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Underwater Li-Fi Communication For Monitoring Scuba Diver's Health

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ABSTRACT

Water electronic communication may be a potential technology to appreciate underwater communication. The experiment of underwater electronic communication within the laboratory is completely different thereupon within the real water setting as a result of the physical scale is restricted. during this paper, many types of agents area unit evaluated to vary the coefficients of experimental water exactly. Then, appeared as criterion for the responsibleness of water recreation, the frequency domain characteristic of knowledge communication through water channel in experimental water is measured and compared. The results show that the sort and particle size of the agents can considerably have an effect on its water properties, and therefore the frequency domain part of the water communication signal are going to be plagued by the agent's concentration. Diving has become a typical means of playacting analysis within the underwater living world. one in all the main issues with diving is that the health problems faced by the diverse throughout diving and there comes the necessity for observance diver's health. This paper primarily focuses on the health observance systems for diverse by transferring the information exploitation Li-Fi (Light Fidelity). this method senses completely different health specifications like heartbeat, temperature and respiratory organ enlargement. The monitored health specifications area unit recorded as a info in a very chip for any analysis. to cut back the ability consumption, the system transfers the information to the close diverse and ship solely throughout the abnormal health issue. The planned system may be burnt up to a hundred thirty five meters ocean depth and therefore the knowledge may be transferred up to 4-5 receivers at a time.

Keywords: —Underwater communication, wireless optical communication, scuba diving, heart beat sensor,Li-Fi communication

INTRODUCTION

Underwater wireless data transmission is of innumerable importance to the military, trade and also the scientific community. therefore on facilitate of these activities, there's an increase within the variety of pilotless vehicles or devices deployed underwater, that need high information measure and high capability for data transfer underwater. among the previous few years, the interest towards optical wireless communication has inflated for terrestrial, area and underwater links because it is capable of providing high information rates with low power and mass demand. several of researchers have administered work for terrestrial and area links, but underwater optical wireless links ar comparatively less explored as a result of it's harder than region links. the most problem for reliable underwater communication is because of good selection of physical processes in numerous styles of underwater environments ranging from shallow coastal water to deep ocean or oceans. Optical communication is also a budding technology to know underwater wireless communication. The experiment of underwater optical communication among the laboratory is totally different among the important water atmosphere as a result of the physical scale is restricted. though since recent many decades, artificial scattering agents are conditioned to recreate belowwater optical communication channels under totally different water quality conditions, however the similarity between experimental water and natural water is not reliable, just like the similarity in frequency domain characteristics. Facing the matter of alignment caused by uncertainty of the position of transmitter and receiver, poor mechanical stability at the side of the complexness of water atmosphere, the transmission characteristics of below water optical communication signals under alignment conditions are tough to urge among the natural H2O atmosphere. Associate in Nursing acoustic communication has been developed for the underwater wireless device network due to its comparatively low attenuation, however the information measure of the underwater acoustic channel is restricted, creating it less favourable for data-intensive applications. Besides, the slow propagation of underwater sound conjointly leads to a substantial delay among the underwater communication link. Underwater sensors cannot share information with those toward land, as each use totally different wireless signals

that solely labour in their individual mediums. Radio signals that travel through air die terribly quickly in water. Acoustic signals, or sonar, sent by underwater devices usually mirror off the surface while not ever breaking through. This causes inefficiencies and alternative problems for a diversity of applications, like ocean exploration and submarine-toplane communication. therefore on beat the disadvantages within the underwater acoustic communication, a replacement approach that is within the most rising space of analysis is that the underwater wire-less optical communication. Initial analysis has begun to see a right away communication link between the satellite or craft and also the underwater vehicle. Recently, underwater wireless optical communication exploitation low cost light-emitting diodes and optical maser diodes conjointly has been researched. comparison the sunshine sources used in these underwater wireless optical communication systems, it's apparent that the LD outperforms light-emitting diodes in terms of information rate. though it's tough to transmit long distance, it's potential to unravel the matter of interference between symbols related to multi-path propagation and so the protection downside related to eavesdropping using a point-to-point methodology that exploits the laser's characteristics of robust directionality at a short distance. unremarkably ocean navigators or trained worker need an extra support from the land once one thing atypical things happen among the ocean, we've got to pass the message to them. With development of the technologies our folks will predict what happen within the ocean, however to transfer these messages to ocean navigators or trained worker is tough. therefore on avoid these problems we tend to introduce Associate in Nursing increased system named below water electronic communication. This paper discusses regarding the underwater electronic communication system used for transferring messages to ocean navigators or fishermen and conjointly as we are able to monitor their health conditions. we tend to United States of America water electronic communication module to urge the text and device readings to the bottom from navigator and this may facilitate us to avoid the undesirable death of navigators subsurface. Since the conditions of underground water even temperature, pressure might vary in any condition; it conjointly contrasts the temperature, force per unit area of navigator. therefore if it lowers or higher throughout a good choice, it cause even the death of the navigator. It conjointly provides the required treatment to the involved person. it's applicable for staffs of forces, marine drivers and people United Nations agency participate in water entertainments. Typically this can be often what we've got accomplished with wireless underwater communications. As against hardwired communications that orbit you to the length of a cable, wireless communications provides you the power to speak along with your chum, or high aspect, with ease and freedom to simply dive.

RELATED WORK

The term Li-Fi was coined by academician Harald Haas, and refers to light-weight based mostly technology that delivers a high-speed, two-way networked, mobile communications in an exceedingly similar manner as Wi-Fi. though Li-Fi are often wont to off-load knowledge from existing Wi-Fi networks, implementations could also be wont to give capability for the bigger downlink demand such existing wireless or wired network infrastructure could also be employed in a complementary fashion. actinic ray Communication is that the different name for Li-Fi. Li-Fi will transmit the info employing a high illumination LED that varies the intensity quicker than the human eye [1]. the gap traveled by the Li-Fi is 20-35 m underwater to transfer the info and there'll not be abundant interference made from Li-Fi. the info encoded in binary kind is shipped to the sunshine transmission systems by high illumination LED. the knowledge is transmitted by switch the LED ON and OFF to supply 0's and 1's. In previous existing strategies, the info is transmitted via acoustic communication, unhearable communication, wired communication, spoken communication, RSTC hand signals, and torch/Flash signals. These existing communication systems round-faced difficulties in propagation beneath ocean water. The optical technique planned in [2] for human activity between 2 autonomous underwater vehicles. The system transfers the info with terribly less power. The vary differs thanks to environmental conditions. It differs per clear and muskier water. Corentin et al. [3] developed associate algorithmic program for police investigation the breath of the frogman. They analyze the signal by victimisation the algorithmic program if there's no respiratory from Aqua-Lung diverse it'll turn out the alarm to the close ship. the delay noted from transferring the info is five.2 s. The memory wont to store the info in Random Access Memory is 800 bytes. the look concerns of underwater optical communication to notice with completely different parameters is alleged in [4] and therefore the major downside is that the attenuation loss thanks to the scattering of sunshine. to get high information measure optical communication that is simulated victimisation town in [5] wherever the info rate is larger than 1gigabits/second the info transfer doesn't need any physical contact. Vijaya [6] planned underwater purpose to purpose communication that causes the arrangement within the optical link thanks to absorption and scattering, that the transmitter and receiver ar misaligned. The alignment of the transmitter and receiver is achieved by increasing the divergence of the transmitted beam. Thomas [7] used 2 orthogonal optical device beams and 2 receiving optical link to receive the info within the ocean. By victimisation optical device communication system technique, it reduces the transmission error issues and it'll additionally limit the scattering levels. to realize high rate, it needs sufficient intrinsic information measure. Chiarella [8] planned to develop communication by diver gestures, called CADDIAN language. The gestures are signs, symbols, alphabets, semantics. In muskier water, it absolutely was troublesome to speak. Tran [9] planned a transceiver style of acoustic house frequency block code OFDM to extend the info output for vertical link communication in underwater. It additionally will increase the info output up to 7.5 kbps. It additionally produces noise, multipath, and rate error. Hachioji-shi [10] planned a theory for police investigation a stray recreational diver underwater. This theory was simulated victimisation network machine and therefore the rate is evaluated. The implementation at underwater propagation model is finished at fifty rate.

PROBLEMSTATEMENT

Almostno alternative systems to observe the health conditions of ocean navigator whereas navigating the ocean. whereas there's a wearable device for observance his/her pulse for himself/herself. however a personal among the bottom cannot notice concerning the health conditions of person underwater. therefore he doesn't notice the health conditions of the person underwater. Diving instrumentality is instrumentality used by

underwater different to create diving activities potential, easier, safer and comfy. This can be instrumentality mainly supposed for this purpose, or instrumentality supposed for alternative functions that is found to be appropriate for diving use. the elemental item of diving instrumentality is associate underwater device, and surface equipped diving instrumentality. however there are not any alternative vital items of kit that create diving safer, additional convenient or additional economical. Diving instrumentality used by recreational Aqua-Lung different issometimes personal instrumentality diver, however skilled different, notably once functioning among the surface equipped or saturation mode, uses an honest deal of support instrumentality not carried by the diver. skin diving may be a mode of underwater diving. Here, the diver uses a self-contained underwater device (scuba), to breathe underwater. Aqua-Lung different carry theirown supply of respiratory gas, sometimes propellant. It permits them larger independence and freedom of movement. though the employment of compressed gas is common, a brand new mixture known as enriched air (Nitrox) has been gaining quality thanks to its advantage of reduced chemical element intake throughout repetitive dives. electric circuit Aqua-Lung systems contains one or additional diving cylinders comprising of respiratory gas at air mass that is equipped to the diver via a regulator. they'll embody further cylinders for vary extension, decompression gas or emergency respiratory gas. electrical circuit or semi-closed circuit rebreather Aqua-Lung systems sanction the employment of exhaled gases. the quantity of gas used is reduced compared thereto of electric circuit, therefore a smaller cylinder or cylinders might even be used for equivalent dive length. Rebreathers lengthen the time spent underwater compared to circuit for corresponding gas consumption; they turn out fewer bubbles and fewer noise than circuit Aqua-Lung. It makes them enticing to hidden military different to avoid detection, scientific different to avoid distressing marine animals, and media different to avoid bubble interference. Disadvantages of the prevailing system square measure the person cannot communicate with the bottom and also the conditions of his health can not be monitored within the ocean. though he dies, the individuals within the ground won't be ready to understand it.additionally wouldn't be ready to comprehend something happening within the ground.

PROPOSED METHOD

The planned technique consists of transmission and receiving section. The transmission section detects the abnormalities moon-faced by the diver and therefore the information is transferred by exploitation the medium referred to as light-weight fidelity. In receiving section the sunshine signal is reborn within the sort of electrical signal and therefore the information is made within the sort of audio. this can be what we've accomplished with wireless underwater communications. As hostile hardwired communications that limits you to the length of a cable, wireless communications provides you the power to speak along with your companion, or high aspect, with ease and freedom to easily dive. Wireless underwater communications area unit a remarkable and straightforward thanks to freely keep associated underwater. benefits of this technique area unit someone WHO is within the ground will observe the health conditions of navigator, alert messages will pass to navigators from the bottom, navigators/fishermen will communicate with ground, and his health conditions are often monitored anyplace, simple preparation, aptness of knowledge and responsibility. As shown within the diagram below, our system contains of a few of Microcontrollers, Heart beat sensing element, temperature sensing element and electronic communication Module. we tend to divided the system into 2 parts; Transmitter module and receiver module. within the Transmitter finish, we've a microcontroller, LCD show, Heart beat sensing element, Temperature sensing element and electronic communication module. Then receiver module consists of Microcontroller, display and electronic communication receiver module. Through our system we tend to transfer information (Text/Image) from one finish to a different finish via electronic communication module. At the start, the readings were taken from heart beat sensing element and temperature sensing element and showed on LCD display of transmitter finish. Once we tend to swaybacked the info communication module within the water, the controller within the transmitter aspect transmits the info to the receiver aspect through water via electronic communication transmission module. Here water can act as a medium between transmitter and receiver. Water electronic communication receiving module can receive the info and provides to the controller within the receiver section. Then the info is showed within the LCD display of the Receiver finish. Through this we will get to grasp the condition of the navigator.
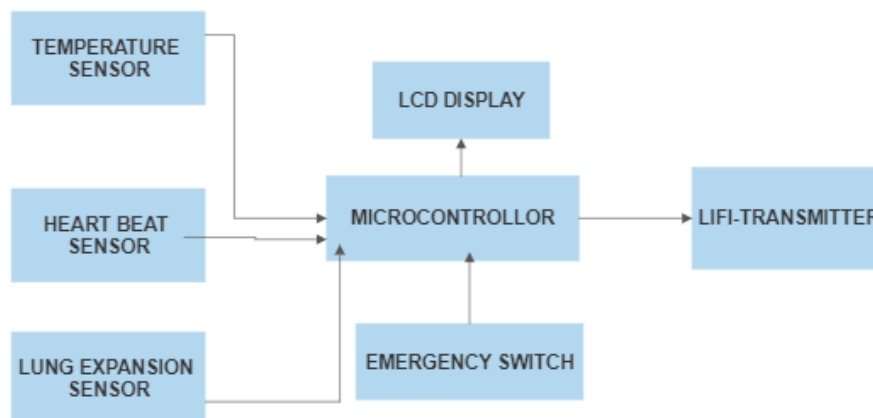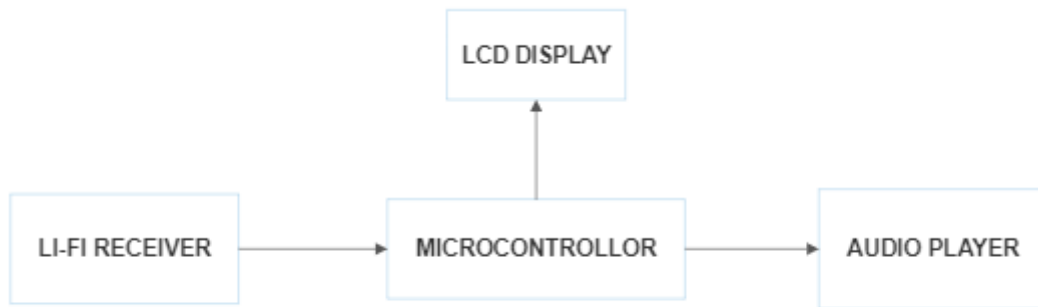

Fig.1.Transmitting Module

Fig.2.Receiving Module

IMPLEMENTATION

Li-Fi is that the use of the actinic radiation portion of the spectrum to transmit data at terribly high speeds. Hardware specifications square measure Ardunio Uno, Atmega328 Microcontroller, vital sign device, Heart Beat device, Water digital communication Receiver & Transmitter, Jumper Wire and liquid crystaldisplay. this can be in distinction to established varieties of wireless communication like Wi-Fi that use ancient frequence (RF) signals to transmit knowledge. With Li-Fi, knowledge is transmitted by modulating the intensity of the sunshine, that is then received by a sensitive detector, and therefore the light-weight signal is demodulated into electronic kind. This modulation is performed in such the way that it's not perceptible to the human eye. Li-Fi could be a class of Optical Wireless Communications (OWC). OWC includes infra-red and ultraviolet communications in addition as actinic radiation. However, Li-Fi is exclusive in this constant actinic radiation energy used for illumination might also be used for communication. Arduino is associate yank normal Code for data Interchange file hardware and coding system package company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices. Its product square measure authorized beneath the antelope Lesser General Public License (LGPL) or the antelope General Public License (GPL), permitting the manufacture of Arduino boards and software system package distribution by anyone. Arduino boards square measure offered commercially in preassembled kind or as home-cured (DIY) kits. Arduino board designs use a spread of microprocessors and controllers. The board's unit equipped with sets of digital and analog input/output (I/O) pins which can be interfaced to various enlargement boards ('shields') or breadboards (For prototyping) and totally different circuits. The board options serial communications interfaces, in addition as Universal Serial Bus (USB) on some models that is also used for loading programs from personal computers. The microcontrollers could also be programmed mistreatment C and C++ programming languages. to boot, to mistreatment ancient compiler tool chains, the Arduino project provides associate integrated development surroundings (IDE) supported the method language project. Arduino Uno may be a microcontroller board. it is a fourteen digital input/output pins (of that vi square measure usually used as PWM outputs), via analog inputs, a sixteen Mc ceramic resonator (CSTCE16M0V53-R0), a USB association, associate influence jack, associate ICSP header and a electrical switch. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with associate AC to DC adapter or battery to urge started. at intervals the worst case state of affairs we are going to replace the chip for one or two of bucks and start another time. "Uno" implies that one in Italian and was chosen to mark the discharge of Arduino package (IDE) one.0. The Uno board and version one.0 of Arduino package (IDE) were the reference versions of Arduino, presently evolved to newer releases. The Uno board is that the first very series of USB Arduino boards, associated conjointly the reference model for the Arduino platform; for an intensive list of current, past or superannuated boards see the Arduino index of boards. Infrared (IR) temperature devices alter correct noncontact temperature measure in medical applications. The foremost common application for this type of temperature detector is activity ear temperature, forehead temperature, or skin temperature. Temperature detector may be a tool will not to measure the temperature through associate electrical signal it wants a measuring device or RTD (Resistance Temperature Detectors). If the excellence in voltage is amplified, the analogue signal is generated by the device and it's directly proportional to the temperature. Pulse detector could also be a well-designed plug-and-play heartrate detector for Arduino. it'll be utilized by students, artists, athletes, makers, and game & mobile developers United Nations agency would like to easily incorporate live heart-rate data into their comes. It collectively includes Associate in Nursing computer code computer file observation app that graphs your pulse in real time.The transmitter section consists of PIC microcontroller, IR sensor, Li-Fi, heartbeat device, temperature sensor, emergency switch, a transmittal module, power provide and liquid crystal display module shown in Fig. 1. The transformer is employed for generating the facility to the device. The heartbeat device is employed for sensing the pumping of the center or it may be measured within the finger artery by presenting the variations within the blood volume. The infrared junction rectifier transmittal associate IR signal into the finger and therefore the mirrored infrared from the blood cells square measure transmitted with a pulse train into a photodiode. For sensing the temperature LM35 device is employed that is employed for changing the vital sign into associate electrical signal. LM35 is little in size and produces terribly high accuracy with terribly less power. The microcontroller is employed for interfacing all the devices and it conjointly consumes terribly less power. The memory hold on in Random Access Memory is 368 bytes. The microcontroller is connected to the liquid crystaldisplay andthe infrared device is employed for police work the obstacles throughout the transmission of information. the sunshine fidelity module consists of a transmission section that produces a white junction rectifier for transmittal and receiving the data. LED's square measure used for its low price, very little in size and consumes less power. the information is made through the Li-Fi to the receiver section.

EXPERIMENTAL SETUP

Theoutput made ifhere are anyemergencyhealth problems visaged by different. there's conjointly an emergency switch if the diver faces any problems that person will press the emergency switch. within the projected system , 3 totally different devices like heartbeat sensor, temperature device, and respiratory organ enlargement device are used. If there have been any abnormalities moon-faced by the diver, the sensors can discover and provides the info via Li-Fi as a light-weight signal. The received light-weight signal by the near diver's receiver is passed into the photodiode which can convert the sunshine signal into an electrical signal and produces the output within the type of an audio signal. The experimental output is seen within the type of the audio spectrum. the info determined from the audio is reborn into an audio spectrum. If there are any abnormalities determined from the diver is created within the output. (the sample results are taken by author itself , the temperature perceived audio spectrum. If there was any abnormality detected from the diver is passed to the near diver or ship.

CONCLUSION

The conception of Li-Fi had been introduced at the side of existing techniques and classical trends used for vehicle to vehicle communications. the info is created solely at the time of emergency thus, it consumes terribly less power. The device is incredibly value effective. It transmits the info at a speed of two Giga Bits Per Second (Gbps) that is quicker than the present systems. With this idea ,we have a tendency to discover a gentle declare observant the eudaimonia states of ocean research worker. Now a days, the air conditions area unit evolving vastly. It influences the ocean pilots in an exceedingly troublesome scenario. it's onerous to screen their eudaimonia conditions once they area unit in ocean. As we have a tendency to most likely am aware, despite whether or not they jump underneath twenty five meters into the ocean their heart beat changes wildly and pulse lows hazardously it'd prompts passing. Also, this may be onerous to guides/angler to continue in those conditions. thus here we have a tendency to propose a framework to screen heath states of Associate in Nursing ocean guide whereas checking the guts beat studying throughout route. Utilizing Associate in Nursing data correspondence framework we are able to screen pilots heart beat even in ground. thus this may assist North American country with discovering the standing of the pilot and might dodge the unsafe circumstances. likewise share prepared messages to them if the atmosphere changes positively once they are exploring. this may likewise assist them with understanding the condition and might firmly come to the board.

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