ABSTRACTS
of the scientific works presented from
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5.3 Communication and computer technologies
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I. PhD Thesis

1. Sivkov, Y.A. Digital signal processing methods in hydroacoustic systems, Nikola Vaptsarov Naval Academy, Varna: 2017.

Abstract:

The topic of this dissertation is related to the problems of modern hydrolocation in part and to the hydrolocation recognition of signals, methods and means for solving them.

The relevance of the topic is determined by the needs of the Navy for an adequate system for carrying out sonar detection. Striving to improve the technical means and software for solving the problems of classification of objects in the aquatic environment. The need to automate operations related to sonar surveillance and recognition using the implementation of the latest years of processing and recognition theory.

Last but not least, the ability to process large amounts of data close to the real time and to achieve greater flexibility due to the use of software processing.

The use of sonar detection is mainly in the military field, leading to the lack of a large number of publicly available publications and developments. There are partial studies in the literature and mention of the use of different methods for solving these problems, but this is not enough to obtain a methodology and algorithm for the operation of such a system. The latter leads to a decrease in the possibility of building an expert system for modernization of the available in the Navy of the Republic of Bulgaria.

The subject of the dissertation is the methods for digital and statistical processing and recognition of the signals received from passive sonar in the course of sonar surveillance and the software for their realization. All experiments were performed with available acoustic recordings used by the Navy, as training developed by institutes in Russia and the USA. The introduction of all non-digital data is carried out in NVNA as part of the present work.

II. Dissertation publication.

2. **Draganov A., Sivkov Y. Recognition and development trends - Relevance for the Bulgarian Navy, Maritime scientific forum, Varna: 2006, Vol. 3, pp. 322-328, ISSN 1310-9278.**

Abstract:

In contemporary surveillance tasks, the recognition process and the proper classification of targets are central. This is especially true in passive hydroacoustics because of its strong military use, and an area in which high probability of proper detection and classification is required.

In the last 10-15 years, there has been a shift from widely used recognition methods, such as the use of a hydroacoustic operator and the Bayesian approach to neural network methods and artificial intelligence. The last two approaches are characterized by a very high probability of recognition, a flexible continuous self-learning algorithm and a high degree of integration.

3. **Draganov, A., Alexandrov, Ch., Sivkov, Y. Neural networks for recognition. Feature space and structure, Maritime scientific forum, Varna: 2006, Vol. 3, pp. 329-338, ISSN 1310-9278.**

Abstract:

Over the past decade, automatic information processing and surveillance have undergone rapid development and the emergence of new and powerful digital technologies.

Artificial neural networks are one of the main focuses in this field and, because of their high efficiency, are a preferred way to solve recognition and classification problems. The main task in the implementation of a neural network is to determine the sign space, ie. the signs by which we will recognize the observed objects and the resulting multilayer structure and activation functions.

Implementation in the field of passive hydroacoustics is a specific field, but it gives a generalized idea of the capabilities of this type of systems and their applicability in other fields, such as space observations and research.

4. **Sivkov, Y. An approach in the recognition of passive hydroacoustic signals. Acoustic Journal, Sofia: 2006. ISSN 1312-4897.**

Abstract:

The use of algorithms modeling a well-trained operator aims to achieve the high precision achieved by it, as well as to create systems that are understandable in structure and mode of operation.

Modern methods, such as INM, require the formation of a sign space that describes the observed objects uniquely, and the use of such algorithms significantly increases the likelihood of correct classification and reduces processing time.

The algorithm is also applicable in other fields, such as vibration analysis, taking into account the specificity of the investigated signals.

5. **Georgiev, G., Sivkov, Y. Analysis of spectral and temporal characteristics of real noise of different types of ships and submarines using Matlab. Maritime scientific forum, Varna: 2006, Vol. 3, pp. 339-343, ISSN 1310-9278.**

Abstract:

The report looks at records of ships and submarines, using statistical and spectral analysis of the digitized data using the Matlab software.

A comparison of the characteristics of different objects and their differences on this basis was made. Subsequently, these data can be used to identify and identify them in a real environment.

6. **Sivkov, Y.A., Draganov, A.G., Nikolova, M.N. Spectral and statistical analysis of underwater acoustic signals - XLI International Scientific Conference on Information, Communication and Energy Systems and Technologies ICEST 2006. Sofia, Bulgaria, 29.06-01.07.2006, pp. 348-352. ISBN-13: 978-954-9518-37-5**

Abstract:

Basic characteristics of underwater acoustic signals are received through spectral and statistical analysis. Precision of this processing in sonar systems is very important for current requirements which are applied to them. The decision offered to solve the problem is consistent with these requirements and the current state of digital and computer technology.

III. Habilitation work – Monography – (B.3)

1. **Sivkov, Y.A. Transformation of the vessel network from sensor-based to an information-based model, Varna, 2019, EtiketPrint, ISBN 978-619-7428-38-4.**

Abstract:

The modern ship is a complex system that needs constant monitoring of a large number of different parameters and the transmission of information about their change. The transition from NMEA 0183 to the NMEA2000 protocol ensures network connectivity between the individual sensors and the transmission of information received by them to unified information displays.

The ship can be considered as a complex technical system made up of many mechanical and electrical systems, as well as a complex information system. The latter requires the establishment of an appropriate information structure including a transmission system, information processing units, interfaces for the extraction and provision of data from and to external users / systems. The requirements for such a system include the following main points:

security - modern methods of access management, data encryption and lack of direct connection between the received and acquired information are used;

multitasking - the ability to work with different users with access to information specific to their needs, such as content and mode of delivery;

modularity - any part of the system can be replaced independently of the others by upgrading with new resources or capabilities within a very short timeframe and without the need for infrastructure replacement;

scalability - the ability to add computing resources and new services without interrupting the system;

timely updating of services - in dynamically changing markets and transport requirements, the crew needs a rapid change of information systems, both at the level of services offered and at the level of integration with third systems.

The proposed approach places users at the center and subordinates the system's requirements to their needs. In the current situation, users of information are obliged to take into account the limitations of the indicators, such as possibilities and space, as well as the lack of possibility to flexibly upgrade the system with additional sensors, as well as receiving information with subsequent combined processing and display from external sources.

IV. Publications (G)

Scientific publications indexed by world-renown referencing databases (G.7)

1. Sivkov, Y.A., Building maritime data hub by using Arduino IoT platform, IAMU AGA 2017, Varna, Bulgaria, Volume I, pp 533-540, ISBN 978-954-8991-95-7.

Abstract:

The study of marine resources, the status of water bodies and others is directly related to the measurement of a large number of parameters and further processed individually or as dependent on each other. Failing due to objective reasons / lack of power, lack of sufficient computing resources, excessive appreciation in the presence of expertise in place, the need to obtain data from several points split in space and sometimes in time / to perform data processing in the place of collection is implemented different platforms that have several types of sensors. This requires the use of a single system for data collection and consolidation and unified message for transmission to the expert control system.

With the integration of data from different types of sensors must be considered interfaces and standards used in equipment platform to collect data and in accordance with world standards in the production of electronic equipment for the marine industry is seen dominance of standard NMEA 0183 -HS and NMEA 2000 communication of these sensors and the system for collecting information.

In some cases used sensors are not realized by providing output NMEA standard, which requires a transformative device that interface to NMEA. This approach allows for the implementation of each sensor network used in shipping than one side. On the other allows for the realization of a system for collecting and processing data, which have unification of input interfaces to reduce the cost and scalability.

For transformation of the interface need a device with the ability to customize the algorithm of conversion depending on the input data, such as configuration must allow dynamic change in the course of work. Most suitable for this purpose is a module based on a microprocessor that supports current market sensor interface and sufficient processing power to perform the conversion without added lag.

The proposed solution gives flexibility when working with different types of sensors, as well as the ability to process only the software package for compatibility with the different NMEA standards. Expansion of the set of sensors combined with the ability to use the created hub for all available and incoming protocols, as well as the ability to operate independently, as a system for collecting, processing, storing and transmitting received data shows the adequacy of the use of modern Arduino platforms.

2. Alexandrov, C., Tsvetkov, M., Kolev, N., Sivkov, Y.A., SENTINEL - 1 for inland waterways traffic monitoring, XX-th International Symposium on Electrical Apparatus and Technologies, SIELA 2018, Proceedings, pp. 7-10, ISBN 978-1-5386-3419-6, 2018, DOI: 10.1109/SIELA.2018.8447125.

Abstract:

The present paper contains information on radar observation of Danube river by using satellitebased Sentinel – 1 Synthetic Aperture Radar (SAR) and incoherent pulse radar installed on the Bulgarian bank near city of Ruse. Radar pictures from both sources are presented in the paper. Distance and azimuth resolutions of both radars are examined as well as the quality of pictures with respect to target detection, ranging and identification

Sentinel -1 project is a part of Copernicus join initiative, introduced by European Commisson (EC) and European Space Agency (ESA). The project objective is radar observation of the Earth surface and consists of two near polar – orbiting satellites for C-band synthetic aperture radar imaging. Within the Copernicus initiative, ESA offers free access to Sentinel – 1 imagery and to data processing tools. The images used in this research were produced in Interferometric Wide swat mode (IW) with dual polarization.

Validation of space-based SAR images is usually carried out by using information from ground-based navigational systems such as Automatic Identification System (AIS), Radar surveillance systems, CCTV, etc., all integrated in so called River Information Systems (RIS). The integration of SAR images with RIS data in order to achieve near-real and global surveillance is the best approach, as the collected information is complementary. Validation could be implemented by using some criterions, as position, size, orientation/movement vector, etc. The general condition is given as:

$$(1)\ P(SAR) - P(RIS) = B\ ,$$

where P(…) is specific parameter, provided by the selected source and B is the threshold value determining the validation criterion.

Scientific publications in non-indexed journals or in edited collective proceedings (G.8)

1. Sivkov, Y.A., Draganov, A.G. Application of multi-static sonar systems in the Black Sea region and Bulgarian Navy, Scientific works – NVNA; Varna: 2005; ISSN 1312-0867; pp. 119-123.

Abstract:

Multi-static sonar systems are one of the promising areas in hydroacoustics and many leading countries are building similar ones on their territory as well as mobile ones. This report provides an overview of the advantages and disadvantages, the principle of operation, the structure of the receivers and the application and implementation of multistatic systems.

In the Collective Security System (NATO) system and its commitments to its partners, and in today's political environment, building such a system is one of the high priority projects for implementation. Another factor determining the construction of the MSS is the technically and morally outdated military equipment and the need for modernization, as well as the possibility of retrofitting existing military equipment models and integrating them into a similar system.

Particularly relevant are the MSS when escorting transport vessels carried out by the forces of several Pact Member States and using the active systems of the transmitter ships, and the passive submarine hydroacoustic station as a receiver.

The Black Sea coastal zone has characteristics, flat terrain bottom and muddy rocky character that allow the construction of the MSS and its full use. This part of the water area has a relatively small depth of up to 200 m in the adjacent coastal zone and the detection of modern low-noise submarines is practically impossible with existing conventional means. Localization of targets is also hampered by the steadily increasing number of ships sailing in the Black Sea, creating a high-level ambient noise environment that impedes the operation of passive hydroacoustics.

It can be summarized that, despite their higher complexity, MSS have no alternative in combating submarines and submarines in coastal and port areas due to the high levels of ambient noise and muddy water. In modern digital microprocessor systems, complexity and speed do not pose a serious problem, but with the use of mass production elements (processors, etc.) that meet the technological requirements make MSS the optimal variant of a sonar monitoring system.

2. Kostadinov K., Sivkov Y.A. A modern approach to implementing an integrated ship monitoring and control system, Annual of “Konstantin Preslavsky” University,Shumen, Vol. I E, Shumen, 2010, ISSN 1311-834X, pp. 26-33

Abstract:

With the development of modern microprocessor and computer technologies it is possible to integrate the information received from all sensors and to create a unified

system for managing the individual systems of the ship. Using the Ethernet network for a medium to transmit data and information from sensors would save considerable financial resources and physical space.

The proposed system is only a fundamental approach in building an integrated system. The proposed standards for the exchange of data and elements for the construction of the various units significantly exceed the requirements for the current needs in the ship, thus creating a stock of performance, which in turn guarantees the development and upgrading of the existing system according to the emerging needs.

3. Sivkov, Y.A, Tsvetkov, M. E-learning in the disciplines of the Department of Electronics at Nikola Vaptsarov Naval Academy. Lessons learned. Maritime scientific forum, Varna: 2012, pp. 146-150, ISSN 1310-9278

Abstract:

This publication examines current trends and teaching practices at leading universities, globally and nationally, with relation to the and use of electronic-assisted and distance learning.

A comparative analysis of the existing Learning Management Systems has been made, and as a result of the analysis the optimal system for integration into the learning process in the Electronics department of Nikola Vaptsarov Naval Academy. At the moment, the system has introduced teaching materials for eight courses, mainly used for: assigning / collecting assignments, electronic forms of exercise reports, presentations and electronic versions of the lecture material, additional materials for the discipline in electronic form, links to additional electronic materials, sample tests and information on course and course evaluation, interactive tools for communication between the teacher and the trainees, or between the trainees themselves, as well as conducting current control and semester exams in the form of tests.

The materials in the system are based on the curricula for accredited specialties at Nikola Vaptsarov Naval Academy and are accessible to all students after registration, approval by an administrator after checking for the current status and enrollment in the respective discipline by an administrator or a teacher.

The use of e-learning in the electronics departments complements current practices, allowing a faster assessment of the positive or negative effects of introducing new elements into the learning process.

It is recognized that the following results have been achieved as a result of the introduction of the system: improvement of students' independent work; increasing the efficiency of test procedures; reducing the use of “unregulated” resources in the learning process; better access of students to the educational content regardless of the paper: lectures, presentations, protocols, etc .; possibility for interactive communication through the system; adding additional assignments / tests to supplement and retain students'

attention to the learning process; the opportunity to prepare students without physically engaging with the information carrier or the venue alone.

The most significant result of the introduction of the system is a tendency to increase the success of the students.

The main advantages are: reducing the time for conducting, checking and giving the result of tests in case of high flow of students is reduced to the time for conducting; the lack of "unregulated" means of testing; many times increased access to available electronic materials and self-testing in the system, as shown by visit statistics. It is possible to add video lectures to the electronic content; adding a mobile application for mobile work; development of existing electronic materials; adding the ability to simulate some of the exercises in the browser.

4. Sivkov, Y.A. Digitalization in hydroacoustic, Maritime scientific forum, Varna: 2013, Vol. 4, pp. 91-93, ISSN 1310-9278.

Abstract:

The advent of digital systems for collecting and processing information in various fields of human knowledge does not bypass hydroacoustics. Adding this functionality to existing ones or building new acoustic systems results in an increase in their efficiency combined with a reduction in cost and physical size. These advantages and the feasibility of implementing remote and autonomous sensors or systems and the distributability of information collection and processing are the focus of this article. The systems under consideration are also limited to passive hydroacoustics with non-directional signal reception, i. the objectives are the classification and identification of the discovered.

This approach reduces the cost of the whole system and increases reliability by reducing the impact of the data transmission medium and amplifiers on the input of the data acquisition and processing system. The use of microcontrollers from the Cortex family will greatly improve the performance of the system, while providing the necessary computational resource to perform partial processing of received signals. In addition, the central system will be unloaded from the large volume of parallel processing information (in sensor networks) and will be able to incorporate additional sensors of different types to improve processing by collecting additional environmental information.

The use of readjustable sensors with data processing capabilities helps to build much cheaper, modular, space-borne passive hydroacoustic systems. Combined with the capabilities of different types of sensors and communication channels (wired and wireless), they provide the basis for the introduction and implementation of this approach in the Adaptive Sensor Grid project developed by a team of several universities.

5. Sivkov, Y.A., Kostadinov, K. Introduction of integrated laboratory platform in education, Maritime scientific forum, Varna 2013, Vol. 4, pp. 79-84, ISSN 1310-9278

Abstract:

The constantly increasing demands for higher education require the identification, as well as of the lecture fund and the quality and manner of conducting the laboratory exercises. This is especially true of the disciplines that train electronics professionals. The focus of this report is on one of the ways to improve laboratory practice in the disciplines of the ship radio electronics, navigation and ship electrical equipment courses. This is also true for most other engineering majors.

One of the earliest applied approaches is the use of laboratory formulations involving the use of experimental circuit boards on which trainees soldered the studied circuits and using laboratory measuring instruments. The specialized stands that came in then offset some of these disadvantages. They are pre-designed and implemented sets of schematic solutions that facilitate the conduct of specific laboratory exercises. Recently, the use of simulation software packages has become widespread.

The downsides of these approaches have been the catalyst for creating a new approach that combines the positives of the approaches under consideration, while at the same time depriving many of their shortcomings. This approach is to integrate all the necessary laboratory instruments, instruments and tools into a single system - an integrated laboratory bench. The application of such an integrated laboratory bench is at the heart of this report.

One of the major challenges in the introduction of integrated lab stands in laboratory work is its choice. Selection criteria can be - its functionality, its price, requirements for additional modules, accessible interface when working with the stand, etc. A much more acceptable option for implementing an integrated laboratory bench when conducting laboratory exercises is the one offered by Digilent Inc. Electronic Explorer Board stand - EEBoard.

The benefits of doing an integrated lab stand, such as:

- reduction of the time for carrying out the laboratory exercise, which in turn contributes to a larger volume of the studied schemes and the possibility for comparative analysis of the data;
- reducing the volume of laboratory equipment used;
- the ability to automatically store the measurement results.

The experimental introduction of the purchased Electronic Laboratory Integrated Laboratory Booth has shown its functionality and applicability in conducting laboratory exercises in such disciplines as Semiconductors, Digital Electronics, "Automation", Analog Circuit, Radioelectronics, Electronics, Microprocessors and more.

Using it significantly increases the interest and knowledge gained by the trainees in passing the relevant disciplines. This leads to the natural conclusion to expand the laboratory to full capacity by purchasing the right number of stands.

6. Nikolov, J., Sivkov, Y.A. Adaptation of a NATO publication on the training of BG Navy specialists, Izvestia: journal of the union of scientists., Marine Science series, Varna: 2016, pp. 100-103, ISSN 1314-3379

Abstract:

The adaptation of the NATO publication ACP-125, in particular to the Executive Method for Tactical Signaling, performed as a result of long-term observations of the training on communication and information security, is presented in the development. Comparison of the results, for the different academic years, at the end of the training course of the students of the Navy College, gives grounds to claim that the goal set in the adaptation - to increase the absorption of the educational material has been achieved. The adaptation presented is included in the development of a methodology, practically applied, which is already successfully used in Nikola Vaptsarov Naval Academy.

7. Sivkov, Y.A., Dimitrov, G. Possibilities of IoT concept in the implementation of automated systems in shipping, Izvestia: journal of the union of scientists., Marine Science series, Varna: 2016, pp. 104-107, ISSN 1314-3379

Abstract:

With the advent of Internet of Things (IoT) platforms, there has been a trend towards their use in all areas of technology. This does not bypass shipping. Their application is mainly in the construction of automated systems for monitoring, data collection and process management. This article examines the scope of the IoT concept. The possibility of integration into ship automation of IoT module is indicated. The use of IoT leads to reduced costs and lead time due to the unified standards for communication between modules, the presence of a large number of systems developed, but with the ability to adapt to shipping, and not least the ability to change the purpose of an already installed module.

The automation of data collection, monitoring and data processing systems is a trend that is increasing with the new requirements to reduce response times in various uncharacteristic situations. This also leads to equipping new or upgrading existing systems with the required automatic electronic data collection capabilities and submitting them to the analysis and decision module. One possible solution is to use modern modules that implement the IoT concept. The consumption was measured using a laboratory power supply unit Tenma 72-10480, which fed the test sample in 20 consecutive independent determinations of temperature and pressure, and then averaged it. outputs, via a serial interface to a PC, and includes time for temperature and pressure measurement as well as their conversion. The results of this measurement are also averaged over 20 iterations.

From the measurements made it can be seen that the module so developed is applicable, as standards to automated ship systems. The processing and output of NMEA

output data is done on a time-to-real scale, and the consumption of the entire module enables the realization of battery power. One of the main advantages of these modules is the short development time, which allows rapid adaptation of IoT platforms to the requirements of a particular implementation. The drawbacks of such a prototype, such as the lack of standards for ship equipment, such as moisture, dust and shock resistance, which would technologically slow down development time, should not be overlooked.

8. Sivkov, Y.A. Application of modern microcomputers in building the IoT solutions, Scientific Works Journal of NVNA, Vol.31, Varna: 2017, pp. 14-17, ISSN 1312-0867

Abstract:

The Internet of Things (IoT) is one of the areas of greatest development in modern electronics. This is mainly driven by the desire of users to receive adequate information and the ability to manage processes in real systems using a public communication channel. To this end, microelectronics manufacturers are developing platforms that are subordinated to the IoT concept and enable the creation of different products and capabilities.

The Raspberry Pi platform is built on the basis of ARM microcontrollers from the Cortex family and contains four representatives: Pi 1, Pi 2, Pi Zero and Pi 3. Table 1 shows a comparative analysis of their characteristics, which shows the development of computing resources, while maintaining the connection to peripherals such as coupling, number and type of interfaces.

The use of Raspberry Pi microcomputers in building IoT applications with basic functionality is not justified because of its high cost. A second disadvantage that can lead to neglect of the platform as a solution is high consumption. When building industrial applications, the need for a large number of input-output pins and interfaces necessitates the use of expansion boards, which would further increase the final cost.

Despite these disadvantages, microcomputers find their application in systems requiring Ethernet connectivity and server functionality, and in particular the need to record a large amount of information.

Checking the use of the Raspberry Pi platform with an exemplary web application and using sensor data revealed their adequacy and ability to take heavy loads in multitasking.

9. Sivkov, Y.A. Final classifier of signals from the output of a Neural Network for processing hydroacoustic signals. Journal of Acoustic, Sofia: 2017, Vol. 19, ISSN 1312-4897, pp. 61-63

Abstract:

One of the main problems in passive hydroacoustics is related to the process of recognizing objects. This requires the development of methods for its implementation and the introduction of new approaches to solving the problem. The classic approach of using a trained operator is one of the main ones, but there are a number of limitations, such as:

- lack of trained operators;
- the need for more than one operator for continuous monitoring;
- high cost of training;
- the operators have individual characteristics and there is no repeatability of the final result;
- there is no possibility of transferring the knowledge to the next operator.

The justified end-classifier is used in the processing of real data extracted from records used for training acoustic acoustics in the Navy, through which representative types of various noise sources of interest for underwater surveillance, such as merchant, passenger, military and fishing vessels and submarines, are presented. The auditory channels of a typical sonar system were used to make them.

LOFAR and DEMON algorithms were used to form the sign space, and the vectors obtained were divided into two groups - for training the classifier and for testing. We used signals from three types of objects (two ships and a submarine) and an ANN structure in three different variants.

To test the trained classifier were constructed using an additional algorithm developed, 100 "false" feature vectors for each class and extracted between 10 and 30 (depending on the length of records available) object vectors of classes used for training that did not are involved in the learning process.

The use of ANN in the classification of passive hydroacoustic signals makes it possible to increase the likelihood of correct classification.

The lack of ability to classify objects not belonging to the classes for which the classifier is trained is a serious disadvantage, which is overcome by the addition of an additional logical block performing the evaluation of the input data from the ANN.

The final classifier provides a significant reduction in the likelihood of false alarm.

10. Dimitrov, G., Sivkov, Y.A. Modern technologies in the future of the seafarers, Varna Medical Forum, Vol. 6, Iss. 2, Varna:2017, pp.152-155, ISSN 2367-5519.

Abstract:

The well-being of seafarers is becoming an important issue that needs to be addressed by the entire shipping industry. With limited communication, tension, and work for a long time in a confined space, human behavior and relationships change. Crew living conditions are often neglected. The human factor is the most important component of

maritime safety. Companies are required to provide good working conditions and to offer clear rules that build good working relationships between the crew and the shipowner. Over the next five years, the onboarding capabilities of ships are expected to be similar to those offered by each mobile network and operator.

This article examines fact-finding studies on the percentage of ships worldwide that do not have Internet access; how many of the shipowners charge crew fees related to internet usage; what is the demand for personal communication services and more. The market-based satellite services and the initiative of major mobile terrestrial operators to encourage shipowners to create conditions for well-being are examined. Education in higher education should also meet new, well-defined and clearly defined needs for the implementation of information and communication specialists. They are required to look at teams, socio-mental processes, working relationships and competencies to deal with non-traditional situations.

With the expansion of communication services and the advancement of technology, the best experience and value is created for consumers, wherever they travel by sea. The aim is to learn the experience of ground systems to be applied on board. Expected up to five years, the capabilities of the board will be the same as for terrestrial communications installations. According to studies, Internet users on the terrestrial networks spend an average of about six hours online per day. Providers are already striving to optimize services across all layers to ensure a sufficiently effective experience. Such an approach can provide high speeds on the Internet without limiting the time they are online.

11. Sivkov, Y.A. Usinga Navigtion Simulator in the development of a COLREGs e-course, Constanta: Journal of Marime technology and Enviroment, Vol. 2, 2017, pp 81-86, ISSN 1844-6116

Abstract:

COLREGs training is one of the major courses of the Naval Academy in the Bachelor program for Navigation. Each student must acquire a certain volume of knowledge and skills that they will be able to apply in their work. The use of graphic presentation of the rules and their application, by illustrating specific situations, is one of the most commonly used methods of presenting the study material during the training in the academic subject. The latter is combined with visualizations designed specifically for the courses that complement static two-dimensional diagrams without any opportunity for interactive change of conditions, which in turn imposes certain constraints.

The article shows the advantages and disadvantages of navigation simulators currently in NVNA. Created on an eColregs platform with the participation of university professors, practitioners and e-learning professionals in a team of six countries (Bulgaria, Croatia, Slovenia, England, Turkey and Spain) One of the biggest problems is the visual

presentation of the tasks under consideration. to provide sufficient information when using a PC.

One of the major problems is the visual presentation of the tasks under consideration, which should provide sufficient information by use of a personal computer. Appreciating the functional capabilities of modern equipment and the needs of students for visualization, the Transas 4000 Navigation Simulator has been used, which provides the necessary presentations of the tasks. This is an unconventional use of the simulator, which was originally designed to train navigational officers during maneuvering, teamwork, etc., but it does not have any built-in functionality for recording the visualization presented to the trainees, nor for presenting the information separately for the needs of the COLREGs training. These disadvantages have been overcome by using special programs to record the screen images and their subsequent processing

E-learning is one of the most promising aspects of education, especially useful in the maritime field. With the current seafarer dynamics, the use of resources that do not require presence at a specific location will generate a great deal of interest, and the educational institutions will place the emphasis on building online platforms, which will prove to be crucial for their presence on the market.

One of the main advantages of the course presented here, is the large set of situations and the extensive use of a navigation visualization simulator, already recognized in marine training throughout the world, which facilitates easy adaptation to the learning contents. Last but not least, the localization in six different languages should also be pointed out, one of them being Bulgarian.

The further development of the project should involve completing the developed course with situations by including a larger number of ships and combining the application of a larger number of regulations. The added situations will aim to cover common situations in practice

As a suggestion for further development of the training, the introduction of a concept for virtual reality and the addition of 360° visualization should be noted, as well as complementing them with interactive functionalities.

12. Sivkov, Y.A. Generator of sign vectors based on a hydroacoustic image for Neural Network training. Journal of Acoustic, Sofia: 2017, Vol. 19, ISSN 1312-4897, pp. 64-67

Abstract:

Recognition in hydrolocation is an important, up-to-date and rapidly evolving part of the process of sonar surveillance. The use of recognition methods simulating the processes of the human brain (neural networks) is an approach that produces high results (over 90% probability of correct classification) in classification, and has the ability to implement computer-based systems through appropriate software.

Recognition is the process of determining the affiliation of an observed object to a group (class) of objects, by the characteristics of the radiation or the signal reflected by it. The recognition process includes three main sub-stages:

- Identifying the signs of object recognition / purpose /;
- Determining the method (s) for recognition based on these features;
- Classification by the method (s) specified.

In general, testing expert systems for evaluating classification in hydroacoustic stations requires a certain number of input signals representing objects belonging to the classes to which the system is trained. These signals are used to train and test the system already trained. Providing them is a process that is independent of the users of the system and requires the observation of different representatives of the classes with which the training is required. This necessitates the use of an alternative approach in which additional images are generated based on a smaller number of real representatives.

In the training of the classifier, it is necessary to use a sufficient number of vectors with signs for each class, providing the classifier with the desired probability of correct classification, which are created by the developed algorithm and software using, as the basic and central, each of the available sonar images.

The above algorithm is implemented in the middle of the Matlab 2013 software product, and the output vectors from its work are submitted to a classifier implemented with artificial neural network Multilayer Perceptron trained by a teacher of the algorithm with back propagation of error / MLP with BPE/ for the purpose of training, testing and testing of noise resistance. An artificial neural network (ANN) output is assigned a final classifier to add the ability to evaluate vectors not belonging to the training classes.

As a result of the developed algorithm training and test vectors can be created for different types of ships, which will be used in the construction of a classifier. For the purpose of the study, the generated input vectors are of different lengths (four, five and six characters) and different number of samples. To test the already trained classifier, additional feature vectors other than those used for training were generated, and in addition to the feature vectors belonging to the class used in the training, feature vectors were set in which one or two of the features differ, and completely randomly generated signs.

13. Sivkov, Y.A. Using blockchain technology in realization of IoT solutions, Strategies, people and technologies in modern shipping. Varna: NVNA, 2018, pp. 159-161. ISBN 978-619-7428-28-5.

Abstract:

The term Blockchain, mainly related to cryptocurrencies, is a technology with very wide application in various fields of information technology. The main advantage is the ability to use both to ensure the uniqueness of the information transmitted and to provide

a reliable method for verifying the attempt to modify already recorded information. The difficulty in implementing this technology is the requirement for a large computing resource, high requirements for the communication channel, and the considerable time required to add a new entry to the chain.

On the other hand, devices using the concept of the Internet of Things require the introduction of new methods to ensure the uniformity of the information transmitted and the security of the data extracted. While a few years ago, such devices were poorly used, their use is currently increasing exponentially, and it is possible to create a user profile based only on data from the connected devices it uses. This increases the risk of unauthorized users accessing this information.

One of the basic guidelines for using IoT devices is to implement the "Smart houses", for which securing the data received, the uniqueness of management and confidentiality are priorities.

The algorithm uses as a basis a high-performance computer system that acts as a digger, providing the link between the user, the IoT device, the local and cloud storage and the local blockchain.

When adding a new record / transaction to the chain, mathematical operations need to be performed that require significant computational resource, which is why they need to add additional resources called miners to the traditional device model, which will be used to calculate the parameters of the new block, and then this information is added to the blockchain.

The reliability of the recorded information is guaranteed by using the classic model used by cryptocurrencies, ie. save the transaction in ledgers, there are several blockchain structures distributed across different networks, such as other "smart homes", computer systems or laptops. Torr networks may be used to ensure anonymity.

The use of blockchain technology and the Internet of Things provides a high level of security and privacy.

Due to the low computing power of IoT devices, the blockchain integration algorithm needs to be adapted and a new type of architecture built for these systems.

14. Sivkov, Y.A., Andreev E. An Approach to Implementing an Student Management System, First International Marine Engineering Conference, 21-23 November 2018 at the Engineering Faculty Nikola Vaptsarov Naval Academy. Varna: NVNA, 2018, pp. 155-160. ISBN 978-619-7428-31-5

Abstract:

The management and administration of student information is a crucial factor in ensuring quality and optimal university process management. For this reason, each university needs to build a system that links student information to a single and up-to-date platform that provides student data integrity.

The automatization of student processes is a key element in the introduction of modern approaches to the administration of higher education processes. Their current state at the Nikola Vaptsarov Naval Academy does not correspond to the high ambitions and achievements in the field of student education, which necessitates a detailed examination and determination of the needs of the individual units and processes, such as providing resources to support their work and increasing the satisfaction of the students in their use.

The introduction of a unified automated system built in the middle of the Internet will significantly improve the quality of university-provided administrative services. The use of web-based software facilitates access to information and is one of the most flexible ways to implement modern software products.

Expected improvements indicate the need for such a system and the introduction and as soon as possible would significantly improve the administrative potential of the university in terms of student related services.

When building a similar scale-based system, it requires an increase in employees directly responsible for its servicing, renewal and security.

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