REMOTE OPERATED VEHICLE BASED HUMAN TRACKING IN UNDERWATER USING LIFI TECHNOLOGY

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ABSTRACT

This paper proposes the lifesaving of human drowned in underwater, the human has drowned under the water otherwise fell down at the lake is difficult to locate and rescue. In this case a life saving rescue person get down under water and search the human who fell down in the water. This misleads in two ways such that he may not save the life of human or else he will also get in trouble. All these factors are taken in to account and a new approach have been proposed to rescue the drowned human under water. The proposed method uses a wireless robot with control over LiFi (Visible light communication) technology and uses a ROV (Remote Operated Vehicle) and PIR Pyroelectric Infrared Sensor to detect human in underwater. To save the human, the proposed device with camera with sensor searches in under water to identify the human easily, locate the person speedily and send signal to rescue team to save the person.

Keyword: Cord control robot, PIR pyro electric infrared sensor, LIFI technology. Remote operated vehicles

I. Introduction:

LiFi, keyed as Light Fidelity, is a wireless technology that uses of visible light for data transmitting on and receiving instead of radio waves. The foremost features of LiFi it can be employed in domestic and trade usage of LED bulbs and utilised to allow the data transfer with a speed of up to 224 gigabits per second, which equal a downloading speed around 18 x1.5 GB in every single second. Light-Fidelity (LiFi) takes Visible Light Communication (VLC) supplementary by using Light Emitting Diodes (LEDs) to grasp entirely networked wireless systems. Synergies are harness as lights develop into LiFi towards cells resulting in improved wireless capacity for the Internet-of-Things (IoT), 5G and beyond [1].III-nitride LEDs second-hand for many application, some illustrate
back in solid state lighting the proposed system has many advantage and suitable for LiFi communication [2]. EH-HL model is proposed for industries and smart homes based on the combination of Energy Harvesting Wireless Sensor Network (EH-WSNs) and hybrid LiFi/WiFi communication techniques and this method capable of resourcefully transmitting the data at elevated speed for bidirectional multi-device and by harvest energy [3]. Implemented LiFi communication for inter vehicle communication V2V using LSI[4]. Comparing to air communication underwater communication has several complex due to its natural not homogeneous state, proposed a acoustic signal which can travel far in water [5].LiFi achieves high speed wireless communication with multiple access points and offer significantly high spatial throughput and proposed a dynamic load balancing scheme [6].Focused on ambient lighting effects obtained by semi transparent solar cell [7].combining LiFi with RF arrangement in order to moderate the data interchange bottleneck in high compactness environment and to diminish the relinquish overhead by properly conveying users to whichever the RF or the LiFi [8].

The work proposes the life saving of human drowned in underwater to locate and rescue. The entire system formed with a LiFi technology, a smart human detect sensor and microcontroller. The obtained result shows the trustiness of this module.

**II. Detection and communication using LiFi**

The detection and communication is done by simple switching on and off the LED in a pattern to define data which will help in switching is imperceptible to human eye. The concept LiFi should qualify the two basic components, a. At least one detector should receive signal b. Light source equipped with microcontroller and supporting Personal Data Assistance (PDA). The figure 1 shows the sample image under drowned human with LiFi system module.
**Figure 1: Sample Detection of Human Drowned at Underwater**

**III. Proposed system module – Transmitter**

The light wave used to transmit the communication signal underwater, the figure 2 shows the system architecture of transmitter section. In existing system uses a slow and antiquated system for communication this does not quite jibe well with poor acoustics which would lie under water. The proposed module employed with LiFi which are solve all the problem. The system block consists of a personal computer and PIC microcontroller and LiFi transmitter module which consists of transmitter circuit and signal transmitting LED. PDA is second-hand to monitor the robot motion in underwater.

![Diagram of power supply, personal computer, PIC microcontroller, LiFi transmitter module, transmitter circuit, LED, PDA](image)

**Figure 2: LiFi transmitter module**

The Power supply is supplied to the PIC microcontroller by and large and the specification of PIC microcontroller is PIC16f877A. The PDA is second-hand for transmitting the significance from underwater to the receiver segment and also it shows the motion of robot in underwater display location. Trough PDA controlling signal are passed PIC microcontroller generate the significance and send to the LED driver. At the LED driver which is constructive for transmit the message and controlling robot and transmits the message in the format digital signals that is in the arrangement of thread of 1’s and 0’s structure. The speed of the transmitting the thread of 0’s and 1’s is incredibly elevated in terms of Gbps. Generally choosing a colour of LED in underwater is preferably in white colour. The transmitted signal is in the determined structure
and the hacker cannot lacerate easily the signal and the protection of the information is favoured for the underwater defence application like Navy too.

IV. Proposed system module – Receiver

The LiFi receiver module which is mounted on the robot consists of LiFi receiver module and PIC microcontroller with two sensors, a. PIR Pyro electric infrared sensor which detects the motion of human b. OMRON D6T thermal sensor which detects the body temperature and concludes the human status and finally the robot controlling the mechanism. The figure 3 shows the LiFi receiver module.

![LiFi receiver module diagram]

At the receiver section the light detector which receives signal are encoded and the encoded signal are passed to attenuator where the signals are amplified with suitable range and passed to PIC micro controller. The robot control is carried with PDA which can control the robot motion and like forward and reverse direction or left and right direction. The two sensors will detect any motion of the human who is fallen down in underwater. The detected signals from the two sensors are passed to PIC microcontroller whether human is alive or dead and send signal to PDA. Generally the
data communicated with very high speed in stipulations of Gbps. The communication take position linking the robot and the PDA is bidirectional, the full duplex communication can be take place and also search out the acknowledgement whether the transmit signal is in point of fact received or not. The detected signal will help the rescue team to locate the human and take necessary step to save the life quickly.

V. Proposed work Flow chart

![Flow chart](image-url)
VI. Spectrum analysis

Electromagnetic spectrum analyses usually employed to find out the range of frequencies, this analysis is carried out for the LiFi having no health issues due to it visible rays. The figure 5 shows the comparison of electromagnetic spectrum over the existing waves.

Proposed hardware module setup

The system is implemented and verified in simulation software to justify the working of the efficient.
Conclusion

The proposed method is tracking the human is drowned or fell down in underwater. This method uses a wireless robot with control over LiFi (Visible light communication) technology fixed with a Remote operated vehicle (ROV) and predetermined PIR Pyro electric Infrared Sensor to detect human in underwater. To save the human, the proposed device with camera with sensor searches the human in under water, locate the person quickly and send signal to the rescue team.

References:

1. Harald Haas(2015) "What is LiFi?" Optical Communication (ECOC) IEEE., DOI: 10.1109/ECOC.2015.7341879
3. Pradip Kumar Sharma (2018) "EH-HL: Effective Communication Model by Integrated EH-WSN and Hybrid LiFi/WiFi for IoT" IEEE Internet of Things Journal. DOI: 10.1109/JIOT.2018.2791999

7. Emilie Bialic (2016) "Semi-transparent solar cells indifferent to ambient lighting for LiFi application" Wireless for Space and Extreme Environments (WiSEE) IEEE. DOI: 10.1109/WiSEE.2016.7877300.

8. Yunlu Wang (2016) "Fuzzy logic based dynamic handover scheme for indoor Li-Fi and RF hybrid network" Communications (ICC) IEEE, DOI: 10.1109/ICC.2016.7510823.