IJDIAS International Journal of Discoveries and Innovations in Applied Sciences
| e-ISSN: 2792-3983 | www.openaccessjournals.eu | Volume: 3 Issue: 9

Monitoring System for Drips That Relies on Ultrasonic Sensors

Abdur Rahman. N
Department of Electrical and Electronics Engineering, Dhaanish Ahmed College of Engineering, Chennai, Tamil Nadu, India.

Mohammed Sulaiman. M
Bachelor of Engineering,
Department of Electrical and Electronics Engineering, Dhaanish Ahmed College of Engineering, Chennai, Tamil Nadu, India.

Rithickshival. M
Bachelor of Engineering,
Department of Electrical and Electronics Engineering, Dhaanish Ahmed College of Engineering, Chennai, Tamil Nadu, India.

J. Rahila
Professor,
Department of Electrical and Electronics Engineering, Dhaanish Ahmed College of Engineering, Chennai, Tamil Nadu, India.

P. Anand
Associate Professor,
Department of Electrical and Electronics Engineering, Dhaanish Ahmed College of Engineering, Chennai, Tamil Nadu, India.

Shagar Banu
Assistant Professor,
Department of Electrical and Electronics Engineering, Dhaanish Ahmed College of Engineering, Chennai, Tamil Nadu, India.

Abstract: Recent years have witnessed a great deal of technical development that has improved our ability to care for patients and guarantee a speedy and secure recovery. The most fundamental requirement is for hospitals to provide competent patient care, including the monitoring and regulation of fluids and electrolytes. Almost all patients in a hospital, especially those in the intensive care unit, rely on drips to control the amount of fluid and electrolytes in their bloodstream around the clock, every day of the week. In order to keep patients from becoming infected, it is necessary to check on or replace their drips on a frequent basis. A patient's health may decline more rapidly or even be lost altogether due to factors such as overcrowding in hospitals and a lack of nurses, despite the system's apparent ease of use. Almost everywhere you go in a hospital, nurses or other staff members check the drip. Because of their busy schedule, the observer can forget to change the bottle when it's time. It was impossible for nurses, even if they had worked extra shifts, to manually monitor the drip levels and conditions of each patient throughout the epidemic. Not having access to adequate nursing care led to the deaths of many individuals. The next step in providing more efficient and convenient healthcare is to automate such crucial tasks. We offer an IoT (Internet of Things) based Drip Monitor System built on top of Arduino UNO to address this pressing problem, as it simplifies the measurement procedure and eliminates the problem of bubble formation in drips.

Keywords: Ultrasonic Sensor, Drips Monitoring System, Arduino UNO, Internet of Things, LEDs, touchscreen sensing,

Introduction

As the population grows, so does the need for better medical facilities and services. Therefore, everyone should prioritise their health and wellness [5]. The Internet of Things is crucial to the health tracking process. Hospitals may save money, provide better care for patients, and use less resources by adopting intelligent equipment and sub-systems. In order to ensure patient safety and lessen the burden on medical professionals, numerous automated health monitoring gadgets have emerged in recent years [6-11]. The invention of these tools has the potential to revolutionise the medical industry. It keeps an eye on things like temperature, heart rate, and the presence of potential heart attack symptoms. Patient monitoring during IV therapy remains a difficult problem despite the prevalence of various high-tech automated devices designed to ensure patient safety. All of these monitoring procedures are performed manually in our existing healthcare system. We require real-time notifications about the patient's status and the amount of Fimos being dripped into their vein (IV therapy). The Intravenous Drip Monitoring System is used to implement this function (IV system) [12-17].

Computer hardware and software, either predetermined in their capabilities or open to modification, are combined to form an embedded system. Embedded systems may be installed in a wide variety of places, including but not limited to: industrial machinery, agricultural and process industry devices, automobiles, medical equipment, cameras, household appliances, aeroplanes, vending machines, toys, and more [18-21]. Embedded systems are computers, but their user interfaces (UIs) can range from completely absent (as in devices optimised for a specific task) to highly complex (as in mobile devices). Buttons, LEDs, touchscreen sensors, and other UI components are all fair game. A remote user interface (GUI) is used by some systems [22-27]. Microprocessors and microcontrollers are both viable options for the hardware of an embedded system. In any case, the product relies on an integrated circuit to do calculation for real-time processes. Visually, microprocessors and microcontrollers are indistinguishable. However, microprocessors only have a central processing unit (CPU), thus they need extra parts like memory chips, whereas microcontrollers are complete systems on their own [28-33].

Microcontrollers have their own processor, memory, and peripherals like RAM, ROM, and serial ports. Microcontrollers are frequently utilised for more sophisticated tasks due to their ability to create entire (if relatively low computing power) systems [34-35]. Microcontrollers have several applications, including in automobiles, robots, healthcare equipment, and common household gadgets. Although there is no clear distinction between SoCs and high-end microcontrollers in terms of RAM, clock speed, etc., the two terms are commonly used interchangeably to describe the latter (fig.1).

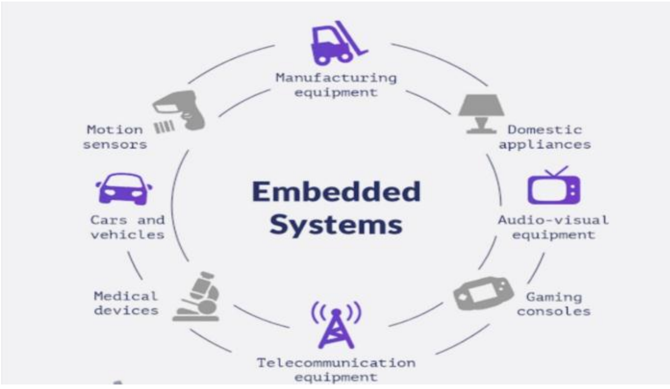


Figure 1: Embedded System

Microcontrollers have a central processing unit (CPU), memory (including flash memory, RAM, and serial communication interfaces), and peripherals. Due to their ability to create full (although low-computing power) systems, microcontrollers are often utilised for more complicated tasks [36-41]. Vehicles, robotics, healthcare equipment, and even common household goods all make use of microcontrollers. The term "system on a chip" (SoC) is commonly used to refer to more advanced microcontrollers, despite the lack of a clear distinction between them in terms of RAM, clock speed, etc (fig.2).

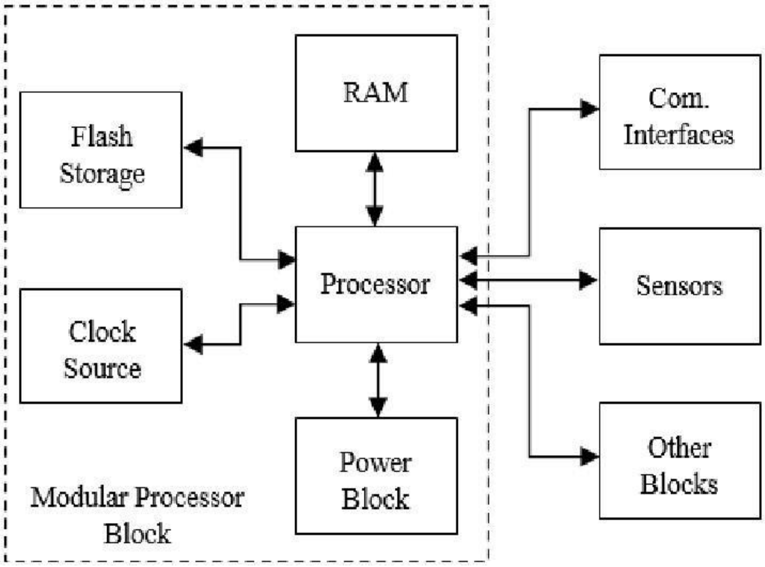


Figure 2: Embedded System Software

Embedded System Software

In comparison to a business desktop PC, the programming environment for an industrial microcontroller is typically less complex and requires less RAM. Bare metal devices are those that have no operating system and are written directly in the language used by the chip's central processing unit (CPU). When serving real-time operating environments, embedded systems frequently employ language platforms or operating systems designed specifically for embedded use [42-45]. Designers have increasingly concluded that near-real-time techniques are suitable at higher levels of chip capability, such as those present in SoCs, because systems are typically fast enough and workloads are tolerant of modest fluctuations in reaction time. Linux distributions with essential features removed are frequently used in these scenarios, however Embedded Java and Windows IoT are two more examples of operating systems that have been optimised for use on embedded devices (formerly Windows Embedded). Embedded devices typically employ flash or rewritable flash memory for storing software and operating systems [46-55].

Embedded Firmware

Embedded firmware, often known as firmware, is software that is installed in a device's memory and functions similarly to ROM but can be updated more simply. Non-volatile memory technologies like ROM, programmable ROM, erasable PROM, and flash memory can be used to store firmware [56-61]. For example, embedded firmware may instruct a device on how to interact with other devices, carry out a set of predefined tasks, or serve as an input/output interface. Embeded software typically refers to the sole code executing on a piece of hardware, whereas embedded firmware can refer to the chip that houses a device's basic input/output system (BIOS) or Unified Extensible Firmware Interface (UEFI), which connect software and the system's operating system [62-69].

Embedded Systems VS. VLSI

The level of complexity of an integrated circuit is often referred to as "large-scale integration" or "VLSI." Microchips can be categorised as either VLSI (very large-scale integration), LSI (large-scale integration), MSI (medium-scale integration), or SSI (small-scale integration) based on the number of transistors they contain. Integration on an Extremely Large Scale (ULSI): When compared to the operating systems and development environments of traditional, desktop computers, embedded systems have significant differences in the field of debugging. Developers working on desktop computers typically have access to systems that can simultaneously execute the code being worked on and the debugger tools used to track the development code's execution, whereas developers working on embedded systems typically do not [70-75]. It is possible to perform basic interactive debugging right on the microcontroller for some programming languages.

Furthermore, processors typically feature CPU debuggers that can be directed and, by extension, control the execution of programmes through a JTAG or comparable debugging connection. However, tools that allow a second debugging system to be connected to the target system through a serial or other connection are often necessary for embedded system programmers [80-85]. As with debugging software on a desktop computer, the programmer in this case can view the source code on the screen of a typical personal computer. One such common method is running software on a personal computer that simulates the physical device in software, allowing the software to be debugged as though it were being run on a real chip. Since many devices with embedded controls are intended for use in settings where safety and dependability are paramount, testing and debugging of embedded systems has garnered more attention. While there are simpler embedded systems out there, an increasing number of them are designed to make decisions in place of humans or to give capabilities that humans simply can't match. Drones and other aircraft systems, for instance, can process sensor data and take action on it faster than people can [86-93].

Literature Survey

According to Boudreau et al. [1], the efficiency of medical staff has grown as a result of the adoption of these new tools and applications made possible by wireless network technology. Smart homes with sensors and information technology are discussed, as are their implications for the care of elderly and young patients. Patients may save money and receive better care if they wore sensors that relayed their vital signs in real time to their doctors. Using technologies like REST, Jess rule engine, and Android, we have created a prototype for medical monitoring of the elderly that can adapt to new circumstances.

According to Raghavendra et al. [2], an IV drip is an essential method of administering fluids and other pharmaceutical drugs intravenously. The benefits of IV drip have led to its widespread adoption. Some difficulties may develop, despite the fact that IV drip is generally safe, effective, and cheap. In this work, the benefits and drawbacks of IV drip therapy are examined, and a method is given for continuous monitoring and control of IV drip using detection of individual drops in the drip chamber. Users of the IV drip system may benefit from such a device by experiencing fewer difficulties and greater peace of mind.

According to Rani et al[3] .'s analysis, the project includes a hospital-grade, trickle-implementation, observer structure. Drip infusion, glucose level monitoring devices, and a display screen make up the foundation. Using a pressure sensor (MPX10GP) technology module, a mixture observing device detects a trickle implantation rate and an empty imbuement arrangement sack, and then transmits this data through radio frequency to a monitoring screen located at the medical caretaker's station (nrf24L01). The data is collected by trickle implantation monitoring devices and displayed visually on the monitoring screen. There will be no air bubbles in the patient's vein since the control valve will close as soon as the pressure sensor value hits the threshold value. The resulting framework is powerful enough to reliably monitor the drip-by-drip implantation status of the handful of patients at the medical caretakers' desk.

According to Ogawa et al. [4], a new system for monitoring drip infusion solutions has been created for use in healthcare settings. Each drip of fluid from the drip chamber is detected, as well as free-flow conditions, by the system. The electrodes are made of copper foil, and there are three of them. Electrodes are placed around the solution bag's PVC infusion tube, the drip chamber's PVC infusion tube, and the infusion PVC tubing. In a drip infusion system, the fluid acts as a capacitor between the individual electrodes. The infusion supply PVC tubing is wrapped with an electrode, and a 30 kHz sine wave is applied to it from the solution bag. The capacitance-coupled signal on the electrode of the drip chamber is the transducer's output. The output signal shifts because the capacitance of the drip chamber grows as the drop of infusion fluid grows in size. Each drop of fluid that falls into the drip chamber can be detected by the electrode. The formation of a droplet of infusion fluid is no longer necessary once the infusion solution has become free-flow. Therefore, the capacitance of the electrode around the drip chamber has no effect on the signal output. Alternatively, the thirty kHz sine wave conveyed by the infusion fluid is detected by the electrode wrapped around the polyvinyl chloride tubing supplying the infusion supply located beneath the drip chamber. Electrodes in the drip chamber and a PVC tube beneath it that connects to an infusion supply may detect fluid flow and individual drops.

They advocated integrating sensors and IoT technology into the current system to keep tabs on saline concentrations. We constructed this system with the help of an Arduino microcontroller and a load sensor. The bottle's weight is translated into the desired voltage by the load sensor. Based on the voltage it receives from the sensor, the ESP8266 microcontroller creates and broadcasts a unique message. To distribute and display the messages on the devices of paying customers, such as medical professionals and caregivers.

Proposed System:

The components include an Arduino Uno, an LDR, a light source, and an HC SR-04 ultrasonic sensor. A drip bottle controlled by an Arduino microcontroller is connected to the sensors. Our system is controlled by an Arduino board; when the drip level drops, it alerts the neighbour with a buzzer; and a pair of LDR and LED has been set up to detect bubbles in the drips [94-101]. The echo delivers a signal to the ultrasonic sensor, which is triggered when the sound waves reach the required level. The Arduino is fed information about how long it takes for the sound to travel to the trigger. When Arduino gets a signal, it executes the program's instructions by sending the signal to the buzzer, motor, and GSM, respectively [102].

Project Explanation

In our project, an Ultrasonic sensor detects when the droplets level drops below 30 percent, at which point the Arduino microcontroller acts on the condition programmed into it by supplying power to the buzzer, sending a signal through GSM, and relaying the same signal via WiFi to the IoT server. The Arduino programme sends a signal to the GSM, which in turn sends a text message to the mobile number specified in the Arduino programme. If the drip level is too low, we will provide the nurse's and family members' contact information. The IoT server also receives real-time readings of the patient's temperature and heart rate. The alarm will go off at the predetermined time in the event that your heart rate or temperature suddenly becomes abnormal. The data is also updated in the IoT server, which is constantly monitored, and provided to the nurse [103-111].

It may be risky for patients if nurses missed the notification or took too long to respond. So, the problem is fixed by linking the supply to a motor that, in turn, links to the valve, automatically shutting off the water supply when the drops reach a predetermined threshold. Air bubbles growing inside the drip line and making their way into the patient's veins is another major focus of our endeavour. So. LED and LDR are used in the arrangement to fix the problem. The LDR is wired across the LEDs on opposite sides of the drips tube. The LDR's LED stays on at all times. A decrease in the brightness of the LDR's emitted light indicates the presence of bubbles in the tube. This triggers the Arduino UNO, which then closes the valve and activates the buzzer based on the conditions set out in the programme. It notifies the nurse that bubbles are beginning to form [112-127].

The Arduino IDE application is used for programming thanks to the utilisation of embedded C. The serial monitor of the Arduino IDE application displays data such as the user's temperature, heart rate, LDR intensity, and the distance between the Ultrasonic sensor and the saline level. Here, a DC motor is used to shut the valve instead of a servo motor. For the sake of clarity, we will use a DC motor in our demonstration. The valve can be closed in the field by connecting the servo motor to it. Providing electrical or other forms of energy to an output load or collection of loads is the job of a power supply, often known as a power supply unit or PSU. The word is typically used to describe

IJDIAS International Journal of Discoveries and Innovations in Applied Sciences
| e-ISSN: 2792-3983 | www.openaccessjournals.eu | Volume: 3 Issue: 9

electrical energy sources, with less frequency applied to mechanical sources and never to others (fig.3).

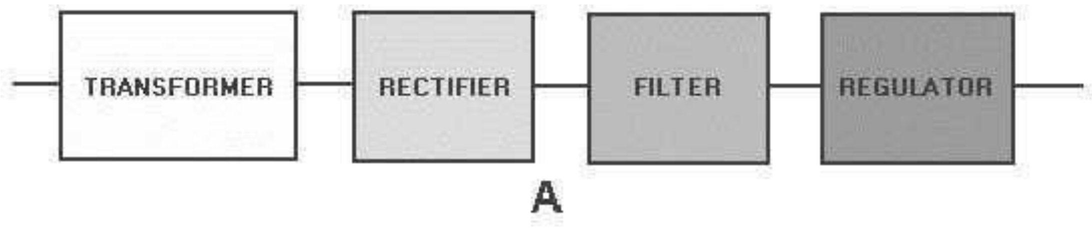


Figure 3: Block diagram of a basic power supply

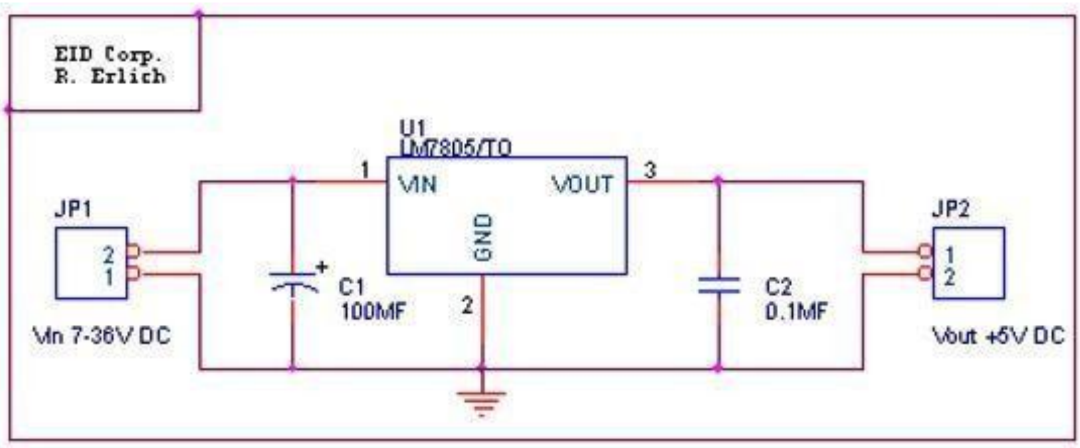
The transformer both modifies the input line voltage by increasing or decreasing it and isolates the power source from the mains. The input signal of alternating current is changed into a direct current that pulses in the rectifier section. However, as you read on, you'll find out why dc with a pulsing current is not preferable. Therefore, a filter section is utilised to refine the DC voltage from its pulsing state into a more usable form. The last part, called the regulator, controls the output. It keeps the power supply's output stable regardless of how much the load current or line voltages fluctuate [128-131]. Once you've learned the purpose of each component, you may follow an AC signal as it travels through the power supply. You must now examine how this signal is modified at each stage of the power supply. You will see how these alterations take place later in the paper.

The input line voltage is transformed by the transformer, which also isolates the power source from the power line. The input signal of alternating current is rectified in the rectifier section to produce direct current with a pulsing waveform. This paper will show you why pulsing dc is not desired, nevertheless. Because of this, a filter section is utilised to transform the alternating DC voltage into a more stable direct current. The final component, the regulator, is responsible for regulating the system. It stabilises the power supply output so that it doesn't fluctuate even when the load current or input line voltages change significantly. Now that you know where everything goes, you can follow an AC signal as it travels through the electricity grid. At this stage, you need inspect each component of the power supply to determine how this signal is modified there. You will learn how and why these modifications occur later in the paper [132-135].

Circuit Description

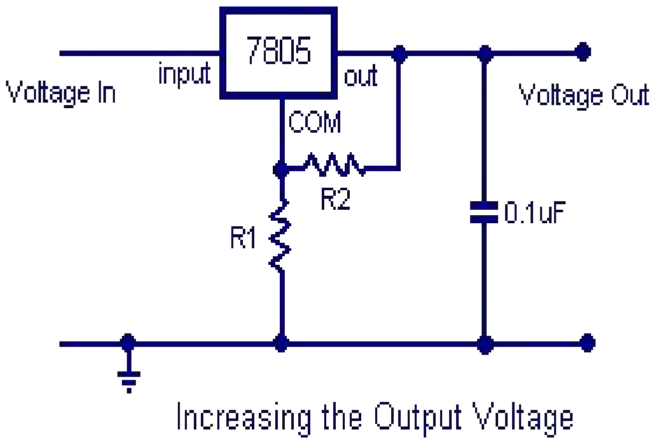
When tinkering with digital devices, this compact +5V power supply circuit comes in handy. These transformers are readily available, but unless improved control can be established, they are not practical for use in digital circuit experiments [136-141]. This circuit's +5V output can be boosted to 1 A with proper cooling of the 7805 regulator chip. The current is capped at roughly 150 mA. Overload and terminal protection are built into the circuit (fig.4).

IJDIAS International Journal of Discoveries and Innovations in Applied Sciences
| e-ISSN: 2792-3983 | www.openaccessjournals.eu | Volume: 3 Issue: 9



1) Figure 4: Circuit Diagram

If we need more than 150 mA of output current, we can update the output current up to 1A by doing the following 0 modifications. Make sure there's enough current to run the circuit by upgrading the transformer at the power source. The 7805 regulators need a heat sink (so big that it



does not overheat because of the extra losses in the regulator) (fig.5).

Figure 5: More Output Current

If we need a voltage other than +5V, we can change the circuit by swapping out the 7805 chips for a different regulator from the 78xx chip family. The voltage output is indicated by the last digit of the chip's code. In order for the regulator to function properly, the input voltage needs to be at least 3V higher than the output voltage. Light switches and appliance controls are often operated and maintained manually [142-145]. However, due to human error or other unforeseen factors, power may be wasted throughout the process of controlling appliances. The light-dependent resistor circuit can be used to adjust the power going to the loads according to the available light, thus solving the issue. A light-dependent resistor, or LDR, is a semiconductor device with a very high resistance. This page explains the basics of LDRs, the LDR circuit, and how they work (fig.6).

IJDIAS International Journal of Discoveries and Innovations in Applied Sciences
| e-ISSN: 2792-3983 | www.openaccessjournals.eu | Volume: 3 Issue: 9

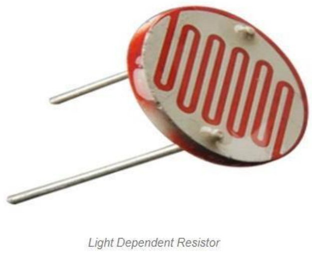


Figure 6: LDR

An LDR consists of a layer of light-sensitive material atop an insulating substrate (often ceramic). To achieve the desired power rating and resistance, the material is laid out in a zigzag pattern. The zigzag divides the metal-placed portions in half (fig.7).

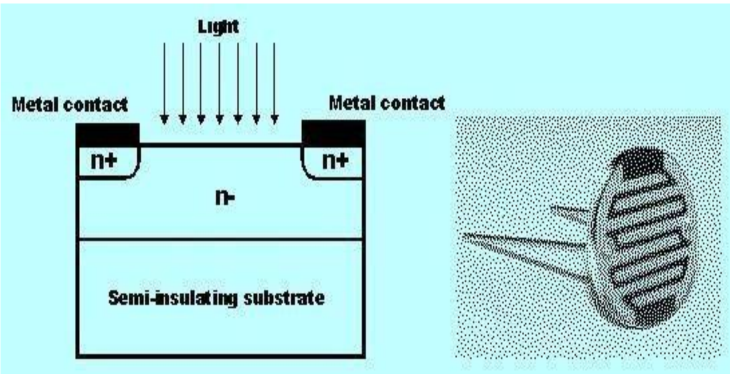


Figure 7: Construction of LDR

If the Ohmic connections are to be established on the edges of the area, their resistances must be minimised such that the resistance changes owing solely to the light's influence. Materials containing harmful amounts of lead or cadmium (such as these) are avoided. Photoconductivity, an optical phenomena, provides the basis for an LDR's operation. The material's conductivity drops as it soaks up the light. When exposed to light, the LDR's valence band electrons are anxious to move into the conduction band. However, in order for the electrons to hop from one band to another, the energy of the photons in the incident light must be greater than the band gap of the material (valance to conduction). Therefore, a high concentration of charge carriers is achieved when light has a high enough energy to excite a large number of electrons to the conduction band. The resistance of the device drops as a result of this process and the increased current flow.

Seven-segment, starburst, and dot-matrix displays are all possible using alphanumeric LEDs. Seven-segment displays are capable of showing any number and a small selection of letters. All the letters may be seen on starburst screens. On a dot-matrix screen, each character takes up about 5x7 pixels. Since its heyday in the 1970s and 1980s, seven-segment LED displays have fallen out of favour as their more energy-efficient and versatile liquid crystal counterparts have taken over the market. LEDs that can display digital RGB colours have their own "intelligent" control circuitry built in. Data in, data out, and sometimes a clock or strobe signal are all provided by these, in addition to power and ground. A daisy chain joins each one of these together. Each LED in the chain can have its brightness and colour adjusted independently using data sent to the first LED in the chain. Christmas lights and LED matrices are two examples of applications that benefit from their unique blend of high levels of control and low visibility. Some even have refresh rates in the kHz range, making them usable for at least some types of video playback. You may know these gadgets by their model number (WS2812 is a popular one) or by a brand name like NeoPixel. To create an LED filament, several LED chips are serially joined on a single longitudinal substrate to generate a thin rod that looks quite similar to an incandescent bulb. These are replacing incandescent lights, which are being phased out in several countries, as a low-cost ornamental option. The filaments require a relatively high voltage in order to function effectively with standard household currents. Single-die LEDs require a sophisticated low voltage, high current converter, but a simple rectifier and capacitive current limiting can offer a low-cost alternative to incandescent lighting. In order to more effectively remove heat, they are typically packaged in bulbs that resemble the lamps they are meant to replace.

Ultrasonic Sensors

An ultrasonic sensor is a device that uses ultrasonic sound waves to determine how far away an item is. A transducer is used to transmit and receive the ultrasonic pulses that are the basis of an ultrasonic sensor's ability to detect and report on nearby objects. Distinct echo patterns are created when high-frequency sound waves bounce off of barriers. The frequency range at which humans can hear is far lower than that of ultrasonic sound. Transducers are the microphones that pick up and transmit the ultrasonic waves. Like many others, our ultrasonic sensors rely on a single transducer for both sending out and picking up acoustic signals. The range of a sonic pulse is measured by the sensor (fig.8).

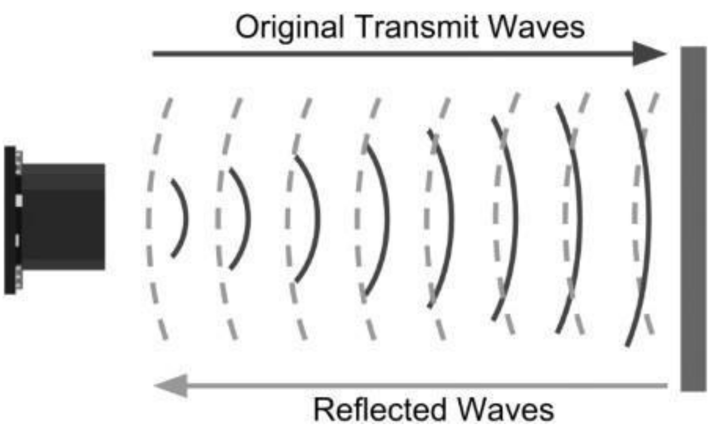


Figure 8: Ultrasonic Sensor

A device that detects and measures distances with the use of ultrasonic sound waves is called an ultrasonic sensor. The transducer in an ultrasonic sensor is responsible for both transmitting and receiving the ultrasonic pulses that are used to determine how close an object is. When high-frequency sound waves bounce off of barriers, the resulting echo patterns are easily recognisable. Sound waves of ultrasonic frequencies are audible only to machines and not humans. The ultrasonic sound is picked up and sent using transducers, which are essentially microphones. Similar to many other types of ultrasonic sensors, ours use a single transducer to both transmit and receive the acoustic signal. The sensor measures how far away a sonic pulse is.

W = C/F (or) W = CT
Where W = Wavelength
C = velocity of sound in a medium
F = Frequency of waveT=Time Period

Ultrasonic inspection often makes use of either longitudinal or shear waves. Compression waves with particle motion parallel to the propagation direction are called longitudinal waves. The particle velocity in a shear wave is perpendicular to the wave's propagation direction. Through the use of high-frequency sound waves, information can be gathered about a test object via ultrasonic detection. Ultrasonic detection uses a binary measurement system. The duration of the sound's journey and the strength of the received signal. Thickness can be determined by measuring velocity and time. Time of flight transducers for wave propagation and particle detection = material sound velocity X thickness.

Transceivers and transducers are ultrasonic sensors that transmit and receive sound waves. Similar to radar, their operation involves the transformation of electrical energy into mechanical energy in the form of sound, and vice versa. Contact transducers, angular-beam transducers, delay-line transducers, immersion transducers, and dual-element transducers are all examples of popular transducer types. Surface flaw detection and thickness measurement are two common applications for contact transducers. Reflection and mode conversion are at the heart of angle beam transducers. Single-element transducers for longitudinal waves that use a removable delay line are called delay line transducers. An advantage of using a delay line transducer is that it allows for better near-surface resolution. The delayed signal from the reflector gives the element time to stop vibrating. Uniform coupling decreases sensitivity variations, scan times are decreased, and sensitivity to small reflectors is increased using immersion transducers compared to contact transducers.

Operation of Ultrasonic Sensors:

The ultrasonic transducer produces an intense burst of sound waves when subjected to a high-voltage electrical pulse, which causes it to vibrate across a narrow range of frequencies. When an obstruction is in the path of an ultrasonic sensor, an electric pulse is produced as an echo of the sound waves. It measures the interval between the transmission of a sound wave and its subsequent echo. Sound wave patterns will be compared to the echo patterns to ascertain the state of the

IJDIAS International Journal of Discoveries and Innovations in Applied Sciences
| e-ISSN: 2792-3983 | www.openaccessjournals.eu | Volume: 3 Issue: 9

detected signal. The speed of sound waves in a medium through which waves are carried and the time necessary for echo reception are related to the distance of barriers or discontinuities in metals. As a result, ultrasonic detection can be used to measure separation distances, locate metal discontinuities, and reveal the height of a liquid. Distances can be measured with the help of ultrasonic sensors. These devices constantly blast their targets with ultrasonic waves, which are then reflected back to the sensor. The distance to the target is then calculated using the speed of sound in the medium by timing how long it takes for the echo to return to the sensor. Industrially available ultrasonic cleaners use a variety of transducer types. In order to impart vibration energy on a solvent, an ultrasonic transducer is attached to a stainless-steel pan filled with the solvent and a square wave is applied to the transducer.

Sonar is used by the ultrasonic distance sensors; the unit sends out an ultrasonic (beyond the range of human hearing) beat, and the distance to the target is calculated by timing how long it takes for the echo to return. The ultrasonic sensor sends out a variable-width beat that is proportional to the relative distance to the target. Different sized cells (macro, micro, pico, and umbrella) make up a GSM network. Each compartment is distinct depending on the application scenario. The macro, micro, pico, and umbrella cell sizes are the five that make up a GSM network. Each cell's coverage area is different depending on the setting in which it is deployed. The transceiver, display, and CPU make up a mobile station, which is managed by a subscriber identity module (SIM) card. Central Office Subsystem interfaces connecting the mobile station and the network. The radio transceivers and management of mobile communication protocols are housed in a separate component called a Base Transceiver Station. The Base Station Controller manages the Base Transceiver and mediates communication between the mobile node and the base station controller.

Sub-System Network: It's what keeps mobile stations connected to the internet. The Mobile Service Switching Centre is the foundation of the Network Sub-system, allowing users to connect to other networks such as ISDN, PSTN, etc. Calls can be routed and roamed between networks thanks to GSM's Home Location Register and Visitor Location Register. It also includes the Equipment Identity Register, which keeps track of all the mobile devices and assigns unique IMEI numbers to each one. The acronym IMEI refers to the unique identifier for mobile devices worldwide. The GSM system is the safest available telecommunications standard because to the security measures that have been standardised for it. This is a significant step toward attaining end-to-end security, as the radio channel already guarantees the privacy of a call and the anonymity of a GSM subscriber.

Either a mobile phone or a modem used to enable a computer or other processor to interact across a network falls under the umbrella term "GSM modem." A GSM modem can only be used within the service area that the network provider has paid for and is activated by inserting a SIM card. It has serial, USB, and Bluetooth for connecting to a computer. A regular GSM cell phone can double as a GSM modem if you have the right cable and driver installed on your PC. Instead of using a GSM mobile phone, a GSM modem is the better option. Transaction terminals, supply chain management, security applications, weather stations, and GPRS mode remote data logging are just some of the various uses for the GSM modem. The below circuit uses the level shifting IC Max232 to connect a GSM modem to the MC. The SIM-mounted GSM modem transmits data to the MC via serial connection when it receives a digit command via SMS from any cell phone. After receiving the comma'STO,' the GSM modem generates an output at the MC, the contact point for turning off the ignition switch, during the running of the programme.

Intelligent GSM Device for Automation and Security

These days, it seems like we can't live without our GSM mobile terminal. The GSM mobile terminal acts as a channel for communication, much as our wallet/purse, keys, or watch. It's convenient to be able to phone anyone or be reached by anyone at any time. The technology used to send and receive text messages (SMS) in this project is based on GSM networks, as the name suggests. Sending and receiving text messages is used for controlling access to home appliances and preventing unauthorised entry. There are two proposed sub-systems in the system. The security alert sub-system provides automated security monitoring, while the appliance control sub-system allows the user to operate household appliances from afar. From a designated phone number, the system can send the user an SMS with instructions for adjusting the home appliance's settings. The second part, security alert, is accomplished by having the system permit automatic generation of SMS upon detection of intrusion, thereby warning the user of potential security risk. Both the magnitude and geometry of the inductor coil can be ignored. You are free to use any coil with a measured value of 1mH to 10mH or higher, or even none at all. In the end, I settled on a 40-turn coil on a little ferrite toroid. The pinout of the piezoelectric element is as follows: M = main terminal, F = feedback terminal, and G = ground plate. The circuit is not particularly complex, and some stripboard will suffice. This piezo buzzer circuit requires so few parts that you could even glue them together.

Applying a voltage to the piezo element's electrodes causes it to bend in any direction. The ground plate is flexed up and down by this flex force. The converse is also true; changing the pressure applied to a piezoelectric element causes it to generate voltage. Self-drive piezo buzzers, as you may recall, have an independent feedback electrode built into their design. The feedback terminal is where the voltage generated by the flex force may be accessed. To create a resonant cavity, a piezo buzzer is inserted inside and a hole is drilled on the side of the cavity opposite the one from which the buzzing sound emanates. Soon enough, the driver circuit and piezo buzzer will work together to begin oscillating at the resonance frequency of the piezo buzzer. Under version 2 of the GNU General Public License, the IDE's source code is available to the public. The Arduino IDE is compatible with C and C++ and has its own set of standards for how code should be structured. The Arduino IDE includes a software library developed by the Wiring project that implements numerous standard I/O operations.

Piezo elements can bend in either direction when a voltage is applied to their electrodes. This flex force causes the base plate to flex in both directions. On the other side, a piezoelectric element will generate voltage when subjected to variable pressure. You already know that self-drive piezo buzzers have an extra feedback electrode that is kept electrically separate from the rest of the

Published under an exclusive license by open access journals under Volume: 3 Issue: 9 in Sep-2023

IJDIAS International Journal of Discoveries and Innovations in Applied Sciences

| e-ISSN: 2792-3983 | www.openaccessjournals.eu | Volume: 3 Issue: 9

device. The feedback terminal is where you can access the voltage generated by the flex force. The piezo buzzer is housed in a resonant chamber with a hole on the side opposite to the side from which the buzzing sound emanates. Driver circuit and piezo buzzer quickly tune to each other and begin oscillating at piezo's resonance frequency. The IDE's source code is available for download under version 2 of the GNU General Public License. The Arduino integrated development environment (IDE) supports C and C++ with its own set of code structure guidelines. The Wiring project's software library is included in the Arduino IDE, and it contains numerous frequently used input and output routines.

Every mobile phone, washing machine, and digital camera that we use on a daily basis is powered by a CPU that runs Embedded C code. The software for each CPU is "embedded." Embedded software is the primary factor in determining how an embedded system operates. The microcontroller is often programmed in embedded C. In the past, assembly-level programming was commonly used to create embedded applications. They were not, however, transportable. However, with the development of higher-level languages like C, Pascal, and COBOL, this shortcoming was eventually eliminated. However, C gained and maintained widespread support as an embedded system programming language. The C code is more secure, scalable, portable, and comprehensible. Dennis Ritchie created the C programming language in 1969. It's a grouping of statements that carry out a specified activity, each of which may be a function. The C programming language can be used to create both high-level and low-level programmes. We should understand how RAM is organised before delving into the specifics of embedded C programming. Designers of embedded systems need technical expertise in order to create appropriate software. These applications are crucial for keeping tabs on and managing machinery. They also make use of the interrupt handlers, timers, serial connectivity, and other internal functions of the microcontroller.

Conclusion

Variables can be declared as integers, characters, floats, etc. using the data type system. The embedded C programme stores information using four distinct data types. Any single character can be stored in the 'cha,' integer values can be stored in the 'it,' and floating-point numbers of arbitrary precision can be stored in the 'float. The following table details the size and range of several data types on a 32-bit system. Depending on the equipment, the size and range may shift when the word size changes. There is special terminology for handling special situations. Keywords are a specific type of term. They are predefined in the Embedded C standard library. Always use lowercase letters for keywords. Before beginning to write the main programme, you must first declare these keywords. Consequently, an ultrasonic sensor can be used to create a reliable automated Saline monitoring system. It will aid in the continuous monitoring of patients by providing various alarms at predetermined times. The nurses won't have to act in a panic because of this. It's a great investment with substantial returns. Since a notification is sent to numerous mobile devices, this can't possibly go ignored. Because of its central role in pharmacological drug delivery, intravenous (IV) drip is often used, however improper administration can have serious consequences. Even though intravenous (IV) drip is a safe, cheap, and effective tool, it is nevertheless possible for a number of problems to emerge. This necessitates cautious handling when giving the IV fluid.

Published under an exclusive license by open access journals under Volume: 3 Issue: 9 in Sep-2023

Reference

1. H. Boudra, A. Obaid, and A. M. Amja, “An intelligent medical monitoring system based on sensors and wireless sensor network” in 2014 International Conference on Advances in Computing, Communications and Informatics (ICACCI), 2014.
2. Raghavendra B, Vijayalakshmi K and M. Arora, “Intravenous drip meter & controller” 2016 8th International Conference on Communication Systems and Networks (COMSNETS), Bangalore, India, 2016, pp. 1-5.
3. K. R. Rani, N. Shabana, P. Tanmayee, S. Loganathan and G. Velmathi, “Smart drip infusion monitoring system for instant alert-through nRF24L01” 2017 International Conference on Nextgen Electronic Technologies: Silicon to Software (ICNETS2), Chennai, India, 2017, pp. 452-455.
4. H. Ogawa, H. Maki, S. Tsukamoto, Y. Yonezawa, H. Amano and W. M. Caldwell, “A new drip infusion solution monitoring system with a free-flow detection function” 2010 Annual International Conference of the IEEE Engineering in Medicine and Biology, Buenos Aires, Argentina, 2010, pp. 1214-1217.
5. Rina Bora, Deepa Parasar, Shrikant Charhate , A detection of tomato plant diseases using deep learning MNDLNN classifier, , Signal, Image and Video Processing, April 2023.
6. Deepa Parasar, Vijay R. Rathod, Particle swarm optimization K-means clustering segmentation of foetus Ultrasound Image, Int. J. Signal and Imaging Systems Engineering, Vol. 10, Nos. 1/2, 2017.
7. Parvatikar, S., Parasar, D. (2021). Categorization of Plant Leaf Using CNN. (eds) Intelligent Computing and Networking. Lecture Notes in Networks and Systems, vol 146. Springer, Singapore.
8. Naufil Kazi, Deepa Parasar, Yogesh Jadhav, Predictive Risk Analysis by using Machine Learning during Covid-19, in Application of Artificial Intelligence in COVID-19 book by Springer Singapore. ISBN:978-981-15-7317-0.
9. Naufil Kazi, Deepa Parasar, Human Identification Using Thermal Sensing Inside Mines, 2021 5th International Conference on Intelligent Computing and Control Systems (ICICCS), Madurai, India, 2021, pp. 608-615.
10. Yogesh Jadhav, Deepa Parasar, Fake Review Detection System through Analytics of Sales Data in Proceeding of First Doctoral Symposium on Natural Computing Research by Springer Singapore. Lecture Notes in Networks and Systems book series (LNNS, volume 169), ISBN 978-981-334-072-5.
11. Parasar, D., Jadhav, Y.H. (2021). An Automated System to Detect Phishing URL by Using Machine Learning Algorithm. In: Raj, J.S. (eds) International Conference on Mobile Computing and Sustainable Informatics. ICMCSI 2020. EAI/Springer Innovations in Communication and Computing. Springer, Cham.
12. Parasar, D., Jadhav, Y.H. (2021). An Automated System to Detect Phishing URL by Using

Published under an exclusive license by open access journals under Volume: 3 Issue: 9 in Sep-2023

Machine Learning Algorithm. In: Raj, J.S. (eds) International Conference on Mobile Computing and Sustainable Informatics. ICMCSI 2020. EAI/Springer Innovations in Communication and Computing. Springer, Cham.

13. Deepa Parasar, Preet V. Smit B., Vivek K., Varun I., Aryaa S., Blockchain Based Smart Integrated Healthcare System, Frontiers of ICT in Healthcare, April 2023 Lecture Notes in Networks and Systems, vol 519. Springer, Singapore, EAIT 2022.
14. Deepa Parasar., Sahi, I., Jain, S., Thampuran, A. (2022). Music Recommendation System Based on Emotion Detection. Artificial Intelligence and Sustainable Computing. Algorithms for Intelligent Systems. Springer, Singapore.
15. Mishra, S., & Samal, S. K. (2023). An Efficient Model for Mitigating Power Transmission Congestion Using Novel Rescheduling Approach. Journal of Circuits, Systems and Computers, 2350237.
16. Samal, S. K., & Khadanga, R. K. (2023). A Novel Subspace Decomposition with Rotational Invariance Technique to Estimate Low-Frequency Oscillatory Modes of the Power Grid. Journal of Electrical and Computer Engineering, 2023.
17. A. B. Naeem, B. Senapati, M. S. Islam Sudman, K. Bashir, and A. E. M. Ahmed, "Intelligent road management system for autonomous, non-autonomous, and VIP vehicles," World Electric Veh. J., vol. 14, no. 9, p. 238, 2023.
18. A. M. Soomro et al., "Constructor development: Predicting object communication errors," in 2023 IEEE International Conference on Emerging Trends in Engineering, Sciences and Technology (ICES&T), 2023.
19. A. M. Soomro et al., "In MANET: An improved hybrid routing approach for disaster management," in 2023 IEEE International Conference on Emerging Trends in Engineering, Sciences and Technology (ICES&T), 2023.
20. B. Senapati, J. R. Talburt, A. Bin Naeem, and V. J. R. Batthula, "Transfer learning based models for food detection using ResNet-50," in 2023 IEEE International Conference on Electro Information Technology (eIT), 2023.
21. B. Senapati and B. S. Rawal, "Quantum communication with RLP quantum resistant cryptography in industrial manufacturing," Cyber Security and Applications, vol. 1, no. 100019, p. 100019, 2023.
22. B. Senapati and B. S. Rawal, "Adopting a deep learning split-protocol based predictive maintenance management system for industrial manufacturing operations," in Lecture Notes in Computer Science, Singapore: Springer Nature Singapore, 2023, pp. 22–39.
23. M. Shah, K. Gandhi, B. M. Pandhi, P. Padhiyar, and S. Degadwala, "Computer Vision & Deep Learning based Realtime and Pre-Recorded Human Pose Estimation," in 2023 2nd International Conference on Applied Artificial Intelligence and Computing (ICAAIC), 2023, pp. 313–319.
24. N. K. Pareek, D. Soni, and S. Degadwala, "Early Stage Chronic Kidney Disease Prediction using Convolution Neural Network," in 2023 2nd International Conference on Applied

Artificial Intelligence and Computing (ICAAIC), 2023, pp. 16–20.

25. P. Padhiyar, K. Parmar, N. Parmar, and S. Degadwala, "Visual Distance Fraudulent Detection in Exam Hall using YOLO Detector," in 2023 International Conference on Inventive Computation Technologies (ICICT), 2023, pp. 1–7.
26. M. Manwal, A. M. Alvi, N. K. Turaga, A. Mittal, R. Rivera, and S. Degadwala, "Node based Label Propagation for Bitcoin Transaction Pattern Identification Over Similar Community," in 2023 International Conference on Inventive Computation Technologies (ICICT), 2023, pp. 1147–1153.
27. D. Agrawal, H. Makwana, S. S. Dave, S. Degadwala, and V. Desai, "Error Level Analysis and Deep Learning For Detecting Image Forgeries," in 2023 7th International Conference on Computing Methodologies and Communication (ICCMC), 2023, pp. 114–117.
28. S. Pareek, A. Kumar, and S. Degadwala, "Machine Learning & Internet of Things in Plant Disease Detection: A comprehensive Review," in 2023 7th International Conference on Computing Methodologies and Communication (ICCMC), 2023, pp. 1354–1359.
29. P. K. Purohit, A. Kumar, and S. Degadwala, "Design and Development of Protected Services in Cloud Computing Environment," in 2023 International Conference on Intelligent Data Communication Technologies and Internet of Things (IDCIoT), 2023, pp. 985–988.
30. H. Lakhani, D. Undaviya, H. Dave, S. Degadwala, and D. Vyas, "PET-MRI Sequence Fusion using Convolution Neural Network," in 2023 International Conference on Inventive Computation Technologies (ICICT), 2023, pp. 317–321.
31. F. Ahamad, D. K. Lobiyal, S. Degadwala, and D. Vyas, "Inspecting and Finding Faults in Railway Tracks Using Wireless Sensor Networks," in 2023 International Conference on Inventive Computation Technologies (ICICT), 2023, pp. 1241–1245.
32. D. Rathod, K. Patel, A. J. Goswami, S. Degadwala, and D. Vyas, "Exploring Drug Sentiment Analysis with Machine Learning Techniques," in 2023 International Conference on Inventive Computation Technologies (ICICT), 2023, pp. 9–12.
33. C. H. Patel, D. Undaviya, H. Dave, S. Degadwala, and D. Vyas, "EfficientNetB0 for Brain Stroke Classification on Computed Tomography Scan," in 2023 2nd International Conference on Applied Artificial Intelligence and Computing (ICAAIC), 2023, pp. 713–718.
34. V. Desai, S. Degadwala, and D. Vyas, "Multi-Categories Vehicle Detection For Urban Traffic Management," in 2023 Second International Conference on Electronics and Renewable Systems (ICEARS), 2023, pp. 1486–1490.
35. D. D. Pandya, S. K. Patel, A. H. Qureshi, A. J. Goswami, S. Degadwala, and D. Vyas, "Multi-Class Classification of Vector Borne Diseases using Convolution Neural Network," in 2023 2nd International Conference on Applied Artificial Intelligence and Computing (ICAAIC), 2023, pp. 1–8.
36. M. Senbagavalli and G. T. Arasu, "Opinion Mining for Cardiovascular Disease using

IJDIAS International Journal of Discoveries and Innovations in Applied Sciences
| e-ISSN: 2792-3983 | www.openaccessjournals.eu | Volume: 3 Issue: 9

Decision Tree based Feature Selection," Asian J. Res. Soc. Sci. Humanit., vol. 6, no. 8, p. 891, 2016.

37. M. S. Valli and G. T. Arasu, An Efficient Feature Selection Technique of Unsupervised Learning Approach for Analyzing Web Opinions. 2016.
38. M. Senbagavalli and S. K. Singh, "Improving patient health in smart healthcare monitoring systems using IoT," in 2022 International Conference on Futuristic Technologies (INCOFT), 2022.
39. S. Venkatasubramanian, D. A. Suhasini, and D. C.Vennila, "An Energy Efficient Clustering Algorithm in Mobile Adhoc Network Using Ticket Id Based Clustering Manager," International Journal of Computer Science and Network Security, vol. 21, no. 7, pp. 341–349, Jul. 2021.
40. Venkatasubramanian, S., Suhasini, A. and Vennila, C., "An Efficient Route Optimization Using Ticket-ID Based Routing Management System (T-ID BRM)". Wireless Personal Communications, pp.1-20, 2021.
41. S. Venkatasubramanian, A. Suhasini, C. Vennila, "Efficient Multipath Zone-Based Routing in MANET Using (TID-ZMGR) Ticked-ID Based Zone Manager", International Journal of Computer Networks and Applications (IJCNA), 8(4), PP: 435- 443, 2021.
42. Venkatasubramanian, S.. "Optimized Gaming based Multipath Routing Protocol with QoS Support for High-Speed MANET", International Journal of Advanced Research in Science, Communication and Technology. vol. 9, No. 1, ,pp.62-73, September , 2021.
43. Veena, A., Gowrishankar, S. An automated pre-term prediction system using EHG signal with the aid of deep learning technique. Multimed Tools Appl (2023).
44. A. Veena and S. Gowrishankar, "Context based healthcare informatics system to detect gallstones using deep learning methods," International Journal of Advanced Technology and Engineering Exploration, vol. 9, (96), pp. 1661-1677, 2022.
45. Veena, A., Gowrishankar, S. (2021). Healthcare Analytics: Overcoming the Barriers to Health Information Using Machine Learning Algorithms. In: Chen, J.IZ., Tavares, J.M.R.S., Shakya, S., Iliyasu, A.M. (eds) Image Processing and Capsule Networks. ICIPCN 2020. Advances in Intelligent Systems and Computing, vol 1200. Springer, Cham.
46. A. Veena and S. Gowrishankar, "Processing of Healthcare Data to Investigate the Correlations and the Anomalies," 2020 Fourth International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC), Palladam, India, 2020, pp. 611-617,
47. A. Veena and S. Gowrishankar, "Applications, Opportunities, and Current Challenges in the Healthcare Industry", 2022 Healthcare 4.0: Health Informatics and Precision Data Management, 2022, pp. 27–50.
48. Venkatasubramanian.S., "A Chaotic Salp Swarm Feature Selection Algorithm for Apple and Tomato Plant Leaf Disease Detection", International Journal of Advanced Trends in Computer Science and Engineering, 10(5), pp.3037–3045,2021.
49. S.venkatasubramanian, "Multistage Optimized Fuzzy Based Intrusion Detection protocol

for NIDS in MANET", International Journal Of Innovative Research In Technology, Volume 8 Issue 6, November, pp.301-311, 2021.

50. K. Bhardwaj, S. Rangineni, L. Thamma Reddi, M. Suryadevara, and K. Sivagnanam, "Pipeline-Generated Continuous Integration and Deployment Method For Agile Software Development," European Chemical Bulletin, vol. 12, no. Special Issue 7, pp. 5590–5603, 2023.
51. S. Rangineni, D. Marupaka, and A. K. Bhardwaj, "An examination of machine learning in the process of data integration," International Journal of Computer Trends and Technology, vol. 71, no. 6, pp. 79–85, Jun. 2023.
52. T. K. Behera, D. Marupaka, L. Thamma Reddi, and P. Gouda, "Enhancing Customer Support Efficiency through Seamless Issue Management Integration: Issue Sync Integration System," European Chemical Bulletin, vol. 12, no. 10, pp. 1157–1178.
53. S. Rangineni and D. Marupaka, "Analysis Of Data Engineering For Fraud Detection Using Machine Learning And Artificial Intelligence Technologies," International Research Journal of Modernization in Engineering Technology and Science, vol. 5, no. 7, pp. 2137–2146, Jul. 2023.
54. L. Thamma Reddi, "Transforming Management Accounting: Analyzing The Impacts Of Integrated Sap Implementation," International Research Journal of Modernization in Engineering Technology and Science, vol. 5, no. 8, pp. 1786–1793, Aug. 2023.
55. M. Suryadevera, S. Rangineni, and S. Venkata, "Optimizing Efficiency and Performance: Investigating Data Pipelines for Artificial Intelligence Model Development and Practical Applications," International Journal of Science and Research, vol. 12, no. 7, pp. 1330–1340, Jul. 2023.
56. D. Marupaka, S. Rangineni, and A. K. Bhardwaj, "Data Pipeline Engineering in The Insurance Industry: A Critical Analysis Of Etl Frameworks, Integration Strategies, And Scalability," International Journal Of Creative Research Thoughts, vol. 11, no. 6, pp. c530–c539, Jun. 2023.
57. S. Rangineni, A. K. Bhardwaj, and D. Marupaka, "An Overview and Critical Analysis of Recent Advances in Challenges Faced in Building Data Engineering Pipelines for Streaming Media," The Review of Contemporary Scientific and Academic Studies, vol. 3, no. 6, Jun. 2023.
58. S.Venkatasubramanian,K., Senthil Kumar & J, Gnana & M, Ayeesha. "IoT and AI Based Recognition and Classification of Covid 19 Persons in Public Place", Turkish Online Journal of Qualitative Inquiry. 12. pp.7098-7110, 2021.
59. Srinivasan, Venkatasubramanian, "Detection of black hole attack using honeypot agent-based scheme with deep learning technique on MANET", Ingénierie des Systèmes d'Information, Vol. 26, No. 6, pp. 549-557, 2021.
60. M. Mandapuram and Md. F. Hosen, "The object-oriented database management system versus the Relational Database Management System: A comparison," Global Disclosure of Economics and Business, vol. 7, no. 2, pp. 89–96, 2018.

Published under an exclusive license by open access journals under Volume: 3 Issue: 9 in Sep-2023

61. M. Reddy, A. Bodepudi, M. Mandapuram, and S. S. Gutlapalli, "Face detection and recognition techniques through the Cloud Network: An Exploratory Study," ABC Journal of Advanced Research, vol. 9, no. 2, pp. 103–114, 2020.
62. G. P. Shukla, P. Chaudhary, P. Ghosh, M. Mandapuram, S. S. Gutlapalli, M Lourens, "Human resource management: a conceptual framework for comprehending the Internet of Things (IoT) and Machine Learning," Official Journal of the Patent Office (IN), no. 26/2023 (30/06/2023), 2023. Patent number 202321036845 A.
63. B. Nemade and D. Shah, "An IoT based efficient Air pollution prediction system using DLMNN classifier," Phys. Chem. Earth (2002), vol. 128, no. 103242, p. 103242, 2022.
64. B. Nemade and D. Shah, "An efficient IoT based prediction system for classification of water using novel adaptive incremental learning framework," J. King Saud Univ. - Comput. Inf. Sci., vol. 34, no. 8, pp. 5121–5131, 2022.
65. B. Nemade, "Automatic traffic surveillance using video tracking," Procedia Comput. Sci., vol. 79, pp. 402–409, 2016.
66. Kumar, R., Joshi, S., Rai, V., Dwivedi, A., & Jha, N. (2022, May). Identification of Pneumonia in Corona Virus Patient. In 2022 International Conference on Computational Intelligence and Sustainable Engineering Solutions (CISES) (pp. 419-423). IEEE.
67. Rai, V., Gupta, G., Joshi, S., Kumar, R., & Dwivedi, A. (2023). LSTM-based adaptive whale optimization model for classification of fused multimodality medical image. Signal, Image and Video Processing, 1-10.
68. Joshi, S., & Dwivedi, A. (2020, March). RFID SYSTEM-used for monitoring and tracking patient (MTP). In 2020 International Conference on Computer Science, Engineering and Applications (ICCSEA) (pp. 1-10). IEEE.
69. Amrita, Joshi, S., Kumar, R., Dwivedi, A., Rai, V., & Chauhan, S. S. (2023). Water wave optimized nonsubsampled shearlet transformation technique for multimodal medical image fusion. Concurrency and Computation: Practice and Experience, 35(7), e7591.
70. Khatiwada, P., Joshi, S., Mohan, K. M., Chouhan, K., Gangodkar, D., & Khan, Z. Z. (2022, April). Design A Wireless Network Data Security System for Medical Records Using Cryptography. In 2022 2nd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE) (pp. 207-211). IEEE.
71. Joshi, S., Rai, P. K., Kumar, R., & Dwivedi, A. (2022, May). Optical Text Translator from Images using Machine Learning. In 2022 International Conference on Computational Intelligence and Sustainable Engineering Solutions (CISES) (pp. 95-100). IEEE.
72. S. Joshi, P. K. Rai, R. Kumar, Rikendra and A. Dwivedi, "Optical Text Translator from Images using Machine Learning," 2022 International Conference on Computational Intelligence and Sustainable Engineering Solutions (CISES), Greater Noida, India, 2022, pp. 95-100,
73. R. Kumar, S. Joshi, V. Rai, A. Dwivedi and N. Jha, "Identification of Pneumonia in Corona Virus Patient," 2022 International Conference on Computational Intelligence and

Sustainable Engineering Solutions (CISES), Greater Noida, India, 2022, pp. 419-423.

74. S. Joshi, R. Kumar, P. K. Rai and S. Garg, "Diabetic Retinopathy Using Deep Learning," 2023 International Conference on Computational Intelligence and Sustainable Engineering Solutions (CISES), Greater Noida, India, 2023, pp. 145-149.
75. R. Kumar, S. Joshi, C. Gupta and R. Aggarwal, "Recommender System for Mobile Applications," 2023 International Conference on Artificial Intelligence and Smart Communication (AISC), Greater Noida, India, 2023, pp. 175-181.
76. S. Joshi, B. S, P. Rawat, D. Deshpande, M. K. Chakravarthi and D. Verma, "A Framework of Internet of Things (Iot) for the Manufacturing and Image Classification System," 2022 11th International Conference on System Modeling & Advancement in Research Trends (SMART), Moradabad, India, 2022, pp. 371-375.
77. A. R. Kunduru, "Security Concerns and Solutions for Enterprise Cloud Computing Applications," Asian Journal of Research in Computer Science, vol. 15, no. 4, pp. 24-33, 2023.
78. A. R. Kunduru, "Industry Best Practices on Implementing Oracle Cloud ERP Security," International Journal of Computer Trends and Technology, vol. 71, no. 6, pp. 1-8, 2023.
79. A. R. Kunduru, "Cloud Appian BPM (Business Process Management) Usage In health care Industry," IJARCCE International Journal of Advanced Research in Computer and Communication Engineering, vol. 12, no. 6, pp. 339-343, 2023.
80. A. R. Kunduru, "Effective Usage of Artificial Intelligence in Enterprise Resource Planning Applications," International Journal of Computer Trends and Technology, vol. 71, no. 4, pp. 73-80, 2023.
81. A. R. Kunduru, "Recommendations to Advance the Cloud Data Analytics and Chatbots by Using Machine Learning Technology," International Journal of Engineering and Scientific Research, vol. 11, no. 3, pp. 8-20, 2023.
82. A. R. Kunduru and R. Kandepu, "Data Archival Methodology in Enterprise Resource Planning Applications (Oracle ERP, Peoplesoft)," Journal of Advances in Mathematics and Computer Science, vol. 38, no. 9, pp. 115-127, 2023.
83. A. R. Kunduru, "Artificial Intelligence Usage in Cloud Application Performance Improvement," Central Asian Journal of Mathematical Theory and Computer Sciences, vol. 4, no. 8, pp. 42-47, 2023.
84. A. R. Kunduru, "Artificial Intelligence Advantages in Cloud Fintech Application Security," Central Asian Journal of Mathematical Theory and Computer Sciences, vol. 4, no. 8, pp. 48-53, 2023.
85. A. R. Kunduru, "Cloud BPM Application (Appian) Robotic Process Automation Capabilities," Asian Journal of Research in Computer Science, vol. 16, no. 3, pp. 267-280, Aug. 2023.
86. A. R. Kunduru, “Machine Learning in Drug Discovery: A Comprehensive Analysis of Applications, Challenges, and Future Directions”, IJOT, vol. 5, no. 8, pp. 29-37, Aug. 2023.

87. Lisha, L., Mousa, S., Arnone, G., Muda, I., Huerta-Soto, R., & Shiming, Z. (2023). Natural resources, green innovation, fintech, and sustainability: A fresh insight from BRICS. Resources Policy, 80, 103119.
88. Ye, W., Wong, W. K., Arnone, G., Nassani, A. A., Haffar, M., & Faiz, M. F. (2023). Crypto currency and green investment impact on global environment: A time series analysis. International Review of Economics & Finance, 86, 155-169.
89. Tauda, G. A., Omara, A., & Arnone, G. (2023). Cryptocurrency: Highlighting the Approach, Regulations, and Protection in Indonesia and European Union. BESTUUR, 11(1), 1-25.
90. Arnone, G., Kumar, A., & Mathure, Y. M. (2022). Application of Fintech in the Modern Banking Industry. Journal of Algebraic Statistics, 13(3), 4244-4249.
91. Panduro-Ramirez, J., Anusha, K., ARNONE, G., Maggavi, R. R., Ruiz-Salazar, J. M., & Almashaqbeh, H. A. (2022, April). An Empirical Investigation in Understanding the Recent Advancements in the Blockchain and Artificial Intelligence for Better Application in the Future. In 2022 2nd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE) (pp. 2473-2477). IEEE.
92. Wang, C., Ahmad, S. F., Ayassrah, A. Y. B. A., Awwad, E. M., Irshad, M., Ali, Y. A., & Han, H. (2023). An empirical evaluation of technology acceptance model for Artificial Intelligence in E-commerce. Heliyon, e18349.
93. Khan, Y., Su'ud, M. B. M., Alam, M. M., Ahmad, S. F., Ahmad, A. Y. B., & Khan, N. (2022). Application of Internet of Things (IoT) in Sustainable Supply Chain Management. Sustainability, 15(1), 694.
94. A. Y. A. B. Ahmad, S. S. Kumari, M. S, S. K. Guha, A. Gehlot and B. Pant, "Blockchain Implementation in Financial Sector and Cyber Security System," 2023 International Conference on Artificial Intelligence and Smart Communication (AISC), Greater Noida, India, 2023, pp. 586-590.
95. A. Y. B. Ahmad, A. A. B. Atta, M. Shehadeh, H. M. A. Baniata, and L. Y. B. Hani, "Fund family performance: Evidence from emerging countries," WSEAS Trans. Bus. Econ., vol. 20, pp. 951–964, 2023.
96. A. Maseleno, S. Patimah, S. Syafril, M. Huda, "Learning Preferences Diagnostic using Mathematical Theory of Evidence," FMDB Transactions on Sustainable Techno Learning., vol. 1, no. 2, pp. 60 –77, 2023.
97. A. Mohammed Saleh Ba wazir, Q. Ahmed Amaamari, and B. Ali Hasan, "The relationships between self-efficacy, managerial competency and learning orientation on job performance among leaders in Saudi universities," International Journal of Intellectual Human Resource Management (IJIHRM), no. 01, 2020.
98. A. Patel, S. Samal, S. Ghosh and B. Subudhi, "A study on wide-area controller design for inter-area oscillation damping," 2016 2nd International Conference on Control, Instrumentation, Energy & Communication (CIEC), Kolkata, India, 2016, pp. 245-249.

99. Almaamari, Q. A., Ali, B. M., & Almeer, S. (2022). Factors Influencing Organizational Performance at Petroleum Products Distribution Company in Yemen. Specialusis Ugdymas, 1(43), 2071-2083.
100. Almaamari, Q., & Abdulhusain, Z. (2022). Leadership, organization Culture and job Satisfaction influence employee performance in private companies in Bahrain. Baltic Journal of Law & Politics, 15(1), 352-361.
101. B. Subudhi, S. K. Sarnal and S. Ghosh, "A new low-frequency oscillatory modes estimation using TLS-ESPRIT and least mean squares sign-data (LMSSD) adaptive filtering," TENCON 2017 - 2017 IEEE Region 10 Conference, Penang, Malaysia, 2017, pp. 751-756.
102. B. T. Devi, and R. Rajasekaran, "A Comprehensive Review on Deepfake Detection on Social Media Data," FMDB Transactions on Sustainable Computing Systems., vol. 1, no. 1, pp. 11–20, 2023.
103. D. Saxena and S. Chaudhary, "Predicting Brain Diseases from FMRI-Functional Magnetic Resonance Imaging with Machine Learning Techniques for Early Diagnosis and Treatment," FMDB Transactions on Sustainable Computer Letters., vol. 1, no. 1, pp. 33–48, 2023.
104. Fraihat, B. A. M., Ahmad, A. Y. B., Alaa, A. A., Alhawamdeh, A. M., Soumadi, M. M., Aln'emi, E. A. S., & Alkhawaldeh, B. Y. S. (2023). Evaluating Technology Improvement in Sustainable Development Goals by Analysing Financial Development and Energy Consumption in Jordan. International Journal of Energy Economics and Policy, 13(4), 348.
105. J. Pradhan, S. Panda, R. K. Mandal, and S. K. Panigrahi, "Influence of GGBFS-based blended precursor on fresh properties of self-compacting geopolymer concrete under ambient temperature," Materials Today: Proceedings, p. S221478532303732X, Jul. 2023.
106. J. Sohlot, P. Teotia, K. Govinda, S. Rangineni, P. Paramasivan, "A Hybrid Approach on Fertilizer Resource Optimization in Agriculture Using Opposition-Based Harmony Search with Manta Ray Foraging Optimization," FMDB Transactions on Sustainable Computing Systems., vol. 1, no. 1, pp. 44–53, 2023.
107. Kumar, A., Kumar, M., Mahapatra, R. P., Bhattacharya, P., Le, T. T. H., Verma, S., & Mohiuddin, K. (2023). Flamingo-Optimization-Based Deep Convolutional Neural Network for IoT-Based Arrhythmia Classification. Sensors, 23(9), 4353.
108. Kumar, A., Kumar, M., Verma, S., Jhanjhi, N. Z., & Ghoniem, R. M. (2022). Vbswp-CeaH: Vigorous Buyer-Seller Watermarking Protocol without Trusted Certificate Authority for Copyright Protection in Cloud Environment through Additive Homomorphism. Symmetry, 14(11), 2441.
109. Kumar, M., Kumar, A., Verma, S., Bhattacharya, P., Ghimire, D., Kim, S. H., & Hosen, A. S. (2023). Healthcare Internet of Things (H-IoT): Current Trends, Future Prospects, Applications, Challenges, and Security Issues. Electronics, 12(9), 2050.
110. Kumar, M., Kumar, D., & Akhtar, M. A. K. (2018, October). Mathematical model

for sink mobility (MMSM) in wireless sensor networks to improve network lifetime. In Communication, Networks and Computing: First International Conference, CNC 2018, Gwalior, India, March 22-24, 2018, Revised Selected Papers (pp. 133-141). Singapore: Springer Singapore

111. Kumar, M., Kumar, D., & Akhtar, M. A. K. (2021). A modified GA-based load balanced clustering algorithm for WSN: MGALBC. International Journal of Embedded and Real-Time Communication Systems, 12(1), 44-63

112. Kumar, M., Mukherjee, P., Verma, S., Kaur, M., Singh, S., Kobielnik, M., ... & Ijaz, M. F. (2022). BBNSF: Blockchain-Based Novel Secure Framework Using RP2-RSA and ASR-ANN Technique for IoT Enabled Healthcare Systems. Sensors, 22(23), 9448.

113. Kumar, M., Mukherjee, P., Verma, S., Kavita, Shafi, J., Wozniak, M., & Ijaz, M. F. (2023). A smart privacy preserving framework for industrial IoT using hybrid meta-heuristic algorithm. Scientific Reports, 13(1), 5372.

114. L. Mohanty, S. K. Panigrahi, and M. Patnaik, “Assessment of water quality of Mahanadi basin using statistical and wavelet techniques,” Materials Today: Proceedings, vol. 62, pp. 6371–6378, 2022.

115. M. Atasever, “Resilient Management in Action: A Comparative Analysis of Strategic Statements in German and Turkish Retail Chain Markets,” FMDB Transactions on Sustainable Management Letters., vol. 1, no. 2, pp. 66-81, 2023.

116. Mishra, S., & Kumar Samal, S. (2023). Mitigation of transmission line jamming by price intrusion technique in competitive electricity market. International Journal of Ambient Energy, 44(1), 171-176.

117. Mishra, S., & Samal, S. K. (2023). Impact of electrical power congestion and diverse transmission congestion issues in the electricity sector. Energy Systems, 1-13.

118. P. K. Sahu, S. Maity, R. K. Mahakhuda and S. K. Samal, "A fixed switching frequency sliding mode control for single-phase voltage source inverter," 2014 International Conference on Circuits, Power and Computing Technologies [ICCPCT-2014], Nagercoil, India, 2014, pp. 1006-1010.

119. Pratap, A., Kumar, A., & Kumar, M. (2021, May). Analyzing the need of edge computing for Internet of Things (IoT). In Proceedings of Second International Conference on Computing, Communications, and Cyber-Security: IC4S 2020 (pp. 203-212). Singapore: Springer Singapore.

120. R S Gaayathri, S. S. Rajest, V. K. Nomula, R. Regin, “Bud-D: Enabling Bidirectional Communication with ChatGPT by adding Listening and Speaking Capabilities,” FMDB Transactions on Sustainable Computer Letters., vol. 1, no. 1, pp. 49–63, 2023.

121. R, Steffi., S. Suman Rajest, R. Regin, and Shynu T. 2023. “Detection Of Prominent Objects by The Use of Deep Learning”. Central Asian Journal of Mathematical Theory and Computer Sciences 4 (5), 62-82.

122. R. Das, S. Panda, A. S. Sahoo, and S. K. Panigrahi, “Effect of superplasticizer types and dosage on the flow characteristics of GGBFS based self-compacting geopolymer concrete,” Materials Today: Proceedings, p. S2214785323037331, Jul. 2023.

123. R. Regin, S. Suman Rajest, Shynu T, & Steffi. R. (2023). The Application of Machine Learning to the Prediction of Heart Attack. International Journal of Human Computing Studies, 5(4), 5-25.

124. Regin, R., S. Suman Rajest, Shynu T, and Steffi. R. (2023). “Electronic Tourism as A Destination Marketing Strategy for World Travellers”. Central Asian Journal of Mathematical Theory and Computer Sciences. 4 (5), 9-28.

125. Regin, R., S. Suman Rajest, Shynu T, and Steffi. R. 2023. “Principal Component Analysis for ATM Facial Recognition Security”. Central Asian Journal of Medical and Natural Science 4 (3), 292-311.

126. S. K. Parhi and S. K. Panigrahi, “Alkali–silica reaction expansion prediction in concrete using hybrid metaheuristic optimized machine learning algorithms,” Asian Journal of Civil Engineering, pp. 1–23, 2023.

127. S. K. Parhi, S. Dwibedy, S. Panda, and S. K. Panigrahi, “A comprehensive study on Controlled Low Strength Material,” Journal of Building Engineering, p. 107086, 2023.

128. S. Lodha, H. Malani, A. K. Bhardwaj, “Performance Evaluation of Vision Transformers for Diagnosis of Pneumonia,” FMDB Transactions on Sustainable Computing Systems., vol. 1, no. 1, pp. 21–31, 2023.

129. S. Sajini, L. T. Reddi, R. Regin, S. S. Rajest, “A Comparative Analysis of Routing Protocols for Efficient Data Transmission in Vehicular Ad Hoc Networks (VANETs),” FMDB Transactions on Sustainable Computing Systems., vol. 1, no. 1, pp. 1–10, 2023.

130. S. Silvia Priscila, S. Suman Rajest, R. Regin, Shynu T, & Steffi. R. (2023). Classification of Satellite Photographs Utilizing the K-Nearest Neighbor Algorithm. Central Asian Journal of Mathematical Theory and Computer Sciences, 4(6), 53-71.

131. S. Suman Rajest, S. Silvia Priscila, R. Regin, Shynu T, & Steffi. R. (2023). Application of Machine Learning to the Process of Crop Selection Based on Land Dataset. International Journal on Orange Technologies, 5(6), 91-112.

132. S. Suman Rajest, Shynu T, R. Regin, & Steffi. R. (2023). An Individualized Recommendation and Promotional System for Tourist Attractions. Central Asian Journal of Theoretical and Applied Science, 4(5), 64-84.

133. S. Suman Rajest, Shynu T, R. Regin, & Steffi. R. (2023). A Visual Approach for Detecting Tyre Flaws That Makes Use of The Curvelet Characteristic. International Journal on Orange Technologies, 5(4), 17-40.

134. Sahoo, A. K., & Samal, S. K. (2023). Online fault detection and classification of 3-phase long transmission line using machine learning model. Multiscale and Multidisciplinary Modeling, Experiments and Design, 6(1), 135-146.

135. Steffi. R, S. S. Rajest, R. Regin, Shynu T, & S. S. Priscila. (2023). Analysis of an

Published under an exclusive license by open access journals under Volume: 3 Issue: 9 in Sep-2023

Interview Based on Emotion Detection Using Convolutional Neural Networks. Central Asian Journal of Theoretical and Applied Science, 4(6), 78-102.

136. Steffi. R, S. Suman Rajest, R. Regin, & Shynu T. (2023). An Examination of the Effects That Marketing Methods Have on Non-Governmental Organizations. Middle European Scientific Bulletin, 34(3), 189-207.

137. Steffi. R, S. Suman Rajest, R. Regin, & Shynu T. (2023). Developing Banking Sector Strategies Amid Economic Turmoil. International Journal on Economics, Finance and Sustainable Development, 5(4), 78-100.

138. T, S., Rajest, S. S., Regin, R. and R, S. (2023) "Protection of User Profiles in Social Networks From Unauthorized Access", Central Asian Journal of Theoretical and Applied Science, 4(4), pp. 32-50.

139. T, Shynu, S. S. Rajest, R. Regin, and Steffi. R. 2023. "OTP As a Service in the Cloud Allows for Authentication of Multiple Services". International Journal on Orange Technologies 5 (4), 94-112.

140. T, Shynu, S. Suman Rajest, R. Regin, and Steffi. R. (2023). "Analysis of the Impact of Employee Training and Development on Performance". Central Asian Journal of Innovations on Tourism Management and Finance 4 (6), 1-25.

141. Upadhyay, S., Kumar, M., Kumar, A., Ghafoor, K. Z., & Manoharan, S. (2022). SmHeSol (IoT-BC): smart healthcare solution for future development using speech feature extraction integration approach with IoT and blockchain. Journal of Sensors, 2022.

142. Upadhyay, S., Kumar, M., Upadhyay, A., Verma, S., Kavita, Kaur, M., ... & Castillo, P. A. (2023). Challenges and Limitation Analysis of an IoT-Dependent System for Deployment in Smart Healthcare Using Communication Standards Features. Sensors, 23(11), 5155.

143. V. Gomathy, and S. Venkatasbramanian, "Impact of Teacher Expectations on Student Academic Achievement," FMDB Transactions on Sustainable Techno Learning., vol. 1, no. 2, pp. 78 –91, 2023.

144. W. Kanyimama, "Design of A Ground Based Surveillance Network for Modibbo Adama University, Yola," FMDB Transactions on Sustainable Computing Systems., vol. 1, no. 1, pp. 32–43, 2023.

145. Y. Abdullahi, A. Bhardwaj, J. Rahila, P. Anand, and K. Kandepu, "Development of Automatic Change-Over with Auto-Start Timer and Artificial Intelligent Generator," FMDB Transactions on Sustainable Energy Sequence, vol. 1, no. 1, pp. 11–26, 2023