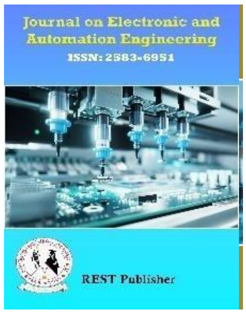
Journal on Electronic and Automation Engineering
Vol: 2(2), June 2023
REST Publisher; ISSN: ISSN: 2583-6951 (Online)
Website: https://restpublisher.com/journals/jeae/
DOI: https://doi.org/10.46632/jeae/2/2/17



Sensor Based Flood & Landslide Pre-Alert System

P.G. Raghavendran, S. Kalaivani, V. Iyyappan, M. Ranjith, K. Mariyappan
Arasu Polytechnic College, Kumbakonam, Thanjavur District, Tamil Nadu, India.
*Corresponding Author Email: arasupolytechnic@gmail.com

Abstract: The proposed system is an advanced early warning system designed to mitigate disasters such as landslides and floods by providing crucial minutes of warning. It consists of a wireless sensor network deployed on the slopes of landslide and flood-prone mountainsides. The network utilizes a Node MCU topology, and for demonstration purposes, a two-node system is suggested. The nodes in this system are equipped with various sensors to gather essential data. They utilize a tipping rain sensor to measure precipitation and an accelerometer to detect potential landslides by monitoring module position changes. Additionally, there's a humidity sensor continuously monitoring surface temperature changes. These sensor nodes transmit their data to a central base station, which acts as a receiver. Both the public and the base station are equipped with Node MCU microcontrollers to facilitate communication. The base unit, positioned at a strategic location, such as the district collector's office, utilizes a long-range transmitter to communicate with the master unit. When the sensor nodes detect significant landslide or flood activity within a specific timeframe, indicating a potential flash flood, this critical information is transmitted to the master unit. The master unit responds by activating an alarm and promptly sending messages to relevant officials and the general public through Node MCU microcontrollers connected to it. This swift communication allows for timely evacuation and response measures to minimize the impact of the disasters.

Keywords: Node MCU, Humidity Sensor, Accelerometer, Moisture Sensor

1. INTRODUCTION

Disaster mitigation plays a crucial role in minimizing the impact of natural disasters on both human lives and property. It is essential to raise awareness about disaster preparedness worldwide, particularly in countries like Indonesia. Implementing advanced embedded device technology specifically designed to detect various disasters, such as earthquakes, tsunamis, floods, landslides, storms, and hurricanes, is of utmost importance. This system utilizes sensors tailored to the type of disaster to be detected, creating an early warning mechanism that can predict and alert communities about potential floods and landslides. The development of these embedded devices involves the integration of hardware, software, and Internet networks. Microchip controllers serve as the hardware, while software applications based on the Internet of Things (IoT) process the information. The microcontroller is programmed with computational algorithms, enabling it to predict the occurrence of natural disasters. By leveraging technological advancements, these devices can effectively detect disasters at an early stage. Moreover, producing these embedded systems with 60% local content not only reduces costs but also aligns with government initiatives towards technological self-reliance. Installing these sensors in disaster-prone areas, particularly those susceptible to flooding and landslides, is essential for disaster mitigation and reducing the potential loss of life and property. The sensor design, based on the Internet of Things, presents a practical solution to address these challenges. Early detection of natural disaster signs through this technology enables faster responses and enhances the reliability of disaster mitigation efforts. In conclusion, Indonesia's urgent need for advanced technology in early disaster detection emphasizes the importance of deploying sensors in disaster-prone regions. By promoting disaster preparedness and implementing effective early warning systems, the goal is to reduce the devastating impact of natural disasters on both human lives and material assets.

2. LITERATURE SURVEY

Mayra Zanchett Manichean et al. aimed to create an Expert System (ES) designed to aid users in managing floods and landslides in the Itajai-Acu River watershed. The system offers an additional option by allowing users to simulate various scenarios, serving as a forecasting tool for potential floods and landslides. They constructed the knowledge base using information provided by CEOPS and relevant scientific research from the study area. The implementation was done in Java, integrated with the Java Embedded Object-Oriented Production Systems (JEOPS) tool, which handled the construction of the knowledge base and rules inference.

On the other hand, Helio Dos Santos Silva et al. developed an environmental disaster warning system for the Itajaí Valley. This system incorporates a telemetric network with rain gauges and level measurement devices. A smaller network of instruments was also set up in the urban area of Blumenau to monitor high-risk areas for landslides. The Regional University of Blumenau (FURB) played a crucial role in this system since it provides real-time information to help approximately one million inhabitants make decisions about potential flooding areas during hydro-meteorological events. They emphasize the importance of continuously upgrading the system with the latest technological advancements and using versatile and user-friendly computational tools. The work showcases some of the tasks carried out in CEOPS, highlights its progress, and acknowledges its limitations. Diwaker Pant et al. focus on Uttarakhand, a Himalayan state vulnerable to natural calamities, leading to significant destruction and property loss. Despite attracting millions of pilgrims and tourists annually, the region faces constant hazards. To address these challenges, the paper proposes a comprehensive study on various disasters and their detection, emphasizing management strategies to minimize losses in hilly areas. The authors advocate the use of wireless sensor networks (WSN) as a promising solution for disaster management and rescue operations. They highlight several applications of WSN, such as earthquake detection and alert systems, flood detection, landslide detection, forest fire detection, monitoring Himalayan River water levels, glacier monitoring, and pilgrimage and tourist management. The deployment of sensors to measure various parameters enables the development of early warning systems to mitigate potential losses. The paper provides an overview of different approaches and applications of WSN to aid disaster management efforts in Uttarakhand, India. Lokesh Rajendran and his co-authors discuss the significant threats and challenges that natural disasters pose to various regions in the country. Providing timely and appropriate assistance to those directly affected by such crises is a daunting task, considering the increasing needs of the affected population and the complexities of these disasters. The emergence of Information and Communication Technology (ICT) has greatly improved the reliability and timeliness of data input from remote sensors. This advancement has enhanced the precision and detail of disaster analysis. Consequently, the development of an effective early warning disaster system has become crucial in responding to such calamities. Such a system plays a pivotal role in alerting civilians well in advance of disasters like earthquakes, tsunamis, volcano eruptions, flash floods, landslides, cyclones, and more. Additionally, it serves as a reference point for mandatory evacuations and facilitates timely decision-making by both individuals and government authorities. The paper specifically focuses on the success of "L&T Smart World's" early warning system, which played a vital role in evacuating 1.2 million people during cyclone "FANI," which struck the coastal areas of Odisha, India, in April 2019. Proposed System: The proposed system is an early warning mechanism designed to mitigate disasters such as landslides and flash floods. It consists of a wireless sensor network deployed on mountain slopes that are prone to these hazards. The network adopts a ZigBee tree topology, and the nodes are equipped with a tipping rain gauge to measure precipitation and buried microphones or piezo elements to monitor pressure changes indicating potential landslides. The data collected by these nodes is transmitted to a base station, which acts as a receiver and is equipped with a ZigBee coordinator. The base station, in turn, communicates with a master unit through a long-range RF transmitter, strategically located at a central point, like the district collector's office. When the nodes detect heavy rainfall over a specific period, signaling a potential flash flood, this information is relayed to the base unit and subsequently to the master unit. Upon receiving this critical data, the master unit activates an alarm and sends SMS notifications to relevant officials via a GSM module connected to it. This proactive approach aims to save lives and resources by providing timely warnings about landslide and flash flood threats. Landslides are known to be highly destructive and deadly natural events, especially in mountainous regions. The Global Landslide Catalog by NASA reported over 25,000 fatalities resulting from around 7,000 rainfall-triggered landslides between 2007 and 2015. The financial impact of these events can be substantial, with estimated costs exceeding $4 billion annually according to the U.S. Geological Survey. Predicting landslides is challenging due to the spatial and temporal variability of factors affecting slope stability. However, advancements in precipitation estimation, high-resolution imagery, and elevation mapping have improved real-time landslide threat prediction. Implementing these technological advancements, especially in developing regions, holds the potential to save numerous lives and allocate resources effectively for landslide prevention and recovery.

To support the development of a prototype for landslide prediction, the Hydrologic Research Center (HRC), a non-profit research corporation, initiated the creation of a landslide hazard threat assessment for Central America. This assessment included incorporating landslide threats into flash flood guidance threat assessments. In October 2015, the system's effectiveness was validated when a significant landslide occurred in a region of Guatemala that had been flagged as an area of very high risk during that time period.

Block Diagram

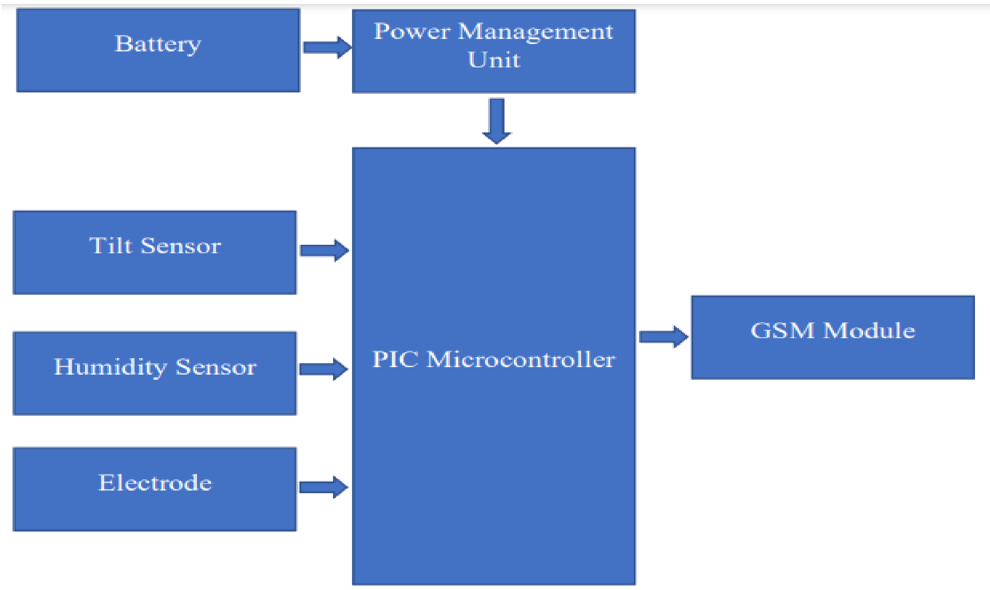


FIGURE 1. Block Diagram of Transmitter Sensing Station

Wireless sensor network (WSN) technology enables the rapid capture, processing, and real-time transmission of essential data at high speeds. This capability proves beneficial during events like heavy rainfall, snowmelt, and fluctuations in ground-water levels. A landslide refers to the downward and outward movement of soil, rock, or vegetation, caused by the force of gravity. Various types of landslides exist, such as rotational landslides, translational landslides, rock falls, rock toppling, lateral spreading, and debris flows. Debris flow involves the downhill movement of collapsed, loosely consolidated material, usually following a stream channel. Landslides can result from both natural and human-induced factors. Natural factors include gravity, geological conditions, intense and prolonged rainfall, earthquakes, waves, and volcanic activities. Intense rainfall, in particular, can weaken slopes and increase soil weight by raising water tables, leading to unstable conditions. Anthropogenic factors involve activities like construction, road building, canal excavation, and mining, which can modify natural slopes, block surface drainage, and impose additional loads on critical slopes. The impact of landslides can be direct or indirect. Direct effects include casualties and injuries to both people and animals. Physical damage may also occur due to debris blocking roads, disrupting supply lines (such as telecommunications, electricity, water), and obstructing waterways. Indirect effects include flooding caused by the movement of large soil masses into reservoirs.

Landslides can have devastating consequences, resulting in loss of life, destruction of property, infrastructure, human settlements, agriculture, and forestland, as well as damaging communication routes. The term "landslide" encompasses various downhill earth movements, ranging from swiftly moving catastrophic rock avalanches and debris flows in mountainous regions to slower-moving earth slides. Some landslides occur gradually, causing damage over time, while others can strike suddenly and unexpectedly, leading to the abrupt destruction of property and lives. The Indian subcontinent, covering approximately 15% of the land area, spans around 0.49 million km2, and is significantly affected by landslides. India has a history of experiencing catastrophic events caused by landslides.

Circuit Diagram: Developing an Early Flood Warning System with Precise Water Level Measurement and Notification Capability The main focus of this project is to create a reliable early flood warning system capable of accurately measuring water levels and promptly sending warning messages to designated clients. The system's primary objective is to predict the remaining time before the flood and identify three distinct water levels: early flood, flood, and low tide post-flood. To achieve this, the system is integrated with a GSM modem that enables it to transmit measured data via SMS (Short Message Service) to two specific clients' phone numbers pre-programmed into the system. The system will send warning messages three times, each corresponding to conditions of being prone to flooding, experiencing flooding, and being in a safe condition. The construction of the system employs PVC pipes to safeguard its components and enhance measurement accuracy. Studies indicate that the system can detect water levels up to 3 meters away when placed inside an 8-inch PVC pipe. Furthermore, it is designed to operate continuously for 24 hours and includes a feature to request real-time water level measurements. This flood early warning system is designed as a stand-alone unit, making it easily deployable in flood-prone areas. The system's settings, including client phone numbers and water level thresholds, can be programmed by sending specific SMS commands to the system. The proposed early warning system holds significant potential in mitigating disasters such as landslides and flash floods. It utilizes a wireless sensor network deployed on slopes susceptible to landslides and flash floods, structured in a ZigBee tree topology. A demonstration model is presented with two sensor nodes, one measuring precipitation using a tipping rain gauge, and the other detecting landslides via buried microphones or piezoelectric elements that gauge pressure changes. The sensor nodes relay their data to a base station, which employs a ZigBee coordinator to receive the information. The base station further communicates with a master unit using a long-range RF transmitter, strategically placed at a central location, such as the district collector's office. In the event of heavy rainfall leading to flash floods, the base station conveys this data to the master unit, which triggers an alarm and sends SMS notifications to relevant officials via an integrated GSM module.

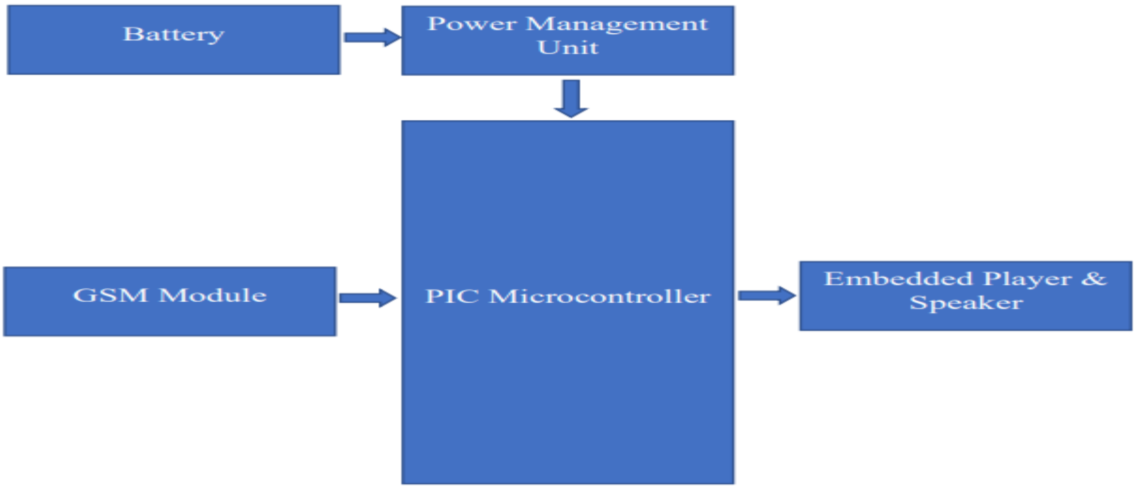


FIGURE 2. Block Diagram of Receiving Sensing Station

Hardwire control:

The major disadvantages in using this control are:

- Difficult to make logic.
- Unreliable.
- Bulk and enlarge.

Electronics control:

The shortcomings in this control are:

- It cannot withstand temperature.
- Input& output ports cannot be expanded.
- Interfacing cannot have achieved easily

3. PROPOSED SYSTEM

In this proposed system, we have two main components: the transmitter and the receiver. The transmitter is equipped with various components, including a Solar Panel, a 12V to 5V DC Regulator, a Battery, a Node MCU (ESP8266) microcontroller, a Moisture Sensor (Electrode), a Humidity Sensor, and an Accelerometer. The Solar Panel generates a 12V DC supply under normal lighting conditions. This voltage is then regulated by the 12V to 5V DC Regulator to ensure a stable 5V DC supply. The Battery serves as an energy storage device, capturing and storing the solar panel's energy. Additionally, the Battery provides power to the Node MCU microcontroller. The Node MCU microcontroller is equipped with an inbuilt Wi-Fi module for communication. It interfaces with the Moisture Sensor, which measures the moisture content in the soil. The Humidity Sensor is used to monitor the atmospheric temperature range. Simultaneously, the Accelerometer continuously tracks the module's position. On the other hand, the receiver consists of a Node MCU (ESP8266), a Single Channel Relay, an Embedded Player, and a Speaker. The Node MCU in the receiver is connected to both the single-channel relay module and the embedded player. The embedded player is linked to a speaker for audio output. In the event that the transmitter detects any faults, it will send an alert signal to the receiver. Upon receiving the alert, the receiver's components will activate, alerting people to the detected fault. In summary, this system utilizes various sensors and a wireless communication setup to monitor environmental conditions and respond with alerts when necessary.

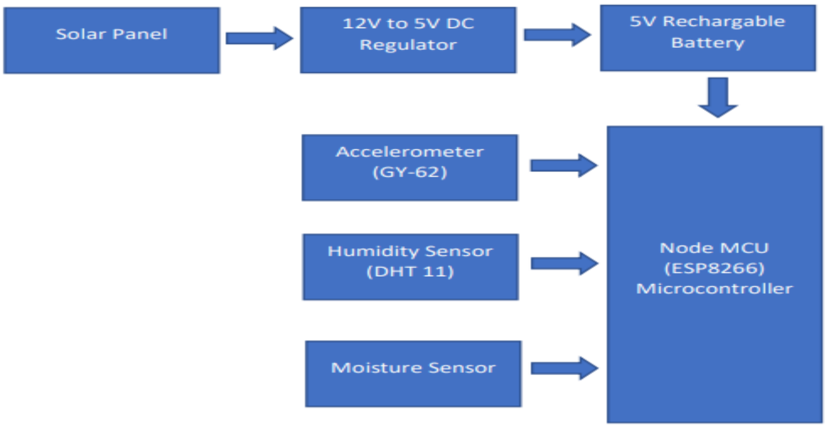


FIGURE 3. Block Diagram of Transmitter

The transmitter comprises various components, including a Solar Panel, a 12V to 5V DC Regulator, a Battery, a Node MCU (ESP8266) microcontroller, a Moisture Sensor (Electrode), a Humidity Sensor, and an Accelerometer. Under normal lighting conditions, the Solar Panel supplies 12V DC power. The Regulator converts this to a stable 5V DC supply. Energy from the Solar Panel is stored in the Battery. The Node MCU microcontroller is powered by the Battery and comes with an integrated Wi-Fi module. The microcontroller is connected to the Moisture Sensor, Humidity Sensor, and Accelerometer. The Moisture Sensor detects soil moisture levels, while the Humidity Sensor measures the atmospheric temperature range. Additionally, the Accelerometer continuously monitors the module's position. Should any malfunction occur on the transmitter side, it will transmit relevant information to the receiver. The receiver consists of an embedded speaker that emits an alert to notify people when it receives information from the transmitter about a detected fault**.**

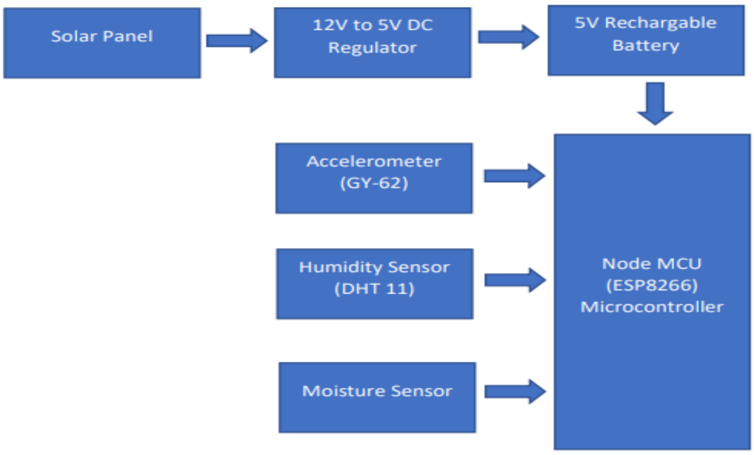


FIGURE 4. Block Diagram of Transmitter

The transmitter consists of several components: A Solar Panel that provides a 12V DC supply under normal lighting conditions, a 12V to 5V DC Regulator to regulate the voltage, a Battery for storing solar energy, a Node MCU (ESP8266) microcontroller with an inbuilt Wi-Fi module, a Moisture Sensor (Electrode) to detect soil moisture content, a Humidity Sensor to sense atmospheric temperature range, and an Accelerometer to continuously monitor the module's position. Under normal conditions, the Solar Panel supplies 12V DC power, which is then regulated to 5V DC by the Regulator. The Battery stores this energy and also powers the Node MCU microcontroller. The microcontroller is responsible for managing the attached sensors (Moisture Sensor, Humidity Sensor, and Accelerometer). If any issues or faults occur on the transmitter side, the microcontroller will transmit relevant information to the receiver. The receiver, equipped with an embedded speaker, will receive these alerts and notify people by generating sound signals to alert them of the detected problem. The recipient is equipped with a Node MCU (ESP8266), a Single Channel Relay, an Embedded Player, and a Speaker. The Node MCU is linked to both the single channel relay module and the embedded player. The embedded player is then connected to a speaker. In the event of any malfunction or issue on the transmitter side, relevant information will be transmitted to the receiver side. Subsequently, the receiver, equipped with an embedded speaker, will sound an alert to notify the people.

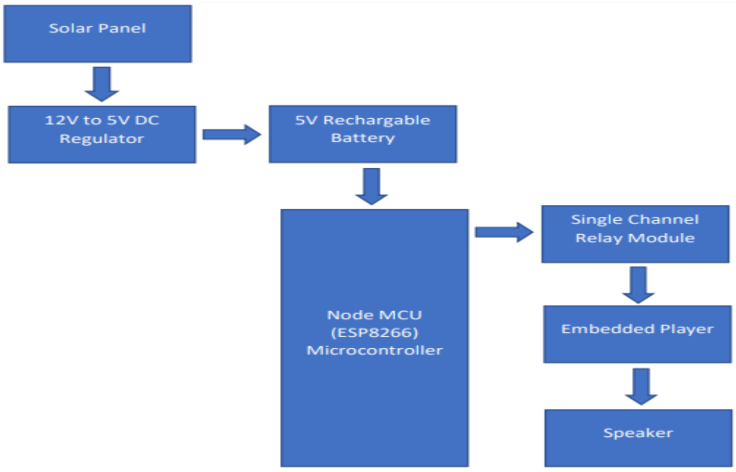


FIGURE 5. Block Diagram of Receiver

4. CIRCUIT DIAGRAM

Circuit Diagram of Transmitter: The transmitter section consists of several components: a Solar Panel, a 12V to 5V DC Regulator, a Battery, a Node MCU (ESP8266) microcontroller, a Moisture Sensor (Electrode), a Humidity Sensor, and an Accelerometer. The Solar Panel is responsible for generating a 12V DC supply under normal lighting conditions. This 12V DC supply is then regulated to 5V DC by the DC Regulator. The excess energy produced by the Solar Panel is stored in the Battery. Both the Node MCU microcontroller and the connected components are powered by the Battery. The Node MCU microcontroller is equipped with an inbuilt Wi-Fi module, enabling it to connect to wireless networks and communicate data over the internet or other devices.

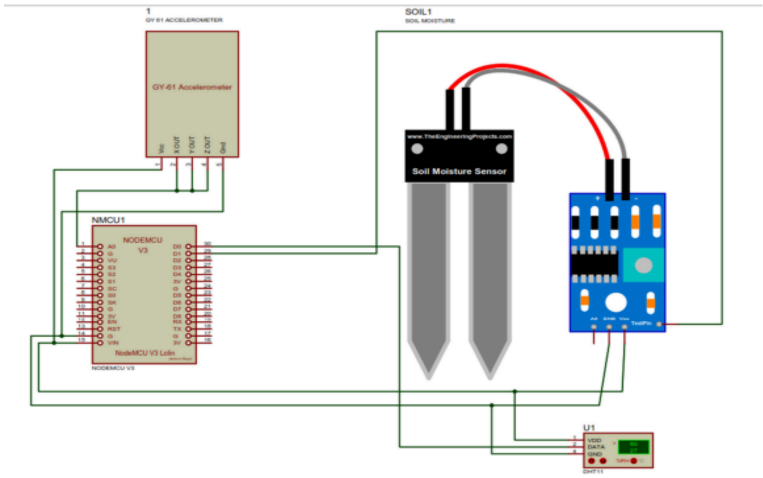


FIGURE 6. Circuit Diagram of Transmitter

The microcontroller is linked to three sensors: The Moisture Sensor, Humidity Sensor, and Accelerometer. The Moisture Sensor detects the moisture level in the soil, while the Humidity Sensor measures the temperature range in the atmosphere. Meanwhile, the Accelerometer continuously monitors the module's position. Should any fault 19 arise on the transmitter side, essential information will be transmitted to the receiver side. The receiver is equipped with an embedded speaker, which promptly alerts people to the situation**.**

Circuit Diagram of Receiver: Our system consists of two main parts: the transmitter and the receiver. The transmitter is equipped with various components, including a Solar Panel, a 12V to 5V DC Regulator, a Battery, a Node MCU (ESP8266) microcontroller, a Moisture Sensor (Electrode), a Humidity Sensor, and an Accelerometer. On the other hand, the receiver part includes another Node MCU (ESP8266), a Single Channel Relay, an Embedded Player, and a Speaker. The Node MCU in the receiver is connected to the single channel relay module and the embedded player. To summarize, the transmitter and receiver components work together to facilitate the transmission of data or signals between the two ends of the system. The transmitter gathers data from various sensors and sends it to the receiver, which then processes the information and triggers actions based on the received data, thanks to the single channel relay and embedded player's functionality.

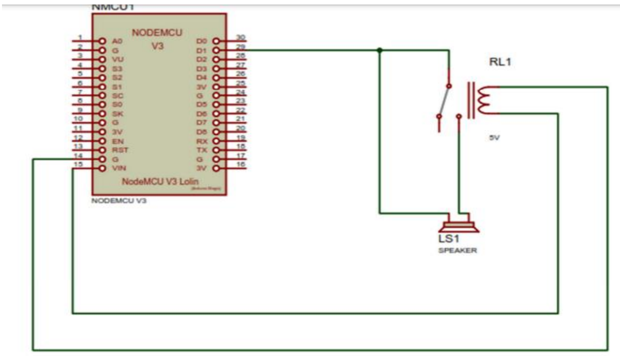


FIGURE 7. Circuit Diagram of Receiver

The embedded player is connected with a speaker. If any fault occurs in the transmitter side, it will send necessary information to the receiver side. Then the receiver has an embedded speaker which alerts the people.

5. WORKING OF PROPOSED SYSTEM

In this system, there are two main components: the transmitter and the receiver. The transmitter is equipped with various components, including a Solar Panel, a 12V to 5V DC Regulator, a Battery, a Node MCU (ESP8266) microcontroller, a Moisture Sensor (Electrode), a Humidity Sensor, and an Accelerometer. The Solar Panel provides a 12V DC supply under normal lighting conditions. The 12V to 5V DC Regulator ensures a stable 5V DC supply. The Battery stores the energy generated by the Solar Panel and powers the Node MCU microcontroller. The microcontroller, which comes with an inbuilt Wi-Fi module, is connected to the Moisture Sensor, Humidity Sensor, and Accelerometer. The Moisture Sensor measures the moisture content in the soil, while the Humidity Sensor senses the temperature range in the atmosphere. Simultaneously, the Accelerometer continuously measures the position of the module. On the other end, the receiver consists of a Node MCU (ESP8266), a Single Channel Relay, an Embedded Player, and a Speaker. The Node MCU is connected to both the single channel relay module and the embedded player. The embedded player, in turn, is connected to a speaker. The transmitter is designed to continuously monitor environmental conditions, particularly focusing on the occurrence of faults such as landslides or flood disasters. If any fault is detected on the transmitter side, it will send relevant information to the receiver side. Upon receiving this information, the receiver's embedded speaker will activate to alert people of the potential danger or disaster situation.

6. HARDWARE COMPONENTS

Solar Panel: The basic concept is straightforward: harness the abundant energy of the sun using a Euro solar system and convert it into electricity. This solar-generated electricity is then integrated into the local power grid, essentially providing power to the utility company. To ensure the quality of the string production, we conduct routine peel tests to monitor soldering integrity. Additionally, we visually inspect the strings to identify any issues with cell printing, cell cracks, mechanical damage, or variations in color.

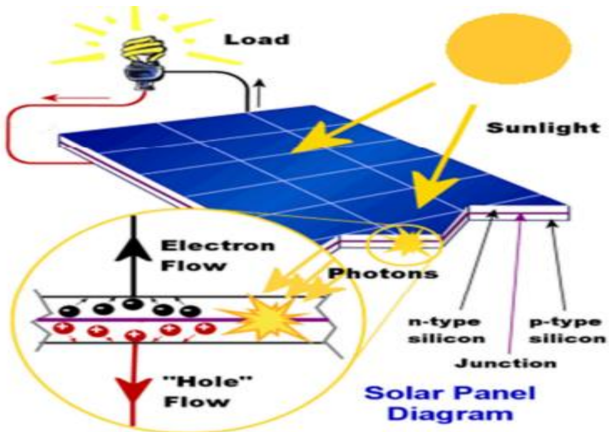


FIGURE 8.

"As an environmentally-conscious energy supplier, you will receive comprehensive support from all sides. The installation electrician will handle all the planning and registration details for your solar energy system. Additionally, the government offers incentives in the form of guaranteed feed-in tariffs to promote renewable energy adoption. With Euro solar, you will have access to advanced solar technology that ensures maximum efficiency and yield. Our Solar Panels utilize high-quality Solar Cells, making them more efficient than other options available in the market. These photovoltaic solar energy systems convert sunlight into electricity, which is then fed into your property's power supply after being harnessed through a row of solar panels on the roof. The primary incentive for adopting photovoltaic systems is the government's energy recovery program, providing a fixed-rate income tax-free for the energy produced. By generating your electricity through solar power, you can significantly reduce your carbon footprint and contribute to combating climate change. Moving on to the technical side, we offer a 12V to 5V DC Regulator that provides a regulated output of 5V and 3.3V, suitable for microcontroller projects requiring precise voltage. The power supply accepts unregulated inputs from 9V to 15V AC or DC, making it versatile and compatible with various power sources. The board's diode bridge input ensures that the polarity of the input doesn't matter, and all outputs are conveniently accessible through screw terminals. Additionally, the board includes an unregulated output voltage to drive high-current loads like relays and motors. Our Node Microcontroller Unit (MCU) is a cost-effective open-source IoT platform based on the ESP8266 Wi-Fi SOC from Espress if Systems. It boasts a 32-bit controller with 30 pins, including 17 GPIO pins for various functions such as I2C, I2S, UART, PWM, IR remote control, LED light, and button programming. The VIN and 3.3V pins provide power to the ESP8266 and external components through an on-board voltage regulator. The MCU can be easily programmed using Arduino, making it simple to obtain data from gas sensors and transmit information through the Wi-Fi unit. Moreover, the Node MCU can be utilized to control a relay for further automation. In conclusion, by partnering with us, you not only contribute to a greener future but also benefit from cutting-edge technology and expert support for your sustainable energy needs.

CONCLUSION

Our primary objective is to safeguard both human life and properties. To achieve this, we have employed highly accurate and cost-effective sensors. These sensors detect various hazards and promptly relay crucial information to the public. Natural disasters such as floods and landslides pose significant risks to communities worldwide, resulting in extensive property damage and loss of lives. In response, many countries have implemented alert systems to mitigate these impacts. However, the effectiveness of such systems is sometimes hindered by inadequate flood warning strategies and procedures. This research paper proposes an innovative automatic flood and landslide warning system that utilizes the Node MCU microcontroller. The system aims to provide timely and direct warnings to people residing in remote flood-prone areas, thereby enhancing their safety and potentially saving lives.

REFERENCES

[1]. Gedikpınar, M., Cavas, M., "Intelligent Home Automation System Based on PIC16F84 ", Journal of Automation (In Turkish), February2005, 168- 171.

[2]. Han, I., Park, H.S., Jeong, Y.K., Park, K.R., "An Integrated Home Server for Communication, Broadcast Reception, and Home Automation", IEEE Transactions on Consumer Electronics, vol. 52, no.1, pp. 104-109, 2006.

[3]. Wong, E., "A Phone-Based Remote Control for Home and Office Automation", IEEE Transaction On Consumer Electronics, Volume 40, No. 1, 28-34, 1994.

[4]. Koyuncu, B., "PC remote control of appliances by using telephone lines", IEEE Transactions on Consumer Electronics, volume 41(1),201-209, 1995.

[5]. Wang, T., Li, Y., Gao, H., " The smart home system based on TCP/IP and DTMF technology", 7th World Congress on Intelligent Control and Automation, 25-27 June 2008, Chongqing, China, 7686-7691.

[6]. M. Saito, “Expanding welfare concept and assistive technology,” in Proc. IEEK Annual Fall Conf., Ansan, Korea, 2000, pp. 156–161.

[7]. S. Warren and R. Craft, “Designing smart health care technology into the home of the future,” in Proc. 1st Joint BMES/EMBS Conf., Atlanta, GA, 1999, p. 677.

[8]. J.-I. Lindström,, “From R&D to market products—the TIDE bridge phase,” in Assistive Technology—Added Value to the Quality of Life, C. Marinˇcek, C. Bühler, H. Knops, and R. Andrich, Eds. Amsterdam, The Netherlands: IOS, 2001, pp. 688–692. 59

[9]. Automation, 25-27 June 2008, Chongqing, China, 7686-7691. Stefanov, D.H., Bien, Z. and Chul Bang, W., "The smart house for older persons and persons with physical disabilities, IEEE Transactions on Neural Systems and Rehabilitation Engineering, vol. 12(2), 228-250, 2004.

[10]. Bayındır, R., Kundakoglu, H., Yıldırım, S., Bekiroglu, E., "Remote Control Application based on Internet and GSM", 5th Internation Advanced Technology Symposium (IATS’09), 13-15 May 2009, Karabük, Turkey.