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| FORM 2  **THE PATENT ACT 1970 &**  The Patents Rules, 2003  **COMPLETE SPECIFICATION**  (See section 10 and rule 13)  1. **TITLE OF THE INVENTION:**  **A Visible light communication to communicate under water and gain information about under water environment.**  **2. APPLICANTS:**   |  |  |  | | --- | --- | --- | | **Name** | **Nationality** | **Address** | | Chennai Institute of Technology | An Indian National | Chennai Institute of Technology  Kundrathur,  Chennai- 600 069  Email: principal@citchennai.net | | Mr. S.Balasubramanian | An Indian National | Assistant Professor  Department of Electronics and Communication Engineering  Chennai Institute of Technology  Kundrathur  Chennai- 600 069  Email: balasubramanis@citchennai.net | | Mrs. N. Surya | An Indian National | Assistant Professor  Department of Electronics and Communication Engineering  Chennai Institute of Technology  Kundrathur  Chennai- 600 069  Email: suryan@citchennai.net | | Mr. Santhoshkumar R | An Indian National | Department of Electronics and Communication Engineering  Chennai Institute of Technology  Kundrathur  Chennai- 600 069  Email: santhoshkumarr@citchennai.net | | Mr. Mohan Kumar O T | An Indian National | Department of Electronics and Communication Engineering  Chennai Institute of Technology  Kundrathur  Chennai- 600 069  Email:mohankumarot@citchennai.net |   **3. NAME OF THE CANDIDATE**     |  |  |  | | --- | --- | --- | | **S.Deepak Chakkrawarthy** | **B.E Electronics And Communication Engineering** | **Third year** | | **Krishna Sridhar** | **B.E Electronics And Communication Engineering** | **Third year** | | **Chandravel MK** | **B.E Electronics And Communication Engineering** | **Third year** |   **4. PREAMBLE TO THE DESCRIPTION**   |  |  | | --- | --- | | **PROVISIONAL**  The following specification describes the invention | **COMPLETE**  The following specification Invention. Particularly describes the invention and the manner in which it is to be performed. |   **5. DESCRIPTION OF THE INVENTION**  **Field of the Invention**  Li-Fi, short for "Light Fidelity," is a wireless communication technology that uses visible light or infrared light to transmit data. It is sometimes referred to as "Visible Light Communication" (VLC). Here is a brief history of Li-Fi  **BACKGROUND OF INVENTION/ PRIOR ART:**  Early Concepts (19th Century):  The concept of using light for communication dates back to the 19th century when Alexander Graham Bell proposed the idea of using light to transmit audio signals. However, practical implementation was limited by the technology available at the time.  Emergence of LEDs:  The development of Light Emitting Diodes (LEDs) in the 20th century marked a significant advancement in lighting technology. LEDs are energy-efficient and can be modulated at high frequencies, making them suitable for data transmission.  **RESEARCH PAPERS AND DISCUSSIONS**  Harald Haas' TED Talk (2011):  The term "Li-Fi" was coined by Professor Harald Haas during his TED Global Talk in 2011. During his talk, Haas demonstrated the concept of using LED light bulbs to transmit data wirelessly, highlighting its potential as a faster and more secure alternative to traditional Wi-Fi.  Experimental Demonstrations (Early 2010s):  Researchers and engineers around the world began conducting experiments to explore the feasibility of Li-Fi. These experiments demonstrated that data could be transmitted through light at high speeds, and Li-Fi was considered a promising technology for various applications.  Standardization (2016-2018):  Several organizations, including the Institute of Electrical and Electronics Engineers (IEEE), worked on developing standards for Li-Fi communication. IEEE 802.15.7, also known as the "Visible Light Communication (VLC) Task Group," released standards for optical wireless communication, laying the foundation for Li-Fi's development and deployment.  **Prior Art Statement**  **OBJECTIVES OF INVENTION**  The main objectives of the visible light communication under water are   * Subsea Exploration and Research * Underwater Monitoring and Surveillance * Environmental Monitoring * Underwater Internet Connectivity * Subsea Oil and Gas Operations * Underwater Archaeology * Aquaculture * Submarine Communications   **DETAILED DESCRIPTION AND** **SUMMARY OF INVENTIONS**  **HARDWARE USED**   * **Microcontroller : Arduino uno** * **Crystal : 16 MHz** * **LCD : 16X2 LCD** * **LIFI module : UART based LIFI module** * **Power source : 12v 1 amp DC battery**   **SOFTWARE USED**   * **Arduino IDE** * **Proteus based circuit diagram**   **APPLICATIONS**   * **LIFI based under water communication** * **LIFI projects** * **LIFI based data and audio communication**   **WORKING**  Li-Fi system mainly includes two parts namely the transmitter and receiver. The input signal at the transmitter section can be modulated with a specific time period then send the data using LED bulbs in 0’s and 1’s form. Here, the flashes of LED bulbs are denoted with 0’s and 1’s. At the receiver end, a photodiode is used to receive the LED flashes strengthens the signal & gives the output.  The block diagram of Li-Fi system is shown below, and the transmitter section includes the input, timer circuit, an LED bulb. The input of the transmitter can be any kind of data like text, voice, etc. The timer circuit in this section is used to provide the necessary time intervals among every bit, and these are transmitted to the receiver end in the form of LED flashes.  The receiver section includes photodiode as well as amplifier. Here, photodiode receives the LED bulb flashes then changes the flashes into electrical signals. Finally, the amplifier receives the signals from the photodiode and amplifies to provide the output.  **Brief description of drawing**  These illustrations serve solely as illustrative examples of selected visuals, and do not depict the actual structure or model of the final implementation. Furthermore, they are not meant to impose any restrictions on the extent of the information disclosed in this document. The aims of this invention will become more evident by the further description and accompanying drawings provided herein.  Figure 1 LIFI component diagram  Figure 2 LIFI working diagram  Figure 3 Diagramatic representation of our project  Figure 4 Original image of our project  **DIAGRAM OF INVENTION**  **LIFI BLOCK DIAGRAM**          **ABSTRACT OF THE INVENTION**  Li-Fi is a VLC (visible light communications) system and the speed of this system is very high. Li-Fi uses normal LEDs to allow the data to transfer and increase the speed up to 224 Gigabits/sec. The data transmission of this technology can be done via illumination. The essential devices of this system are the bright light emitting diodes. Instead of led we can use laser to increase the distance  Since laser is unidirectional  **Advantages of Li-Fi**  The advantages of Li-Fi include the following.  Speed-The speed of the Li-Fi is very high, and we can watch the videos without buffering.  Security- The light of the Li-Fi doesn’t run through the partition, therefore, it is more protected and hacking is not possible.  Risk-free-Li-Fi utilizes light waves which are harmless.  Consistent- The data transfer is more protected.  **Disadvantages of Li-Fi**  The disadvantages of Li-Fi include the following.  Apart from several benefits, the Li-Fi technology is facing several problems. It requires LOS (line of sight), as well as the receiver, would not be a move in inside.  The main problem is how the receiver will send the data back to the transmitter section.  Another disadvantage of this technology is an interference of exterior light sources such as normal bulbs; sunlight in the lane of communication will cause intermission in the transmission.  It doesn’t work in the dim areas.  **FUTURE DEVELOPMENT**  We can work on the disadvantages of the LIFI and improve its features which would make it a effective way of communication.  Also find further ways to improve the device application on various fields |