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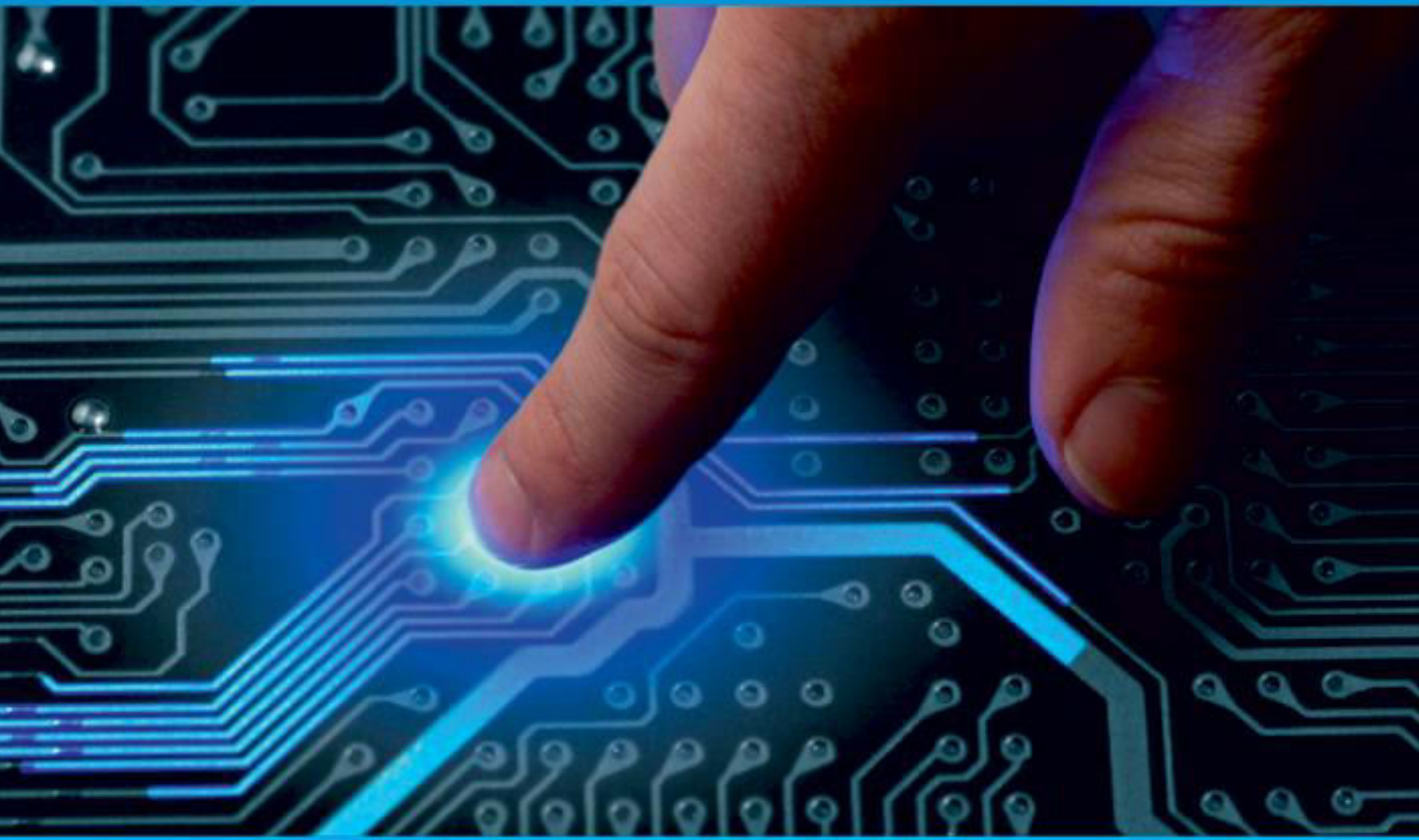

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Empowering Flood Rescue with IoUT Communication System

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ABSTRACT: During floods, communication to the control room becomes a critical challenge as mobile towers shut down for electric safety, leaving no alternative means to inform rescue teams. The main goal is to improve communication during floods and rescue operations using Water Data Communication and IoUT technology. The Internet of Underwater Things (IoUT) is proposed as a solution, utilizing water as a communication channel through Water data transmitter modules and GPS locations for efficient rescue operation.The Rescue will have the Water data receiver module. It receives the details about the rescue needed people with GPS location so can move immediately with rescue things and can access them faster operation. We use ATMega328 controller with Water data TX and RX modules the project is proposed. By pressing the Tx module with EM switch can make immediate transfer of data and will be done all process as mentioned.

KEYWORDS: Floods, Rescue, Communication, Internet of underwater things, IoUT.

I. INTRODUCTION

In the face of natural disasters, communication becomes both a critical need and a major challenge. Among the most devastating of these disasters are floods, which can disrupt conventional communication systems, leaving affected populations and emergency responders in dire straits. During floods, traditional communication infrastructure, such as cell towers and landlines, often fails due to power outages or physical damage. This breakdown not only hampers rescue operations but also delays the critical delivery of assistance to those in urgent need. However, an innovative solution leveraging the unique environment created by floods themselves offers a promising alternative. The concept of underwater data communication, traditionally explored in the realms of oceanographic research and military applications, is now being adapted to address this challenge. Utilizing water as a communication medium, this technology forms the backbone of what is termed the Internet of Underwater Things (IoUT). By enabling data transmission through water, IoUT offers a robust platform for communication in flood-affected areas where traditional systems have failed. This system incorporates a series of water data transmitters and receivers that can operate effectively below the water surface. These devices are designed to utilize short-range, high-frequency sound waves to carry data from one point to another. In a flood scenario, the transmitter units could be deployed by individuals or emergency teams in need of assistance. Each unit is equipped with a GPS module that provides precise location data, alongside an emergency messaging system activated by an electromagnetic (EM) switch. This setup ensures that even in the absence of cellular signals, the location and needs of flood victims are communicated efficiently to rescue teams. The receiver units, carried by rescue teams, are tuned to pick up signals from the transmitters. Upon receiving a distress signal, these units decode the information, providing rescuers with the exact location of the victims and details about their situation. This data is crucial for prioritizing rescue operations and deploying resources effectively, ensuring that help is dispatched to where it is needed most urgently. By leveraging Arduino controllers, a popular platform for prototyping electronic devices, the IoUT system can be customized and scaled to meet diverse operational demands. The use of Arduino also facilitates the integration of various sensors and modules, making the system adaptable and robust for complex disaster scenarios.

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II. HARDWARE COMPONENTS

1) Power supply:

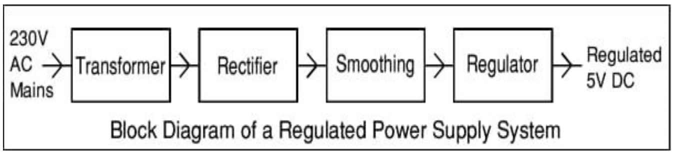

Fig 1: Power supply

An AC powered linear power supply usually uses a transformer to convert the voltage from the wall outlet (mains) to a different, usually a lower voltage. For critical electronics applications a linear regulator will be used to stabilize and adjust the voltage. This regulator will also greatly reduce the ripple and noise in the output direct current.Adjustable linear power supplies are common laboratory and service shop test equipment, allowing the output voltage to be set over a wide range. An AC power linear power supply refers to a type of power supply that converts alternating current (AC) voltage from a wall outlet into a stable, direct current (DC) voltage suitable for electronic devices. This type of power supply uses linear voltage regulation techniques, typically involving a transformer, rectifier, and regulator components to achieve the desired output voltage. Linear power supplies are known for their simplicity, reliability, and low noise output but are often less efficient compared to switch-mode power supplies, especially when dealing with high power levels. A power supply that provides 5V DC current typically involves a rectifier, capacitor, and possibly other components. Rectifier is a Converts AC (alternating current) to DC (direct current). It can be a diode-based rectifier or a more complex circuit like a bridge rectifier, depending on the design.Capacitor is a Smoothens the output voltage by storing and releasing electrical energy as needed. It helps in reducing voltage ripples or fluctuations in the DC output.When AC power is supplied to the rectifier, it converts it to a pulsating DC waveform. The capacitor then filters out the pulsations, resulting in a more stable DC output with minimal ripple. This stable 5V DC current is then available for powering electronic devices or circuits. The step-down transformer is based on electromagnetic inductionPrimary and Secondary Coils is a step-down transmitter has two coils of wire it is primary coil and the secondary coil. These coils are typically wound around a common core made of ferromagnetic material like iron.AC Input When an alternating current (AC) flows through the primary coil, it generates a changing magnetic field in the core. Voltage Transformation it is ratio of the number of turns in the primary coil to the number of turns in the secondary coil determines the voltage transformation ratio. For a step-down transformer, the secondary coil has fewer turns than the primary coil. This results in a lower output voltage across the secondary coil compared to the input voltage across the primary coil.Isolation and Voltage Regulation In addition to voltage transformation, transformers provide electrical isolation between the input and output circuits. They also help regulate voltage by maintaining a nearly constant output voltage (ignoring losses) as long as the input voltage remains within specified limits.Applications are the Step-down transformers are widely used in various applications, including power distribution, voltage regulation in electronic devices, reducing voltage for household appliances, and powering electronic circuits at lower voltages than the main supply.In summary, the working principle of a step-down transmitter involves electromagnetic induction to transform higher input voltages into lower output voltages while providing electrical isolation and voltage regulation capabilities. Turns ratio=Vp/Vs=Nn/Ns and Power out=Power in

$V_s * I_s = V_p * I_p$
V_p = primary (input) voltage
N_p = number of turns on primary coil
I_p = primary (input) current
V_s = secondary (output) voltage
N_s = number of turns on secondary coil
I_s = secondary (output) current

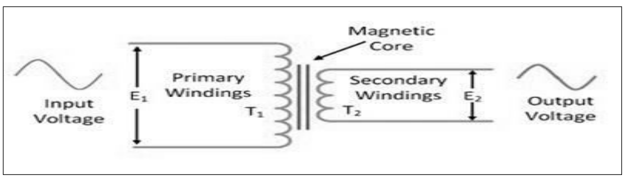

Fig 2: Voltage

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Low voltage AC output is typically used for devices like lamps, heaters, and certain AC motors. However, for electronic circuits to operate with low voltage AC, they usually require additional components like a rectifier to convert AC to DC and a smoothing capacitor to reduce voltage fluctuations, making it suitable for electronic devices.

2) Bridge Rectifier:

A bridge rectifier can be made using four individual diodes, but it is also available in special packages containing the four diodes required. It is called a full-wave rectifier because it uses the entire AC wave (both positive and negative sections). 1.4V is used up in the bridge rectifier because each diode uses 0.7V when conducting and there are always two diodes conducting, as shown in the diagram below. Bridge rectifiers are rated by the maximum current they can pass and the maximum reverse voltage they can withstand (this must be at least three times the supply RMS voltage so the rectifier can withstand the peak voltages). Please see the Diodes page for more details, including pictures of bridge rectifiers.

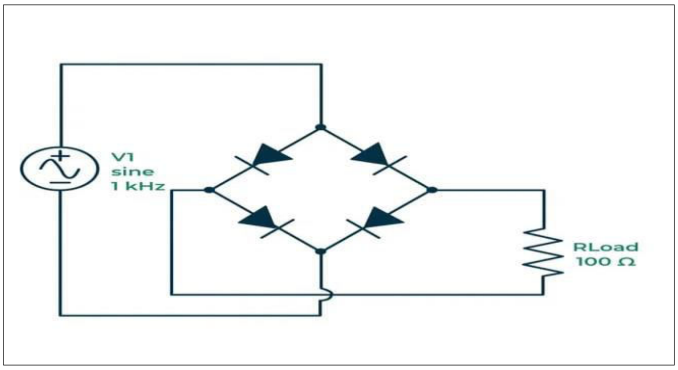

Fig 3: Bridge Rectifier

3) Regulator:

Regulators with step-down transformers convert high voltage AC input to lower voltage AC output. This output is then rectified to DC and regulated using components like transistors or integrated circuits to maintain a stable DC voltage despite variations in input or load. The transformer steps down the voltage, while the regulator ensures the output remains consistent, making it useful for applications requiring a specific voltage level, like power supplies for electronics.

Positive regulator
- input pin
- ground pin
- output pin
- It regulates the positive voltage

Negative regulator
- ground pin
- input pin
- output pin

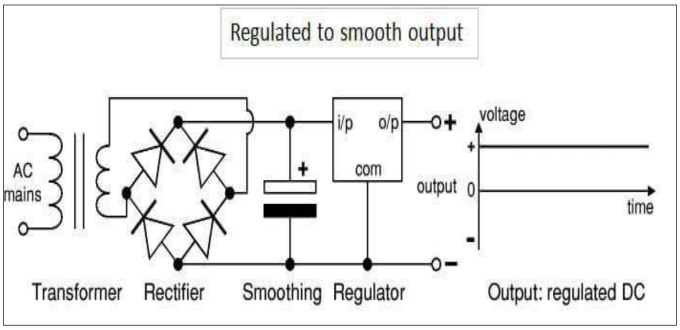

Fig 4: Regulator

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4) GPS:

The Global Positioning System (GPS) is a U.S. space-based global navigation satellite system. It provides reliable positioning, navigation, and timing services to worldwide users on a continuous basis in all weather, day and night, anywhere on or near the Earth. GPS is made up of three parts: between 24 and 32 satellites orbiting the Earth, four control and monitoring stations on Earth, and the GPS receivers owned by users. GPS satellites broadcast signals from space that are used by GPS receivers to provide three-dimensional location (latitude, longitude, and altitude) plus the time.

Fig 5: GPS

How It Works:

Global Positioning System, works through a network of satellites that orbit Earth. Satellites: There are around 30 GPS satellites orbiting the Earth. These satellites continuously transmit signals containing the satellite's location and the precise time the signal was sent. Receiver: A GPS receiver on Earth (such as in your smartphone or GPS device) picks up signals from multiple satellites.Triangulation:The receiver calculates its distance from each satellite based on the time it took for the signals to travel from the satellites to the receiver. Since the signals travel at the speed of light and the precise time of transmission is known, the receiver can determine the distance by calculating how long the signal took to arrive. Position Calculation: By triangulating its distance from at least three satellites, the GPS receiver can determine its exact location on Earth using a process called trilateration. More satellites (usually four or more) improve the accuracy and may also provide altitude information. Data Processing: The GPS receiver processes this information using algorithms to calculate latitude, longitude, altitude, and sometimes velocity. Mapping and Navigation: Once the receiver knows its position, it can overlay this information on maps to show your location or help navigate to a specific destination. GPS is widely used in various applications, including navigation systems in vehicles, mobile phones, aviation, marine navigation, surveying, and location-based services like ride-sharing apps.

GPS RECEIVER:

A GPS receiver is a device that receives signals from GPS satellites and calculates its own position on Earth based on those signals. It is a crucial component in any GPS system. Signal Reception: The GPS receiver picks up signals transmitted by multiple GPS satellites. Each satellite continuously sends signals containing its location and the precise time the signal was transmitted. Triangulation: The receiver calculates its distance from each satellite by measuring the time it takes for the signals to travel from the satellites to the receiver. Since the speed of light is known, the receiver can determine distance by timing how long the signals took to arrive. Position Calculation: Using the distances from multiple satellites, the GPS receiver employs a process called trilateration to determine its exact position on Earth. Trilateration involves intersecting spheres (representing the distances to the satellites) to pinpoint the receiver's location. Data Processing: The receiver processes the satellite signals and distance measurements using algorithms to calculate latitude, longitude, altitude, and sometimes velocity. This data is then used for navigation or mapping purposes. GPS receivers come in various forms, from dedicated devices used in vehicles and outdoor activities to integrated receivers in smartphones, tablets, and other mobile devices. They play a vital role in providing accurate positioning information for a wide range of applications, including navigation, tracking, surveying, and location-based services

Fig 6: Satellites

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***2-D TRILATERATION**:*

In a 2D context, GPS trilateration simplifies the process by assuming that the receiver and satellites are all on the same plane (e.g., the Earth's surface). Here is how the 2D trilateration concept works in GPS: Satellite Positions: GPS satellites are orbiting the Earth at known positions, broadcasting signals including their own positions and timestamps. Distance Calculation: The GPS receiver measures the time it takes for signals from at least three satellites to reach it. By multiplying this time by the speed of light, it calculates the distance to each satellite. Circle Intersection: Using the calculated distances, the receiver creates circles around each satellite. The radius of each circle is the distance from the receiver to the corresponding satellite. The receiver's location is where these circles intersect. In a 2D scenario, this intersection point represents the latitude and longitude coordinates of the receiver's position on the Earth's surface. Error Correction: GPS receivers employ various techniques to correct for errors, such as atmospheric delays, satellite clock inaccuracies, and multipath effects caused by signal reflections. Differential GPS (DGPS) is one method that improves accuracy by using a reference station with known coordinates to correct the receiver's measurements. Application: Once the receiver determines its position through trilateration, it can be used for navigation, mapping, tracking, and various location-based services. 2D trilateration is essential for GPS applications in land navigation, such as in vehicles, smartphones, and other devices that require accurate positioning on maps or for route planning.

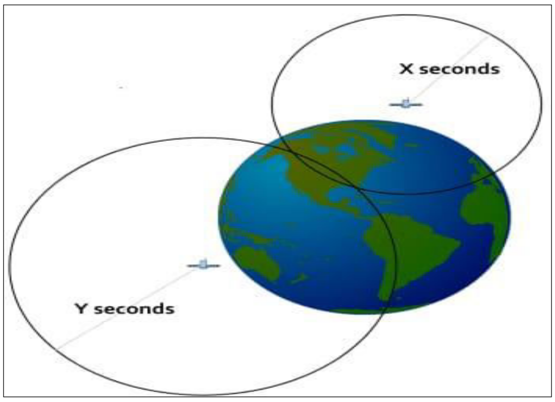

Fig 7: 2D trilateration

***3-D TRILATERATION*:**

GPS (Global Positioning System) trilateration is a technique used to determine the position of an object using distance measurements from three or more known points. In GPS, these known points are the satellites in the GPS constellation. Trilateration works by measuring the time it takes for signals to travel from the satellites to the receiver (e.g., your GPS receiver) Satellite Signals: GPS satellites continuously transmit signals that include the satellite's position and the time the signal was sent.

Receiver Measurements: Your GPS receiver collects signals from at least three satellites. By measuring the time, it takes for each signal to reach the receiver, the receiver can calculate the distance to each satellite based on the speed of light.

Calculating Position: Using the distances calculated from the signals received from multiple satellites, the GPS receiver can determine its position through trilateration. Trilateration involves intersecting spheres (or in three dimensions, intersecting spheres, or hyperboloids) centered on each satellite. The intersection point(s) of these spheres/hyperboloids represents the possible location(s) of the receiver.

Error Correction: GPS systems account for factors that can introduce errors, such as atmospheric effects and satellite clock errors, to improve the accuracy of the calculated position. Overall, GPS trilateration is a fundamental principle behind how GPS devices determine their location on Earth's surface.

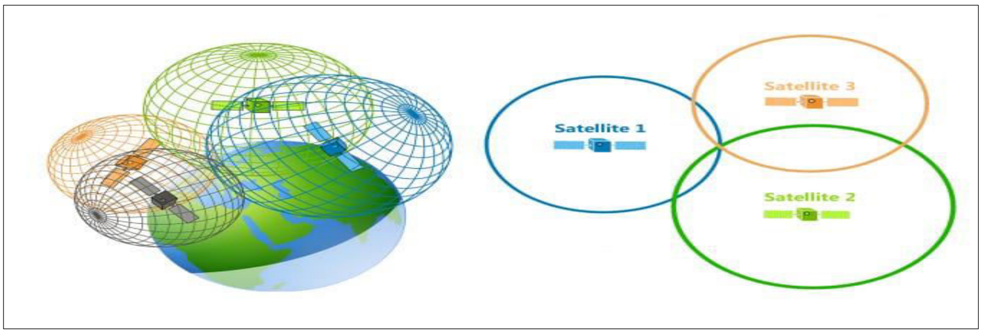

Fig 8: 3D trilateration

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GPS CALCULATIONS:

The GPS calculation involves several steps to determine the receiver's position accurately. Satellite Signal Reception: The GPS receiver collects signals from multiple satellites in the GPS constellation. Each satellite broadcasts its position and a precise time signal. Time Delay Calculation: The receiver calculates the time delay for each satellite signal to reach it. This delay is based on the difference between the time the signal was sent by the satellite and the time it was received by the receiver. Distance Calculation: Using the time delay, the receiver calculates the distance to each satellite based on the speed of light. The formula used is: Distance = Speed of Light x Time Delay. Satellite Position: The receiver uses the satellite signals to determine the precise position of each satellite in space. This information is obtained from the signals broadcast by the satellites themselves. Trilateration: The receiver performs trilateration using the distances to at least three satellites whose positions are known. Trilateration involves intersecting spheres (in 2D) or intersecting spheres/hyperboloids (in 3D) centered on each satellite. The intersection point(s) represent the possible location(s) of the receiver. Error Correction: GPS receivers apply error correction techniques to account for factors that can affect signal accuracy, such as atmospheric effects, satellite clock errors, and signal reflection. Position Calculation: Based on the trilateration results and error corrections, the GPS receiver calculates its precise position on Earth's surface, including latitude, longitude, and often altitude. This process is repeated continuously as the receiver tracks signals from multiple satellites, allowing it to update and refine its position calculation in real-time.

Fig 9: Satellite

5) Microcontroller: Arduino Uno

Arduino is an open-source project that created microcontroller-based kits for building digital devices and interactive objects that can sense and control physical devices. The project is based on microcontroller board designs, produced by several vendors, using various microcontrollers. These systems provide sets of digital and analog input/output (I/O) pins that can interface to various expansion boards (termed shields) and other circuits. The boards feature serial communication interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino project provides an integrated development environment (IDE) based on a programming language named Processing, which also supports the languages C and C++.

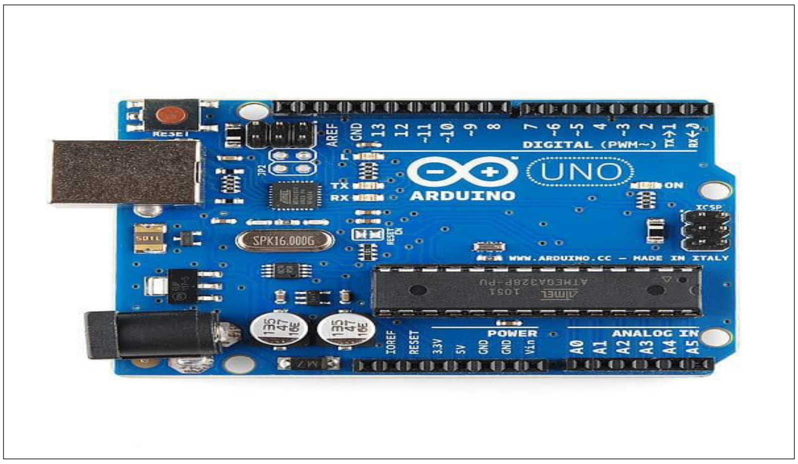

Fig 10: Arduino Uno

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Product Description

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter. Arduino Uno has a number of facilities for communicating with a computer, another Arduino board, or other microcontrollers.

Features

- Microcontroller: ATmega328P
- Operating voltage: 5V
- Input voltage: 7-12V
- Flash memory: 32KB
- SRAM: 2KB
- EEPROM: 1KB

Applications

- Real time biometrics
- Robotic applications
- Academic applications

6) 16x2 LCD

LCD stands for liquid crystal display. They come in many sizes 8x1 , 8x2 , 10x2 , 16x1 , 16x2 , 16x4 , 20x2 , 20x4 ,24x2 , 30x2 , 32x2 , 40x2 etc . Many multinational companies like Philips Hitachi Panasonic make their own special kind of LCD'S to be used in their products. All the LCD'S performs the same functions (display characters numbers special characters ASCII characters etc).Their programming is also same and they all have same 14 pins (0-13) or 16 pins (0 to 15). Alphanumeric displays are used in a wide range of applications, including palmtop computers, word processors, photocopiers, point of sale terminals, medical instruments, cellular phones, etc.

Product Description

This is an LCD Display designed for E-blocks. It is a 16 character, 2-line alphanumeric LCD display connected to a single 9-way D-type connector. This allows the device to be connected to most E-Block I/O ports. The LCD display requires data in a serial format, which is detailed in the user guide below. The display also requires a 5V power supply. Please take care not to exceed 5V, as this will cause damage to the device. The 5V is best generated from the E-blocks Multi programmer or a 5V fixed regulated power supply. The 16 x 2 intelligent alphanumeric dot matrix displays is capable of displaying 224 different characters and symbols. A full list of the characters and symbols is printed on pages 7/8 (note these symbols can vary between brand of LCD used). This booklet provides all the technical specifications for connecting the unit, which requires a single power supply (+5V).

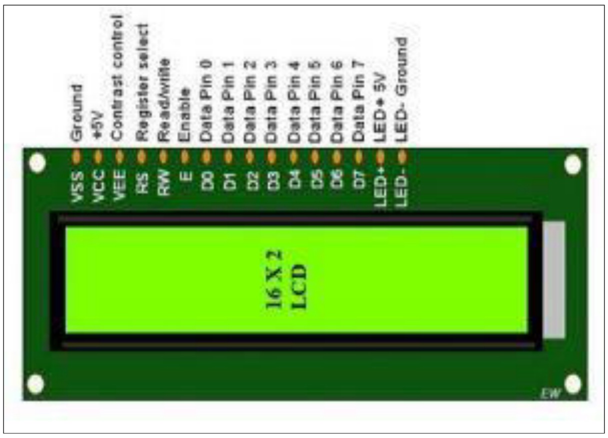

Fig 11: LCD Display

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III. SOFTWARE DESCRIPTION

Arduino Software (IDE)

Get the latest version from the download page. You can choose between the Installer (.exe) and the Zip packages. We suggest you use the first one that installs directly everything you need to use the Arduino Software (IDE), including the drivers. With the Zip package you need to install the drivers manually. The Zip file is also useful if you want to create a portable installation. When the download finishes, proceed with the installation and please allow the driver installation process when you get a warning from the operating system

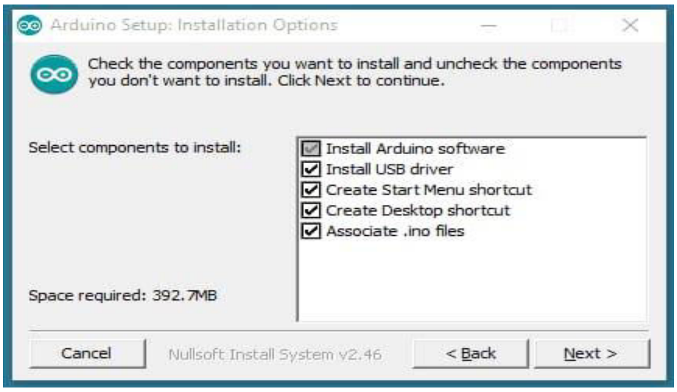

Fig 12: Setup Screenshot

When the download finishes, proceed with the installation and please allow the driver installation process when you get a warning from the operating system.
Choose the components to install.

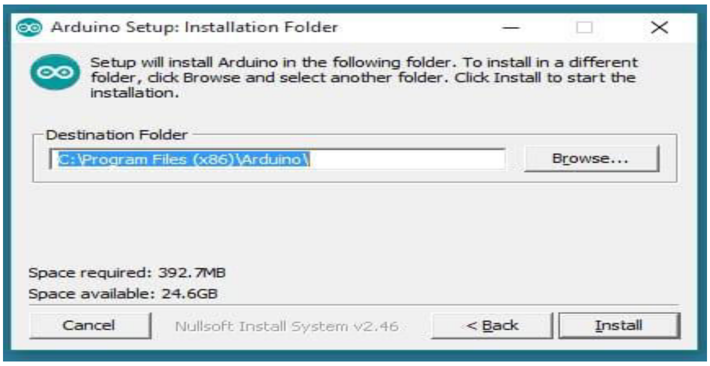

Fig 13: Setup Screenshot

Choose the installation directory (we suggest to keep the default one)

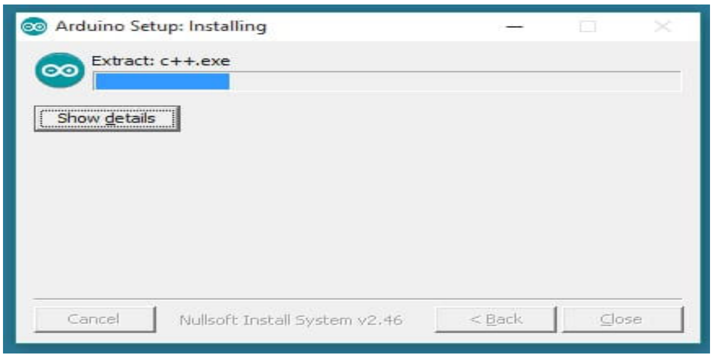

Fig 14: Setup Screenshot

The process will extract and install all the required files to execute properly the Arduino Software.

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IV. TECHNICAL DETAILS

The Arduino Boot loader sets the "erase Address" to zero every time the boot loader is called. ROBOTC called the "Load Address" command to set the address in which we want to write/verify when downloading program. When writing a page of memory to the arduino, the Arduino boot loader will erase the existing page and write a whole new page. In the scenario of downloading firmware, everything is great because the Erase Address and the Loaded Address both start at zero. In the scenario of writing a user program, we start writing at memory location 0x7000, but the Boot loader erases information starting at location zero because the "Load Address" command doesn't update where to erase. Our modification is to set both the Load Address and the Erase Address so the activity of writing a user program doesn't cause the firmware to be accidentally erased.

Summary

- Microcontroller : Arduino UNO
- Operating Voltage 5V
- Input Voltage (recommended)
- Input Voltage (limits) 6-20V
- Digital I/O Pins 54 (of which 14
- provide PWM output)
- Analog Input Pins 16
- DC Current per I/O Pin 40mA
- DC Current for3.3VPin 50mA
- Flash Memory 256 KB of which 8 KB
- used by bootloader
- SRAM 8KB
- EEPROM 4KB
- Lock Speed 16MHz

The Arduino UNO can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using. More than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts. They differ from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the programmed as a USB-to-serial converter.

V. ADVANTAGES

The IoUT system maintains functionality in flood conditions where traditional communication systems fail. By using water as the communication medium, it stays operational despite the shutdown of electrical and network infrastructures. Equipped with GPS, the system precisely pinpoints the locations of those needing help, crucial during floods where disorientation is common. This precision ensures that rescue efforts are directed exactly where needed. The system features an EM switch on the transmitter, allowing instant data transmission. This rapid activation is vital for quick communication of emergencies, drastically reducing the response time. Built on the Arduino platform, the IoUT system can be easily adjusted to fit various flood scenarios and environments. This adaptability makes it applicable in multiple settings, maximizing its utility. Arduino-based components are affordable and widely available, making the IoUT system a cost-effective solution for disaster management. This accessibility enables broader deployment, even in budget-restricted areas.

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VI. APPLICATIONS

The IoUT system can be deployed in areas prone to flooding to facilitate rapid and accurate location of affected individuals. By providing real-time data to rescue teams, the system ensures that help is dispatched efficiently to those in urgent need, reducing the potential for casualties and speeding up rescue efforts.During disasters that result in widespread power outages, traditional communication systems often fail. The IoUT system operates independently of power grids, using water as a communication medium. This makes it invaluable for maintaining communication between emergency responders and affected communities during critical times.The system can be used to coordinate the logistics of relief efforts in disaster-affected areas. By transmitting information about the needs and numbers of affected individuals, it helps in planning and distributing resources such as food, medical supplies, and temporary shelter more effectively. Besides human rescue and communication, the IoUT system can be adapted to monitor and report changes in environmental condition. During a flood, such as water quality, water level rises, or the presence of hazardous substances, providing valuable data for ongoing response efforts and future preparedness.The IoUT system can be integrated with other technological solutions, such as aerial drones or satellite communications, to create a comprehensive, multi-layered disaster response system. This integration can extend the capabilities of each technology, providing a more robust response mechanism across different disaster scenarios.

VII. RESULTS AND DISCUSSIONS

The deployment of the Internet of Underwater Things (IoUT) during flood scenarios has demonstrated a crucial advancement in disaster response communications. The initial results of this project highlight the system's reliability in maintaining effective communication under conditions where traditional networks fail. IoUT's use of water channels to transmit data and GPS locations has proven to be a robust solution, significantly reducing the communication blackout periods that commonly accompany severe flooding. This has facilitated much faster coordination and deployment of rescue teams to the affected areas. Furthermore, the introduction of the IoUT technology has shown a marked improvement in response times for emergency services. With the ability to transmit critical information such as the location and needs of stranded individuals directly to rescue teams, the system has shortened the time between disaster onset and response initiation. This acceleration is not only a technical success but also a potentially life-saving feature, reducing the risk to both victims and first responders by ensuring that rescue operations are timely and well-informed. However, the application of IoUT in real-world conditions has also uncovered several challenges. The variance in water composition and environmental interference in different flood-prone areas occasionally hindered signal integrity, indicating a need for further refinement in technology to ensure robust performance across all potential scenarios. Moreover, integrating IoUT with existing disaster management systems posed logistical and technical hurdles that need to be addressed to streamline operations in future deployments. Economically, the IoUT presents a cost-effective alternative to rebuilding traditional communication infrastructures after each disaster, which can be prohibitively expensive. The community response to the trials was overwhelmingly positive, emphasizing the added sense of security and preparedness afforded by the new system. This acceptance is crucial for widespread adoption and underscores the social benefits of innovative disaster management technologies like the IoUT.

VIII. CONCLUSION AND FUTURE WORK

The Internet of Underwater Things (IoUT) represents a pioneering approach to solving the communication disruptions typically experienced during flood events. By harnessing water as a communication channel, the IoUT system provides a critical innovation, ensuring uninterrupted data transmission when conventional networks fail. This system's ability to quickly and accurately relay information about flood victims' locations and needs directly influences the efficiency and effectiveness of rescue operations, potentially saving lives and mitigating the impact of the disaster.Despite its significant advantages, the practical deployment of the IoUT has highlighted areas requiring further refinement, such as enhancing signal stability across various aquatic environments and integrating seamlessly with existing emergency protocols. These challenges underscore the need for ongoing research and development to fully realize the IoUT's potential and ensure robust performance under all conditions.In sum, the introduction of the IoUT into disaster management marks a substantial forward leap in emergency response capabilities. It is a testament to the power of innovative technology to transform our approach to crisis management. As this technology matures and integrates more deeply with traditional disaster response mechanisms, it promises to significantly bolster resilience to flooding disasters globally. By continuing to advance the IoUT, we are not just improving a technological tool; we are redefining the landscape of emergency communication, making it more reliable, efficient, and responsive in the face of nature's challenges.

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REFERENCES

1. R. Karthika and S. BalaKrishnan, "Wireless Communication using Li-Fi technology", International Journal of Electronics and Communication Engineering, 2015.
2. Ruonan Ji, Shaowei Wang, Qing Quan Liu and Wie leu, "High speed visible light communications: Enabling Technologies and State of the Art", MDPI Applied Sciences, vol. 8, no. 4598, 2018.
3. Lubin Zeng, Dominic O'Brien, Hoa Le-Minh, Kyungwoo Lee, Daekwang Jung and Yunjie Oh, "Improvement of date rate by using equalization in an indoor visible light communication system", 2008 4th IEEE International Conference on Circuits and Systems for Communications, 2008.
4. Naresh Subray HariKant and N. Sridhar, "Development of Data Transmission Model for Underwater Communication using Li-Fi Technology" in , IEEE, 2020.
5. Olivier Bouchet, Pascal Porcon, Mike Wolf, Liane Grobe, Joachim Walewski, Stefan Nerreter, et al., "Visible-light communication system enabling 73 mb/s data streaming" in , IEEE, 2010.
6. Junyi Jiang, Fan Jin and Lajos Hanzo, "Video Streaming in the Multiuser Indoor Visible Light Downlink" in , IEEE, 2015.
7. Jay H. Bhut, Dharmrajinh N. Parmer and Khuhbu Mehta, "Li-Fi Technology-A Visible Light Communication", International Journal of Engineering Development and Research, 2014.
8. Anwesha Chakraborty and T rina Dutta, "Latest advancement in Light Fidelity (Li-Fi) Technology", International Journal of Advanced Research in Computer Science and Management Studies, 2017.
9. Debing Wei, Li Yan and Jie Wang, "Dynamic Magnetic Induction Wireless Communications for Autonomous Underwater Vehicle Assisted Underwater IoT" in , IEEE, 2020.
10. Lifang Fenz, Rose Qingyang Hu, Jianping Wang, Peng Xu and Yi Qian, "Applying vlc in 5G networks: Architecture and key technologies", IEEE Network, 2016.
11. Sandeep Shukla and Shivendra Singh, "Analysis of Underwater Communication using Visible Light LEDs" in , IEEE, 2020.
12. Vuong V. Mai, Chuyen T. Nguyen and Mat T. Nguyen, "Underwater optical wireless communication-based IoUT networks: MAC performance analysis and improvement", Optical Switching and Networking, 2020.
13. Ahmed Aizaldeen Abdullah and Mustafa Qays Hatem, "Audio Transmission through Li-Fi technology", International Journal of Civil Engineering and Technology (IJCIET), 2018.
14. Nandha Mahendran and Jeyamohan Kumar, "Underwater Wireless Communication using Visible Light LEDs", International Journal of Innovative Research in Science Engineering and Technology, 2019.
15. Fumin Wang, Yuanfan Liu, Fengyi Jiang and Nan Chi, "High-speed underwater visible light communication system based on LED employing maximum ratio combination with multi-pin reception" in Optics Communications, Elsevier, 2018 2010

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