ADVANCED BORDER SECURITY ALERT FOR FISHERMEN AND SMART DATA TRANSFER USING RF

Ms.Arul Vysiya KG[1], E. Gurunath[2], Hemavathi Yoganathan[3] , A. Nandha Kumar[4]

[1]Assistant Professor, Dept. of Electronics and Communication Engineering, Dr. NGP Institute of Technology, Tamil Nadu, India

[2,3,4]IV Year, Dept. of Electronics and Communication Engineering, Dr. NGP Institute of Technology, Tamil Nadu, India

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Abstract - *Here is a solution for fishermen. In day-to- day life, a lot is heard about many Tamil fishermen being caught and put under Sri Lankan custody and even killed. Here, a system is designed using embedded system which protects the fishermen by notifying the country border to them, by using Global Positioning System (GPS), GSM and RF transceiver. A GPS receiver is used to find the current location of the fishing boat or vessel. Using GPS, the current latitude and longitude values can be found out and is sent to the microcontroller unit. Then the controller unit finds the current location by comparing the present latitude and longitudinal values with the predefined value. From this result of the comparison, this system alerts the fishermen of their reach to the nautical border and to trigger an alarm which consists of a Piezo-buzzer to circumspect the fishermen. If the boat is in normal area, then the LCD displays normal zone. Thus, it can be made clear that the boat is in normal area. In case, it moves further and reaches the warning zone, the LCD displays warning zone and the boat gets shutdown by using fuel injector. Once the engine is off, then we can restart engine by sending message from coast guards satellite network to the registered sim into the boat. A RF transceiver is used to transmit the data. In the first step, the data is transmitted under 100km from the port. By using this, the GPS data is transmitted to the coast guards and to their family members by using GSM module and RF transceiver*.

Key Words: **GPS, GSM, RF Transceiver, Controller, DGPS.**

1.INTRODUCTION

Global Positioning system (GPS) provides a wide range of navigation and timing services. With the combined terlocked usage of the GSM technology, it can be used for border security, tracking of boats and ships in the oceans and in the seas. The current issue of Indian fishermen of being abducted by the Srilankan navy is of serious concern. This paper serves as a benefit for these people where a DGPS system is attached to the boat which in turn is connected to an alarm device. The DGPS receives the topographic location of the boat in the sea and then triggers an alarm if the border of the country is crossed by the boat. Topographic location of a country's border can be obtained with the information of the latitude and longitude of the place and position of the boat. The borders of each country are defined in two levels. The first level extends till a certain distance in the sea and it is called as the National border of the country. Succeeding the natio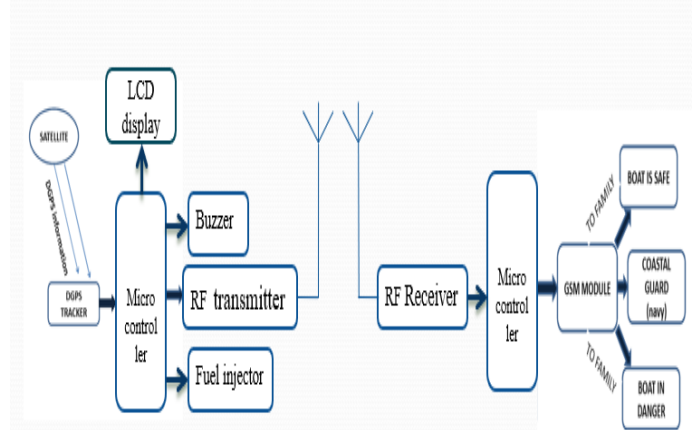nal borders and just a few kilometers towards is the International borders. The additional advantage from the existing border alert systems that are already imparted is that, the interlock of the GSM where minute by minute position of the boat can be received through an SMS to the family members from the control room through the use of DGPS. But, earlier systems employed infrared radiations which proved to be quite disadvantageous and difficult to use. The DGPS report is also sent to the control room from which the location of the boat can be tracked, in case it is lost in the seas. The paper uses a GPS device, GSM, microcontrollers and an alarm system to alert the fishermen whenever the border is crossed by unauthorized means. The number of fisherman abducted by the Srilankan navy scenario is shown below: The existing system is a low cost maritime border crossing alert system mainly focused on the small scale fisherman who lives just near to the poverty line. This system includes data collection unit, processing unit, controlling unit and transmission unit. The data collection unit consists of location detection components like transmitter and other components attached in the boat that accomplishes the vessel localization by collecting the geographical positions. The processing unit holds the set of latitude and longitude values of the sea in the form of databases that can be used for comparing the present boat position with legal border limits. The controlling un in the sea shore (remote station) from where the decision has been made if the vessel crossed the maritime border. All the communication among these three units is handled by transmission unit.

1.1 PROPOSED BLOCK DIAGRAM

1.2 BLOCK DIAGRAM DESCRIPTION

Part 1 depicts the transmitter side. The DGPS tracker plots the exact location by getting the details using the satellites. It is then sent to the microcontroller (CC 3200). By comparing the values with the predefined set of values, the LCD displays whether the boat is in safe zone or danger zone. The engine automatically gets shut down when it is in the range of 1 KM to the danger zone. The engine is shut down by using the fuel injector. And the buzzer automatically rings. The RF transmitter sends the information to the to the RF receiver. Further action takes place in the receiver side. Part 2 depicts the receiver side. It receives the information from the transmitter. The RF transmitter sends the information to the microcontroller (MSP 430). It further sends to the GSM module. From the GSM module, the message is sent to the coastal guards and the family members based on the location of the boat, whether it is in safe mode or danger mode.

2. RELATED WORKS

1. Gui Gao, Yongbo Luo, Kewei Ouyang, and Shilin Zhou- The high-resolution dual-polarization synthetic-aperture-radar images are produced by the PMA detector which is used in detecting ships. A new probability density function to characterize the PMA statistics of homogeneous sea surfaces is considered. By using the new density and multiplicative model, the PMA detector's statistical model for nonhomogeneous sea surfaces is specified and demonstrated to be the $G0$ distribution.

2. Armando Marino and Irena Hajnsek- The ship detection is the most important topic in remote sensing, and synthetic aperture radar (SAR) has a valuable contribution, allowing detection at night time and with almost any weather conditions.   Polarimetry can play a significant role considering its capability to discriminate between different targets. Recently, a new ship detector exploiting polarimetric information has been developed, namely, the Geometrical Perturbation–Polarimetric Notch Filter (GP–PNF). The work is mainly focused on devising two statistical tests for the GP–PNF. The latter one allows an automatic and adaptive selection of the detector threshold. Firstly, the probability density function (pdf) of the detector is analytically derived. Later, the Neyman–Pearson lemma is exploited to set the threshold calculating probabilities using the clutter pdf (i.e., a constant false-alarm rate) and a likelihood ratio.

3. Armando Marino, Shane R. Cloude and Iain H. Woodhouse- - Target detectors which use the polarimetry are focused on single targets, since it can be characterized in a deterministic way. The algorithm proposed in this paper is aimed at the more difficult problem of partial-target detection (i.e., targets with arbitrary degree of polarization). The authors have already proposed a single-target detector employing filters based on a geometrical perturbation.Therefore, to enhance the algorithm to the detection of partial targets, a new vector formalism is introduced.

4. Armando Marino, Shane R. Cloude, and Juan M. Lopez-Sanchez-In the contemporary world, the anthropogenic influences on ecosystems are central points to understand the evolution of the earth. A polarimetric synthetic aperture radar might have a significant contribution in tackling problems concerning land use change, since such data are available with any-weather conditions. Moreover, the discrimination capability could be enhanced by the polarimetric analysis. An algorithm able to identify targets scattering an electromagnetic wave with any degree of polarization has been developed recently, which makes use of a vector rearrangement of the elements of the coherency matrix. In the present work, this target detector has been modified to perform change detection between two polarimetric acquisitions, for land use monitoring purposes.

5. Delphine Cerutti-Maori, Ishuwa Sikaneta, and Christoph H. Gierull- The paper uses an optimum processing method for ground moving-target indication (GMTI) using a multichannel synthetic aperture radar (SAR) system. This method enables efficient detection of moving objects and accurate estimation of their parameters and does not require any knowledge of the street network. The processing is applied to data acquired with the Canadian RADARSAT-2 satellite. Results of the performed trial are compared with the expected GMTI performance of the radar in order to validate the theory.

6. Valeria Gracheva and Joachim Ender- One of the efficient methods to detect slow targets with low signal-to-clutter-plus-noise ratios is space–time adaptive processing (STAP). In order to apply STAP to maritime radar systems, the multichannel properties of sea clutter are to be known. This paper investigates these characteristics for airborne microwave radar systems that are used to detect vessels in the open sea. It is shown that the motion of sea echoes and different sea scattering types cause different multichannel properties of sea clutter compared with land clutter.

7. Eduardo Makhoul, Antoni Broquetas, Josep Ruiz Rodon, Yu Zhan, and Francisco Ceba- This paper proposes a new optimized multichannel synthetic aperture radar (SAR) configuration which is based on receiving antennas with nonuniformly displaced phase centers, intended for ground moving target indication (GMTI) applications over maritime scenarios. This system is compared with current SAR transmissions, such as TerraSAR-X (TSX) or TanDEM-X (TDX). The GMTI capabilities of the different configurations are analyzed in a two-level performance approach.

8. Delphine Cerutti-Maori and Ishuwa Sikaneta- This paper mainly generalizes the well-known displaced phase- center antenna (DPCA) method for efficient ground moving target indication (GMTI) using a two-channel synthetic aperture radar (SAR) to any multichannel SAR/GMTI radars independent of the number of receive channels. This method of processing is called as extended DPCA (EDPCA) is derived in this paper and is applied to data acquired with the Canadian RADARSAT-2 satellite.

9. Vilhelm Gregers-Hansen, Rashmi Mital- The main characteristic of radar sea clutter, important for radar performance evaluations, is its apparent reflectivity defined as ¾± (m2=m2). "Apparent" here can be used as a reminder that any measurement of sea clutter reflectivity includes the effects of propagation and shadowing close to the sea surface. Sea clutter reflectivity depends on many factors, including sea state, wind velocity, grazing angle, polarization, and radar frequency.

10. Diego Cristallini, Debora Pastina, Fabiola Colone, and Pierfrancesco Lombardo- An innovative scheme is presented for moving target detection and high-resolution focusing that is used to exploit a bank of chirp scaling algorithms (CSA), each one is matched to a different along track target velocity component. The new scheme is thought for multichannel (MC) synthetic aperture radar systems, to provide a high-resolution focusing of the moving targets.

11. Wentao An, Chunhua Xie, and Xinzhe Yuan- This method is to eliminate the influence of target returns on the estimation of local sea clutter distributions, an improved iterative censoring scheme (ICS) for constant false-alarm rate detectors has been proposed with two modifications. initially, the proposed ICS censors out both target pixels and their four-connected neighborhood pixels from the estimation of local sea clutter distributions. Second, a novel initial detector is proposed to improve the convergence speed of ICS.

12. Marina Gashinova, Liam Daniel, Stanislav Hristov, Xiaoyong Lyu, Andrew G. Stove and Mikhail Cherniakov- The feasibility of a bistatic passive maritime surveillance system based on the use of communication satellites as illuminators of opportunity is considered and confirmed experimentally. A theoretical comparison of the characteristics of a radar using Inmarsat and Iridium signals as donors has been performed. The procedure of enhancing the range resolution by coherently combining available scarce active communication channels in the frequency domain is presented with the example of the Inmarsat I-4 satellite Broadband Global Area Network (BGAN) signals.

13. Gulab Singh, Sang-Eun Park, and Hirokazu Kobayashi- A method is proposed that improves the constant false alarm rate (CFAR) detection of targets in a nonhomogenous clutter environment. Clutter data from neighboring cells might have an edge with unknown location dividing data samples into two parts with different independent and identically distributed (IID) Weibull distributions. An automatic clutter edge localization is proposed which allows us to eliminate the outlier/misleading data, and thereby improves the CFAR detection performance. A CFAR detector (CFARD) which uses this estimator is also suggested.

14. Yi Cui, Jian Yang, Yoshio Yamaguchi- The statistical behavior of the sea clutter in synthetic aperture radar (SAR) images is characterized by both the marginal distribution and the spatial correlation. However, simultaneous modeling of the joint information remains a difficult job because of the non-Gaussian clutter nature. In this paper, a semiparametric approach is proposed for addressing this problem.

15. Yinghua Wang and Hongwei Liu- This paper presents a new hierarchical scheme for detecting ships from high-resolution synthetic aperture radar (SAR) images. The scheme consists of two stages: detection and discrimination. In the detection stage, the existing internal Hermitian product is extended to obtain a new detector. The new detector makes a combined use of the complex coherence among more than two subapertures and the intensity of each subaperture. When the subaperture number is increased, the target/clutter contrast is shown to be improved. Ship candidates are obtained by applying a threshold. Ship discrimination is performed by using one-class classification.

3. CONCLUSIONS

The proposed system can be used for the protection of Indian fishermen. Since this system has better efficiency, it has good data transmission which helps the fishermen for their safety. The high range helps for the protection of fishermen and also helps them retain in safe zone.

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