. If the measured object distance is less than the threshold then the radar stops and the ARM7 will send an encrypted frame wirelessly towards the approaching tank unit through IR transceiver. The IR module will transmit the encrypted frame wirelessly. The range is 5 meters.

Approaching Tank Unit:

Here the ARM7 μ C is interfaced to the IR transceiver unit and when the encrypted frame is received by the ARM7 μ C via IR module, the received encrypted frame is decrypted by on board μ C and then sent back to the tank using the same IR module.

V. ADVANTAGES

1. Its distance measurement resolution is high. Its measurement updates fastly.
2. It also works in many types of weather and atmospheric conditions.
3. Less time delays and Quick response time.
4. The RC4 algorithm used for encryption and decryption Provides speed and simplicity which efficiently implemented in both software and hardware.
5. RC4 is fast, and it is applicable in real time processing.

VI. CONCLUSION

This paper gives accurate detection and authentication of target object. The accurate target object is detected by the ultrasonic radar model and RC4 algorithm is used to determine the detected object is friend or enemy. RC4 algorithm is easier, fast and also provides more security. In this paper, the radar having two main parts that is transmitter and receiver. IR transceiver is used for wireless communication between transmitter and receiver. PC is having VB software which continuously scans and monitors the position of obstacle. It gives the visual description of incoming object. However image processing proves to be time consuming for fast detection of objects as well as

become difficult in adverse weather condition, hence this system becomes very useful in night situations, adverse weather condition or smoky battlefield environment where human eye is unable to identify the incoming object.

REFERENCES

- [1] Amit Kenjale, "Automatic Object Recognition, Tracking and Destruction for military application," 2013 World Congress on Information and Communication Technologies.
- [2] Supriya Kunjir Rajesh Autee, "Terrorist Scanner Radar Along with Camera using Ultrasonic Frequency and Multiple Object Detection," International Journal of Advanced Research in Computer Science and Software Engineering Volume 5, Issue 9, September 2015.
- [3] Nidhi Singhal¹, J.P.S.Raina², "Comparative Analysis of AES and RC4 Algorithms for Better Utilization," International Journal of Computer Trends and Technology- July to Aug Issue 2011.
- [4] Kulkarni Laxmi G. and Dawande Nitin A., "Secured communication for missile navigation" International Journal of Engineering research and General Science volume 2, Issue 4, june - july,2014.
- [5] S. W. Khole, S. P. Chincholkar, E. M. Chaudhri, "Secured Missile Navigation," International Journal Of Pure And Applied Research In Engineering And Technology, Vol. 3 (9), May 2015.
- [6] Murumkar Govind, Nikumbh D. M., "Smart Secured Wireless Communication For Missile Navigation Using RC4 Algorithm," International Journal of Scientific Research and Engineering Studies (IJSRES) Volume 2 Issue 2, February 2015.
- [7] A. K. Shrivastava, A. Verma, and S. P. Singh, "Distance Measurement of an Object or Obstacle by Ultrasound Sensors using P89C51RD2," International Journal of Computer Theory and Engineering, Vol. 2, No. 1 February, 2010.
- [8] Mansoor-Ul-Hassan Siddique, "Ultrasonic Radar and Its Applications," Proceedings of the 9th WSEAS International Conference on Applied Informatics And Communications (AIC '09).
- [9] Chetana Singh¹, Abha Agnihotri², Pallavi Patel, "Development Of Radar Using Ultrasonic Sensor," International Journal Of Advance Research In Science And Engineering Ijarse, Vol. No.2, Issue No.10, October 2013.

