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HIGH SPEED AREA EFFICIENT VLSI ARCHITECTURE OF THREE OPERAND BINARY ADDER

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TKR College of Engineering & Technology, India

ABSTRACT

For Area-efficient VLSI architecture a Two-operand binary adder is designed where in which area is more and speed of operation is low, because of these limitations a new architecture with Three-operand binary adder logic is to be designed instead of previous architecture which performs 3-9 times faster than the previous architecture. Three-operand binary adder is the basic functional unit to perform the modular arithmetic and various Cryptography and Pseudorandom Bit Generator (PRBG) algorithm. Carry save adder (CS3A) is widely used technique to perform the Three-operand binary adder. However the ripple-carry stage in CS3A leads to a high propagation delay. Moreover a parallel prefix Two-operand binary adder such as Han-Carlson (HCA) can also be used for Three-operand addition that significantly reduces the critical path delay a cost of additional hardware. Three-operand binary addition significantly decreases area and power consumption. Hence a new High-speed and Area efficient adder architecture is proposed using pre-compute bitwise addition followed by carry prefix computation logic to perform the Three-operand binary addition. With this Logic a new architecture is to be designed, for 16-bit Three-operand binary addition which is called as 16-bit Three-operand binary adder. To design this logic we are using Xilinx ISE, ModelSim software with VHDL, Verilog languages.

I. Introduction

Efficient and high-speed arithmetic circuits, such as binary adders, play a crucial role in digital system performance. Therefore, the development of VLSI architecture for a three-operand binary adder that is both area-efficient and fast is essential. A three-operand binary adder takes three binary numbers as inputs and generates their sum as output. The design of its VLSI architecture should aim to minimize the circuit's required area while maximizing its speed. Several techniques can be utilized, including pipelining, parallelism, and optimizing the circuit's layout. Advanced CMOS technology and circuit design methodologies like transistor sizing, gate sizing, and clock gating can also enhance the circuit's efficiency and performance.

In earlier, we used Ripple carry adder and Carry look ahead adder in being armature.

1. Ripple Carry Adder

Fig 1.2.1 refers to a Ripple Carry Adder which is a digital circuit that produces the computation sum of two double figures. A Ripple Carry Adder is constructed with the full adders connected in protruded w.ith the carry affair

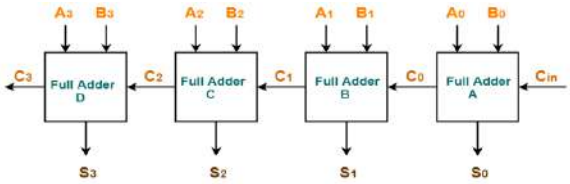

Fig 1: Ripple Carry Adder

From each full adder connected to the carry input of the coming full adder in the chain. Then 'n' number of ripple carry adders is used. Where the affair of one adder is given as input to coming adder i.e., coming adder should be awaited for the input which comes from former adder.

2. Carry Look Ahead Adder

A Carry Look Ahead Adder(CLA) are fast adder is a type of electronics adder is used in digital sense. Fig1.2 refers to Carry Look Ahead Adder. A Carry Look Ahead Adder improves the speed by reducing the quantum of time needed to determine the carry bits. But this CLA is only used for this lower number of bits; when we increase number of inputs the complexity also increases downsides OF Being Armature.

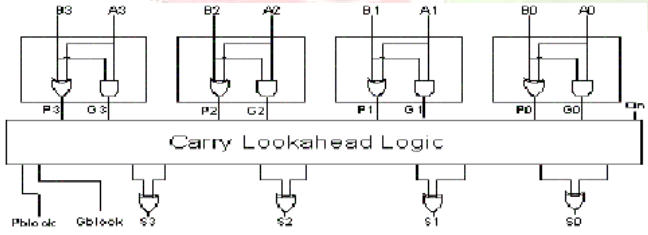

Fig 2: Carry Look Ahead Adder

By using the Ripple Carry Adder (RCA) we observed that one adder should stay for the input from the former adder by this there's further detention in the process. So to overcome this limitation we're going with the Carry Look Ahead Adder (CLA). A Carry Look Ahead Adder is used to reduce the detention means speed is increased compared to Ripple Carry Adder. But this Carry Look Ahead Adder is used for only lower number of bits, when we increase the number of bits automatically the sense gates(area) used are increased by this complexity also increases. To overcome the Ripple Carry Adder and Carry Look Ahead Adder's downsides we're going with a new system i.e., proposed armature.

II. Proposed Architecture

The previous architecture utilized a ripple carry adder, which resulted in slow execution speeds and increased delay due to the dependence of each block or bit on the previous one. In order to enhance the speed and reduce the delay, a carry look ahead adder was introduced, resulting in faster execution times. However, the use of this adder is limited to a smaller number of bits, as increasing the number of bits can lead to a more complex process. A new architecture was proposed to address the limitations of the previous design, with the aim of improving speed and reducing delay and area.

The project involves the use of Parallel Prefix Adders (PPA), specifically the Han-Carlson Adder (HCA), as well as Linear Congruential Generators (LCG) and Dual Linear Congruential Generator (DLCG). The current project employs Parallel Prefix Adders (PPA), including the Han-Carlson Adder (HCA), in addition to utilizing Linear Congruential Generators (LCG) and Dual Linear Congruential Generator (DLCG)

Parallel Prefix Adder

Multilevel-look Ahead adders or parallel-prefix adders can be utilized to overcome the delay of carry-look ahead adders. These adders operate by computing intermediate prefixes in small groups and then gradually combining them to determine the final carry bits. The structure of these adders is based on a tree-like architecture that resembles the carry propagate adder, with the addition of pre-computation and post-computation stages shown in the below fig 1.8. During the pre-computation stage, each bit performs a calculation to generate or propagate a carry, as well as to obtain a temporary sum. In the prefix stage, the carry generate/propagate signals of each group are computed to form a carry chain that provides carry-in for the adder below.

$$G_{i:k} = G_{i:j} + P_{i:j}$$

$$G_{j-1:k}\ P_{i:k} = P_{i:j}\ \ P_{j-1:k}$$

The final stage of the multilevel-look ahead adder or parallel-prefix adder is the post-computation stage, where the sum and carry-out are generated. However, if only the sum is required, the carry-out can be disregarded.

$$s_i = t_i \wedge G_{i:-1}$$

$$C_{out} = g_{n-1} + p_{n-1} \_ G_{n-2:-1}$$

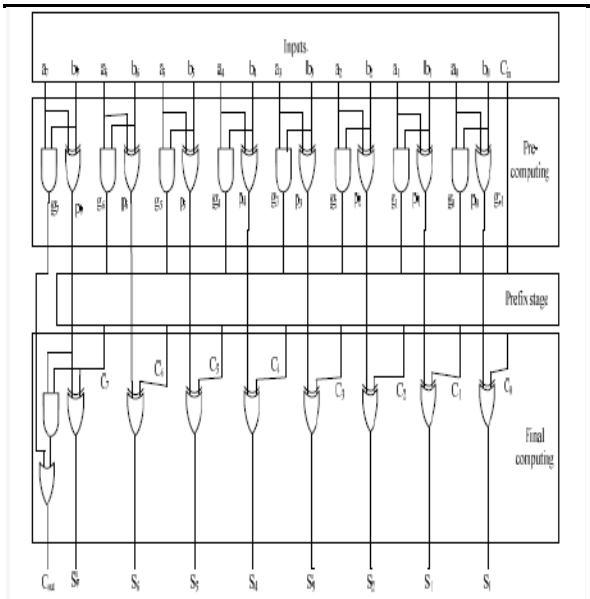

Fig 3:8-bit Parallel-Prefix Structure with carry save notation

Assuming that g-1 is equal to cin, where Gi:-1 is equal to ci, the parallel-prefix structure diagram is presented in Figure 3.4, demonstrating an example with 8 bits. The equations mentioned earlier can be utilized to implement all parallel-prefix structures, but their interpretation can result in different types of trees, such as the Brent-Kung, which is recognized for its sparse topology but requires more logic levels. The performance of prefix structures can be influenced by several design factors, including radix/valency, logic levels, fan-out, and wire tracks.structures, but their interpretation can result in different types of trees, such as the Brent-Kung, which is recognized for its sparse topology but requires more logic levels. The performance of prefix structures can be influenced by several design factors, including radix/valency, logic levels, fan-out, and wire tracks.

1. Han-Carlson Adder

Compared to other two-operand adder techniques, the Han-Carlson adder is known for its fast speed and low gate complexity, with the lowest area delay product (ADP) and power-delay product (PDP). As a result, the Han-Carlson adder (HCA) can be utilized to perform three-operand addition in two stages, as demonstrated in Figure 3.4.1.

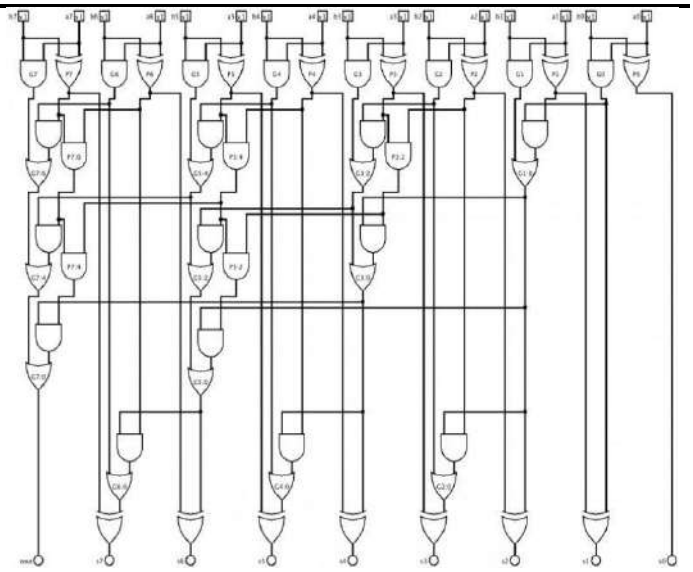

Fig 1.2 logic diagram of 8-bit Han-Carlson adder

The Han-Carlson prefix tree concept is comparable to Kogge-Stone's structure due to its high fan-out. However, the Han-Carlson prefix tree has the advantage of requiring significantly fewer cells and wire tracks than Kogge-Stone.

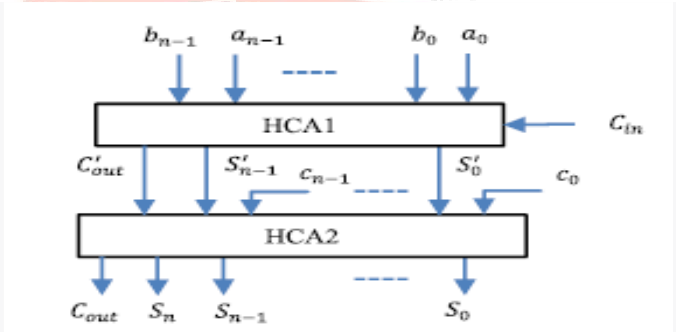

Fig 4: Block level architecture of HCA-based three-operand adder (HC3A)

3. Linear Congruential Generator (LCG)

An algorithm that produces a sequence of pseudo-random numbers using a piecewise linear equation is known as a linear congruential generator (LCG) as shown in the below figure 3.6.1.1. LCG is one of the most well-known and oldest pseudorandom number generator algorithms. These generators are easy to understand in terms of their underlying theory and are simple to implement. They are also fast, particularly on computer hardware capable of modular arithmetic via storage-bit truncation.

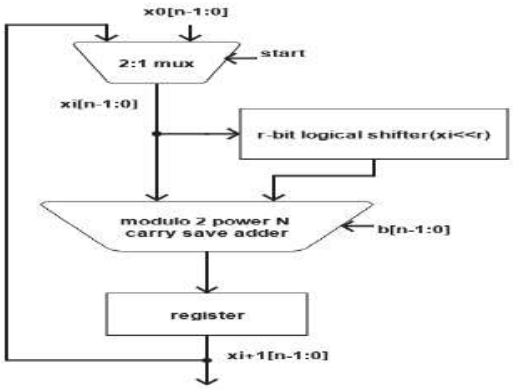

Fig 5: Architecture of the linear congruential generator

The design of the linear congruential generator involves the use of a 3-operand modulo 2n carry save adder, an n-bit 2x1 multiplexer, an n-bit register, and a logical shifter, as depicted in the figure. The LCG has low hardware complexity and occupies less area. However, due to its linear structure, it is not able to pass randomness tests since the next sequence can be identified by anyone after some time.

The architecture of the proposed "Modified Dual-CLCG" requires initial values of a0 ,b0,p0,q0, four prime numbers l1,l2,l3,l4 < 2n , four numbers m1,m2,m3,m4 < 2nsuch that __−1 4 = 0, four LCG modules, and Magnitude Comparator (MC). Each LCG module comprises MUX, Register, R-generator, Shifter, Adder, and XOR gate. To implement the "Modified Dual-CLCG," the architecture requires several initial values such as a0, b0, p0, q0, four prime numbers l1, l2, l3, and l4 (less than 2n), and four numbers m1, m2, m3, and m4 (less than 2n), such that __−1 4 = 0. Additionally, the implementation requires four LCG modules, each consisting of a MUX, Register, R-generator, Shifter, Adder, and XOR gate, and a Magnitude Comparator (MC).

- MUX: The initial value, clock, and feedback of the LCG module are given as the inputs to the MUX. Initially, the value of feedback is zero.
- R-Generator: It is a switch that goes high only when the input satisfies, and is zero in other cases. Whenever the switch becomes high, the value of n is 2n-1. For instance, when input is 5, then r is 2, i.e., 22-1=5.
- Shifter: It performs left shift operation r times on the ai, where i is the round number. For example, if r=2, then ai is shifted twice.
- Adder: It is designed by cascading n full adders in two rows.
- Register: This is used to store the value of Adder. The value stored in the register is the output of the LCG module, which is given as feedback.
- Magnitude Comparator: This is used to compare the values of two LCG modules based on the following criteria: If ai>bi output=1 else output=0
- XOR gate: Performs XOR operation on the outputs of the two magnitude comparators. The output of the XOR gate is the output of the entire proposed system.

3.2 Operation

The system follows a set of steps, which begin by initializing a0, b0, p0, q0 to random numbers. These four values are given as one of the inputs to each mux, situated in lcg, respectively, while the other two inputs are clock and feedback. Initially, the clock is one, and feedback is zero. The mux's output is given to the r-generator, which decides the number of times the input value needs to be shifted. Later, the bits are shifted according to the value of the r-generator. The result of the shifting operation, the output of mux and l1 are given as inputs to a adder. The output of the Adder is stored in a register and is given as feedback to mux; it is also given as input to a magnitude comparator.

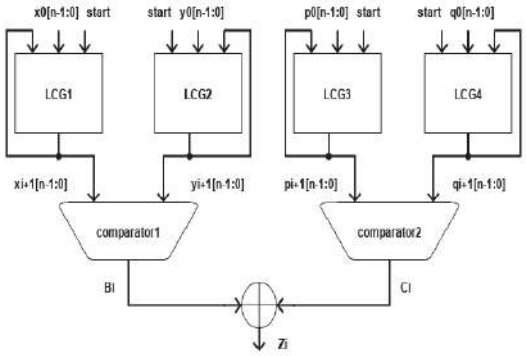

Fig 6: block diagram of dual linear congruential generator (DLCG)

The magnitude comparator takes two inputs, one from each lcg and then, compares every bit of the two inputs and gives a necessary output in the range of 0 to 2n. For example: if the bit size is four, it generates 0 to24, i.e., 0 to 15 binary numbers randomly. The primary advantage of a magnitude comparator is its inbuilt function which helps in generating a solution of a gate level equation without solving it.

Software used here is Vivado. Vivado is a software suite created by Xilinx, a leading semiconductor

company that provides programmable solutions for various industries. It is specifically designed to help engineers design and program Field-Programmable Gate Arrays (FPGAs) and Programmable System-on-Chip (SoC) devices. Vivado offers a comprehensive set of tools for design, simulation, implementation, and programming of these devices, making it a valuable tool for developers working on complex digital systems. With Vivado, engineers can achieve faster development cycles, higher performance, and greater productivity in their FPGA and SoC projects

III. Simulation Results

1. Han-Carlson Adder

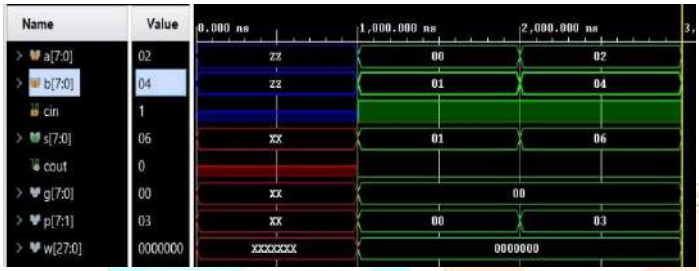

Fig 8: output waveform of Han-Carlson Adder

Based on the provided waveform, the system has several inputs, including a, b, and cin, as well as outputs p, g, w, s, and cout. Initially, values must be assigned to a, b, and cin. The adder itself consists of three stages: pre-computational, carry generation, and post-computational. The inputs a and b are first provided to the first stage, and the outputs of this stage are p and g. These p and g values are then passed as inputs to the second stage, which produces the output w. The value of w is then given as input to the third and final stage, which outputs s and cout.

Power Report

Fig 9: power report of Han-Carlson Adder

The power report of a Han-Carlson adder shows the amount of power consumed during operation. It can be generated using simulation software and includes information such as total power consumption, dynamic power, and leakage power. The Han-Carlson adder is designed to reduce power consumption by minimizing logic gates and using efficient gate configurations. Analyzing the power report can help optimize the circuit's design to minimize power consumption while maintaining performance.

Utilization Report

A utilization report for the Han-Carlson Adder analyzes the circuit's resource usage, including logic cells, registers, and routing resources. This report helps to optimize resource usage, improve performance, and reduce power consumption. It is generated by design software and provides detailed information on the percentage of resources used and the number of logic cells, registers, and routing resources used. By analyzing the report, designers can optimize routing, reduce the number of logic cells, and use efficient gate configurations to improve efficiency and meet design requirements.

Name	Slice LUTs (41000)	Slice (10250)	LUT as Logic (41000)	Bonded IOB (300)
hancarlson	11	5	11	24

Fig 10: Utilization report of Han-Carlson Adder

2. Linear Congruential Generator (LCG)

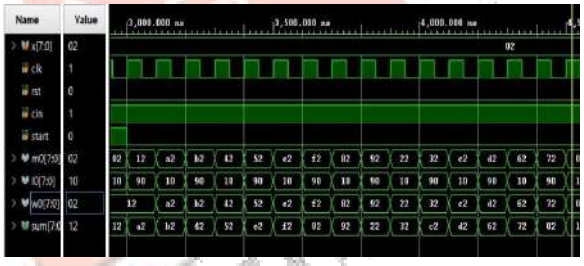

Fig 12: output waveform of LCG

Based on the provided waveform, the system has several inputs including X0, clock, reset, start, and cin, as well as outputs m0, l0, and sum. Initially, a random value is assigned to X0. Subsequently, the appropriate signals must be applied to clock, reset, start, and cin as necessary. Once X0 is applied, it is passed through a multiplexer (MUX), which outputs m0. The value of m0 is then shifted using a shifter that shifts 3 bits, producing l0 as an output. Both m0 and l0 are then inputted into an adder, and the resulting sum is stored in a register. This sum is then outputted as the final value.

Power Report

Fig 13: Power report of LCG

The power consumption of a linear congruential generator is affected by the complexity of the multiplier and the clock frequency. Low-power components and clock gating techniques can be used to reduce power consumption. Increasing the size of the shift register also increases power consumption.

Utilization Report

The linear congruential generator is widely used in various applications that require pseudorandom numbers, such as cryptography, simulations, and games. In cryptography, it is used for key generation and data encryption. In simulations, it is used to create realistic scenarios in various fields such as finance, engineering, and social sciences. In gaming, it is used for game mechanics and procedural content generation. Additionally, linear congruential generators can be used in statistical sampling and Monte Carlo simulations to estimate the probability of complex events.

Name	Slice LUTs (41000)	Slice Registers (82000)	Slice (10250)	LUT as Logic (41000)	Bonded IOB (300)	BUFGCTRL (32)
lcg_ppa	10	8	3	10	19	1
u3 (diff_4)	10	8	3	10	0	0

Fig 14: Utilization Report of LCG

3. Dual Linear Congruential Generator (DLCG)

Fig 16: Output Waveform of DLCG

Based on the waveform, the system has several inputs, including x0, y0, p0, q0, and start, and outputs, including sum0, sum1, sum2, sum3, out1, out2, and the final output. Initially, we assigned the values 1, 2, 3, and 4 to the inputs x0, y0, p0, and q0, respectively, which serve as inputs to four linear congruential generators (LCGs). The outputs of these LCGs are sum0, sum1, sum2, and sum3. The values of sum0 and sum1 are then inputted into comparator1, while sum2 and sum3 are inputted into comparator2. The outputs of these two comparators are out1 and out2. Finally, the final output is generated through the XOR operation using out1 and out2 as inputs.

Power Report

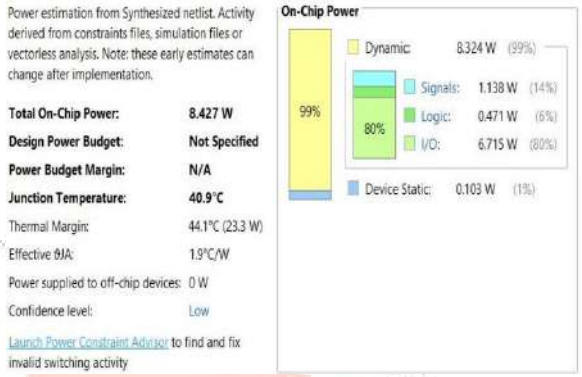

Fig 17: Power Report of DLCG

The power consumption of a dual linear congruential generator depends on the implementation of its components and clock frequency. The use of two generators and an XOR gate increases the overall complexity of the circuit, resulting in higher power consumption. Low-power components, clock gating techniques, and optimized shift register size can be used to reduce power consumption.

Utilization Report

The dual linear congruential generator is a popular choice for applications requiring high-quality pseudorandom numbers due to its ability to provide a larger range of values and a more uniform distribution compared to a single generator. It is easy to implement and can be optimized for power consumption, making it a versatile option for various applications.

Name	Slice LUTs (41000)	Slice Registers (82000)	Slice (10250)	LUT as Logic (41000)	Bonded IOB (300)	BUFGCTRL (32)
dual_lcg_ppa	52	32	15	52	43	1
u0 (lcg_ppa)	19	8	9	19	0	0
u1 (lcg_ppa_0)	11	8	3	11	0	0
u2 (lcg_ppa_1)	11	8	3	11	0	0
u3 (lcg_ppa_2)	11	8	5	11	0	0

Fig 18: Utilization Report of DLCG

CONCLUSION

In conclusion, high-speed, area-efficient VLSI architecture for a three-operand binary adder is a promising development in the field of digital circuit design. This architecture offers advantages over traditional binary adders, including higher speed, greater area efficiency, lower power consumption, flexibility, and accuracy. The applications of this architecture are numerous, ranging from image and video processing to automotive and aerospace systems, financial applications, gaming, and the Internet of Things (IoT).

FUTURE SCOPE

The future scope of this architecture is wide-ranging, with potential applications in emerging fields such as quantum computing and AI, as well as established fields such as 5G and edge computing. Ongoing research and development in the field are likely to lead to new and innovative applications of this architecture in the future. Overall, high-speed, area-efficient VLSI architecture for a three-operand binary adder is a valuable development in the field of digital circuit design, with the potential to improve the performance and efficiency of a wide range of applications.

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INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

PROTECTION FOR WOMEN BY USING A PORTABLE SMART SECURITY DEVICE

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ABSTRACT:

This Project presents a women safety detection system using GPS and IOT modems. The system can be interconnected with the alarm system and android APP alert to the parents and neighbours. This detection and notify system is composed of a GPS receiver, Microcontroller and push button, buzzers and LED's. GPS Receiver gets the location information from satellites in the form of latitude and longitude. The Microcontroller processes this information and this processed information is sent to the user using IOT platform and the IOT modem sends a notification to the parents. When a woman in danger and in need of self-defense then she can press the button which is allotted to her. By pressing the button, the entire system will be activated then immediately a notification will be sent to concern person with location using GPS and also the parent can track that women from anywhere anytime. And further we can extended by adding up an shock pin Module for self-defence.

KEYWORDS: NodeMCU-ESP8266, GPS, Relay, Buzzer, Shockpin module, BLYNK IOT.

INTRODUCTION:

Now a days, women are facing colorful issues like sexual assaults. similar violence will surely have huge impact on the lives of victim. It also affects their health and their cerebral balance. These kinds of violence keep on adding day by day. Indeed academy women are abducted and sexually abused. We're living in a society where a nine months old girl child doesn't have security, the women was abducted, ravished and also boggled. On witnessing those violations against women, its impulses us to do commodity for women safety. So, in this design we've planned to propose a device which will act as a tool to give security and ensures the safety of the women. Microcontroller, GSM and GPS module are used to shoot announcements and current

position of women to colorful mobile figures in their contact. In addition, this design will also act as a safety measure which will stun the opposition for many seconds. This design will help us to deliver numerous women from those fiendish in the society.

I n India, there are now significant worries about the safety of women. According to the National Crime Records Bureau, sexual harassment incidents increased 82% in 2016 versus the previous year. In every case, family members, friends, or neighbours made up 95% of the rapists. With the recent rape and murder of young women, the majority of public discussion has centred on outrage, punishment, and tougher laws. Everyday, women throughout the world are abused or molested. These predators must be kept out of the reach of women. She must protect herself since sometimes the law won't be enough to keep her safe. For it, a self-defense firearm is necessary. We are able to link the gadgets in the women's module to the web server with the aid of Arduino. The GPS kit's data will be collected by Arduino and sent to the web server.

The data will then be sent from the web server to the parent's Android application, allowing the parent to see where the women is right now. In this project, GPS will be utilised to deliver alerts containing the women's current position to Android devices. As a result of this system's reliance on gps capabilities, the cellular network is essential to its operation.

EXISTING SYSTEM:

In Women based security system victim has to press the emergency button, but in emergency conditions pressing the button is may not be possible. Using Smart Phone", the women cannot send its location by itself. The parent of that child has to send the message to the child's system to know their location. In "Mobile Tracking Application for Locating Friends", a tracking application software must be installed in the mobile phone and the friends must be previously registered in the friends group of application. To track their friends mobile phones are needed in both sides. In an Intelligent System based on RFID and GPS Technologies for Women Safety. has some limitations in terms of cost, signal interferences and also the information access to invalid and unauthenticated users. The main drawback of these applications and services is that the initial action has to be triggered by the victim which often in situation like these doesn't happen. So the emphasis is to build a solution that works autonomously in situations encountered. This paper presents new method to provide protection for women by ringing the buzzer and send the messages to the mobile numbers they stored, with the location where the women is present

PROPOSED SYSTEM:

This approach is intended for both parents and women. The women will have a tracking device, and the parents will each have an Android smartphone. Alert is a fundamental feature that will be utilised, but GPS is only available on Android smartphones. For communication between a tracking device and a web server, Arduino will be utilised. Parents use the programme to locate the women.

Using a GPS tracking gadget and an Android phone. The tracking gadget is carried by women along with an alert button on the Android phone that the parents are carrying that also contains the application. Which, when activated, will inform the parent that the women is in danger.

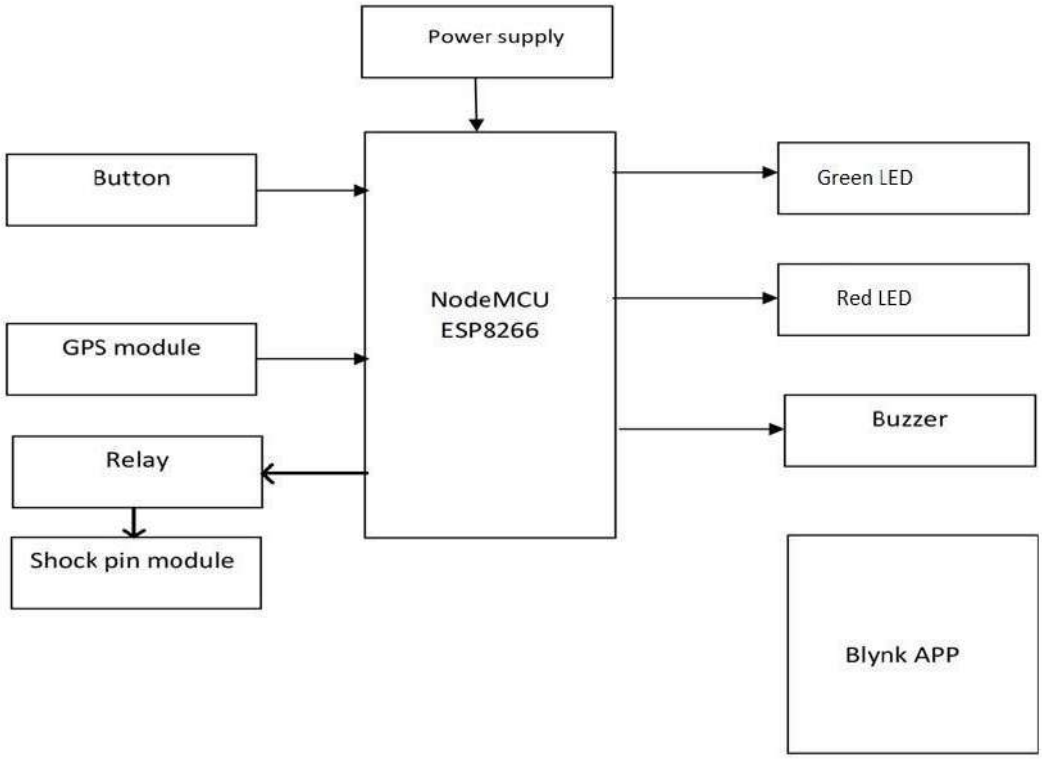

Fig: Block Diagram

WORKING:

After pressing the button, a microcontroller receives our inputs and processes them. Next, gps is used to display the location of the woman who is in danger. The global positioning system, or GPS, is used to find a person's where abouts online, anywhere in the globe. When the red led is on, we must assume that woman is in danger. If the green led is on, however, the women is safe. The buzzer will turn on when the women is in danger.

- **ESP8266:** It store the data and send to NodeMCU. It has a inbuilt wi-fi module and Storage with 4MB ROM and 128KB RAM.
- **NODEMCU:** It is a 32-bit microprocessor with 16 GPIO pins,12 Data pins,1 UART,1 SPI. It works at 5V power, with wi-fi frequency 2.4 GHZ, 1 analog input pin and I^2C pin.
- **RELAY:** Relay which is act as a switch and it give 12V power to the lock. Relay is also a switch that connects or disconnects two circuits. But instead of manual operation a relay is applied with electrical signal, which in turn connects or disconnects another circuit.

- **BLYNK IOT:** It is a server, used for the send notification to the owner and real time monitor through the app. It provides High Security Service and Server for IOT applications.
- **GPS:** GPS is used to identify the location in the form of longitude and latitude.

CONCLUSION:

In the sphere of protecting the disabled, children, women, and others, smart and intelligent gps-based automatic tracking and alarm systems can be helpful. By employing an automatic calling system, these tracking systems help by boosting the possibilities of tracing the victim. The tool can locate precisely where anything is in a faraway place and track it. A tracking system can serve as a security measure.

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INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

AUTOMATIC PETROL PUMP BY USING BIOMETRIC

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ABSTRACT

An automatic petrol pump using biometric technology is a system that allows guests to refuel their vehicles by authenticating their identity using biometric information similar as fingerprints, iris reviews, or facial recognition. An automatic petrol pump using biometric technology offers a secure and accessible way for guests to pierce energy, reducing the need for physical cards or cash, and enhancing security at the pump. still, it would bear robust security measures, proper conservation, and compliance with applicable regulations to cover client data and insure dependable operation. Overall, an automatic petrol pump using biometric technology can give an accessible and secure way for guests to refuel their vehicles while minimizing the need for physical cards or cash and reducing the threat of identity.

I. Introduction

In moment's world, technology has had a significant impact on nearly every aspect of our lives, including the energy assiduity. Petrol is one of the most important goods that we bear in our diurnal lives. It powers our vehicles, creators, and machines. Petrol stations are responsible for furnishing petrol to consumers in a safe and effective manner. The traditional petrol pump system requires guests to make cash or card payments to the energy attendants, which can be time- consuming and inconvenient. To address this challenge, colourful energy stations have espoused automatic petrol pump systems that offer a flawless and effective fuelling experience The automatic petrol pump by using biometric technology is an innovative result that has been developed to make the fuelling experience more accessible, briskly, and secure. Biometric technology refers to the use of natural characteristics similar as fingerprints, facial recognition, and iris recognition to authenticate a person's identity. The automatic petrol pump system uses biometric identification to authenticate the client and automatically apportion energy to the vehicle without any mortal intervention. This system has multitudinous

advantages over the traditional petrol pump system and is gaining fissionability among energy stations and consumers. The automatic petrol pump by using biometric technology has multitudinous benefits over the traditional petrol pump system. originally, it eliminates the need for cash or card payments, making the fuelling process briskly and more accessible. The system uses biometric authentication to identify the client, and the payment is made automatically without the need for the client to make any physical payments. This reduces the time spent staying in line to make payments, performing in briskly and more effective fuelling. Secondly, the automatic petrol pump by using biometric technology ensures security by precluding unauthorized access to the energy station, reducing the threat of fraud and theft. The system uses biometric identification to authenticate the client, and only sanctioned guests are allowed to pierce the energy station. This helps to reduce the threat of fraud and theft, which is a significant concern for energy station. Thirdly, the automatic petrol pump system helps in monitoring and controlling the energy division, therefore reducing energy destruction and icing accurate billing. The system keeps track of the quantum of energy allocated to each vehicle and generates accurate bills, which eliminates the possibility of crimes in billing. The system also helps in covering the energy stock situations, icing that the energy station always has enough energy to me et client demand. The automatic petrol pump system operates in a simple yet effective manner. Upon appearance at the energy station, the client is needed to register their biometric details at the enrolment cell. The biometric data is also stored in the system's database, and the client is issued with a unique ID number. During posterior visits to the energy station, the client only needs to input their ID number, and the system will authenticate their biometric details and apportion energy to the vehicle.

The automatic petrol pump by using biometric technology has multitudinous benefits to both the energy station and the guests. For the energy station, it ensures accurate billing, reduces energy destruction, and enhances security. On the other hand, guests enjoy a briskly, more accessible, and secure fuelling experience. The system eliminates the need for physical payments, reduces staying time, and ensures that only authorized guests pierce the energy station.

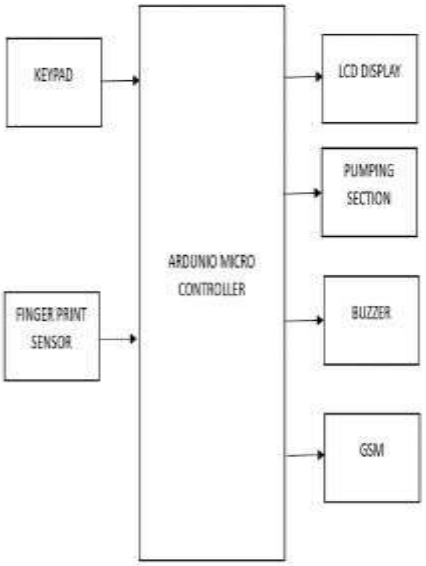

Figure 1. Block diagram

II. Existing system

An automatic petrol pump using biometric technology is a relatively new concept in the fuel retail industry. It aims to offer a secure and convenient method for guests to access fuel by using their biometric information for authentication.

Currently, most fuel pumps require guests to either pay using a physical card or cash. This method has some security risks as physical cards can be lost or stolen, and cash can be subject to theft. Biometric technology provides a more secure method of authentication, as each person's biometric information is unique and difficult to replicate.

Some existing automatic petrol pumps using biometric technology already exist in the market, and they typically use facial recognition for authentication. Guests simply approach the pump, and the camera will scan their face to verify their identity. Once authenticated, the pump will dispense fuel to the desired amount.

One such system is the "MAYA" automatic petrol pump by UAE-based company ENOC. The system uses a combination of facial recognition and license plate recognition technology to offer a seamless and secure refuelling experience. The system also includes various safety features, such as automatic shut-off if the fuel tank is full, and real-time monitoring of fuel levels and pump performance.

Another example is the "Green Gas Station" in India, which uses biometric authentication via fingerprint recognition. The system offers a more environmentally friendly refuelling option, as it uses natural gas instead of traditional petrol or diesel.

Overall, automatic petrol pumps using biometric technology offer a promising solution to the security risks associated with traditional payment methods. While still in their early stages, these systems have the potential to become a standard in the fuel retail industry in the future.

III. Proposed system

The proposed system for an automatic petrol pump using biometric technology aims to streamline the fuelling process by barring the need for physical payment styles and reducing the chances of fraudulent conditioning. The system would use biometric authentication to identify and authorize guests, making the fuelling process more secure and effective. Then are some crucial factors of the proposed system Biometric Registration guests would need to enrol their biometric information, similar as point, iris check-up, or facial recognition, into the system at the petrol pump. This information would be securely stored in a database and used for unborn authentication purposes. Biometric Authentication When a client arrives at the petrol pump, they would need to suffer biometric authentication to corroborate their identity. This could be done using biometric detectors or cameras installed at the fuelling station. The system would compare the client's biometric information with the stored data to ensure a match before pacing to the coming step. Energy Selection and allocating Once the client's biometric information is authenticated, they can elect the type and quantum of energy they want to buy. The energy dispenser would be actuated automatically, and the named energy would be allocated into the client's vehicle without the need for any physical payment or card snatching. Automatic Payment The system would be linked to the client's bank account or payment portmanteau, and the energy cost would be automatically subtracted from their account. A digital damage would be generated and transferred to the client's registered dispatch or mobile number for record keeping. Monitoring and Security The system would have robust monitoring and security features to descry and help any unauthorized access or fraudulent conditioning. CCTV cameras, intrusion discovery systems, and other security measures would be in place to ensure the safety and integrity of the system.

IV. Working

The working principle of an automatic petrol pump using biometric technology involves several ways Biometric Registration First, guests need to enrol their biometric data, similar as point or iris check-up, into the petrol pump's database. This process generally involves capturing and storing the biometric data of the client along with other applicable information, similar as their name, address, and vehicle details, in a secure database. Biometric Authentication When a client arrives at the petrol pump to refuel their vehicle, they need to suffer biometric authentication to corroborate their identity. The client's biometric data, preliminarily enrolled in the system, is captured again and compared with the stored data for authentication. Identity Verification The system also verifies the client's identity by matching the captured biometric data with the stored data. However, the system proceeds to the coming step, If the biometric data matches. else, the system denies access to the fuelling process. sale Authorization Once the client's identity is vindicated, the system authorizes the fuelling sale. This generally involves checking the client's account balance, vehicle details, and energy type to ensure that the client has sufficient finances and the right vehicle type for the fuelling process. Energy allocating Upon successful authorization, the energy pump is actuated, and the client can start fuelling their vehicle. The system monitors the energy allocated and calculates the cost grounded on the energy type and volume. Payment Processing After the fuelling process is completed, the system calculates the total cost grounded on the energy allocated and deducts it from the client's linked payment system, similar as a credit card or a digital portmanteau. A damage is generated for the client as evidence of the sale. Logging and Reporting The system also maintains a log of all fuelling deals, including the client's biometric data, energy type, volume, cost, and payment details, for auditing and reporting purposes. System Security It's pivotal for an automatic petrol pump using biometric technology to have robust security measures in place to cover the stored biometric data and help unauthorized access. This may include encryption, firewalls, access controls, and regular security check-ups. Overall, the working principle of an automatic petrol pump using biometric technology involves biometric registration, authentication, identity verification, sale authorization, energy allocating, payment processing, logging, and system security to give a secure and accessible fuelling experience for guests.

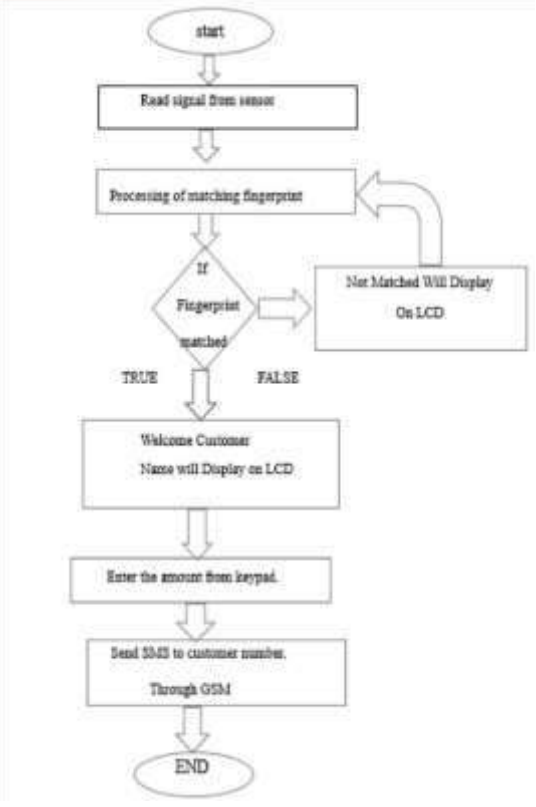

Figure 2. Flow Chart of Working

V. Implementation and results:

The perpetration of a petrol pump using biometric technology can yield colourful results, depending on the specific circumstances and the effectiveness of the system. Then are some implicit issues Enhanced Security Biometric technology can give a advanced position of security compared to traditional styles, similar as using energy cards or keys, as biometric data is unique to each individual and delicate to replicate. This can help help unauthorized access and energy theft, reducing security pitfalls and losses for the petrol pump driver. Improved Convenience Biometric systems can offer a more accessible fueling experience for guests, as they can simply use their biometric data, similar as point or iris checkup, for authentication rather of carrying physical cards or flashing back Leg figures. This can save time and trouble for guests, performing in bettered client satisfaction and fidelity. Effective sale Processing Biometric systems can streamline the fueling sale process by automating the authentication, authorization, and payment processing way. This can affect in briskly fueling deals and reduced ranges, leading to bettered functional effectiveness for the petrol pump driver. Enhanced stoner Experience Biometric technology can give a ultramodern and innovative stoner experience, which can attract and retain guests. guests may perceive the use of biometric systems as a slice- edge and accessible way to fuel their vehicles, which can appreciatively impact their perception of the petrol pump and affect in increased client fidelity. Reduced Fraud and crimes Biometric systems can help reduce fraud and crimes associated with traditional styles, similar as energy card abuse, identity theft, or homemade crimes in sale processing. The use of biometric data for authentication can give a more secure and accurate means of vindicating client individualities, performing in reduced fraudulent conditioning and sale crimes. Compliance with Regulations Biometric systems must misbehave with applicable regulations and laws, similar as data protection, sequestration, and security regulations. enforcing a biometric system that meets nonsupervisory conditions can insure that the petrol pump driver is clinging to applicable laws and regulations, reducing the threat of forfeitures or penalties fornon-compliance. Challenges and Costs enforcing and maintaining a biometric system can come with challenges and costs, similar as original setup costs, system integration, conservation, and implicit specialized issues. The results of a petrol pump using biometric technology can be told by the effectiveness of the system in addressing these challenges and managing costs. In conclusion, the result

of enforcing a petrol pump using biometric technology can include enhanced security, bettered convenience, effective sale processing, enhanced stoner experience, reduced fraud and crimes, compliance with regulations, but also challenges and costs. Proper planning, perpetration, and operation are pivotal to insure that the biometric system delivers the intended results and benefits for the petrol pump driver and guests.

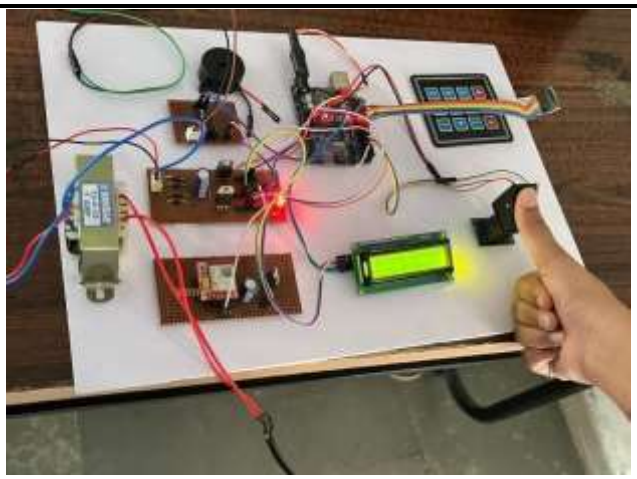

Figure 3. Prototype

Advantages

1. Man power is reduced due to automated self – service
2. Benefits to the petrol companies by maintaining the data of the costumers as well as the petrol consumption.
3. Due to use of finger print technology robbery of the fuel prevented.
4. Accuracy in the amount of petrol filling.

Applications

1.Improved security

2. Faster transactions

3.Better tracking and monitoring

4.Customization of services

5.Contactless services

VI. Conclusion

In conclusion, an automatic petrol pump using biometric authentication offers several advantages, including increased security, faster transactions, improved tracking, and personalized services. These benefits can enhance the customer experience and improve the profitability of petrol pump businesses. Overall, biometric authentication technology has the potential to revolutionize the petrol pump industry, making it more efficient and convenient for customers while also increasing revenue for business owners.

VII. Future scope

The future scope for automatic petrol pumps using biometric authentication include integrating biometric payments, utilizing advanced sensors for predictive maintenance, incorporating artificial intelligence for optimizing inventory levels and personalizing services, remote management capabilities, and integration with electric vehicle charging. These advancements can enhance efficiency, reliability, and customer experience, resulting in increased profitability and convenience for customers

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IoT Based Monitoring System for Comatose Patients

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ABSTRACT

The Internet of Things is a rising subject of specialized, social, and financial essentialness. IOT includes in different offices like Medical businesses, Automobile ventures, Manufacturing enterprises, and so forth. Presently a day's utility segments regular articles are being joined with Internet network and incredible information explanatory capacities that guarantee to change the manner in which we work, live, and play. Nowadays, for coma persistent a Dynamic Service Non Dependency Verification has been executed utilizing IOT. The principal procedures of this undertaking start with equipment interface. This system will collect the information of patients with the help of sensors. These sensors use WIFI to communicate this information to the internet. This system is powered by the Raspberry Pi ans GSM Modem.

Keywords – IoT, Raspberry Pi, GSM, Temperature Sensor, Humidity Sensor, Saline Level Sensor, Alerts, Monitoring

INTRODUCTION

As we know coma is a state of unconsciousness in which patient cannot feel or respond to the pain, light or sound, it does not initiate volunteering any actions. Patients in a coma state need to have a continuous update of Blood pressure, temperature, humidity, and urine level. Doing this manually can become almost impossible to keep updates of multiple patients at the same time. This requires more man power and makes the staff busy to attend another patients who also have medical needs. Considering the technical developments happening in our day-to-day life, we can take the advantages and help in such situations by monitoring the health parameters of a comatose patient using sensors like temperature sensor,

humidity sensor, saline level sensor and urine level sensor. The monitored parameters are uploaded into a cloud using raspberry pi and gsm modem which allows to check them at any instant of time. If the critical levels of health parameters are crossed then the alerts are generated to the respective mobile number of a person who is taking care of patient, who may be a nurse, a family member or a doctor.

In the current existing system, man power is required to note down the readings and update them to doctors if in case of critical level which makes this a very complicated and time taking. In case of emergencies if the attending person of the patient goes away from patient and critical levels are reached then the treatment delay is occurred and may to lead severe conditions. To help in avoiding such worst cases our proposed system comes into play.

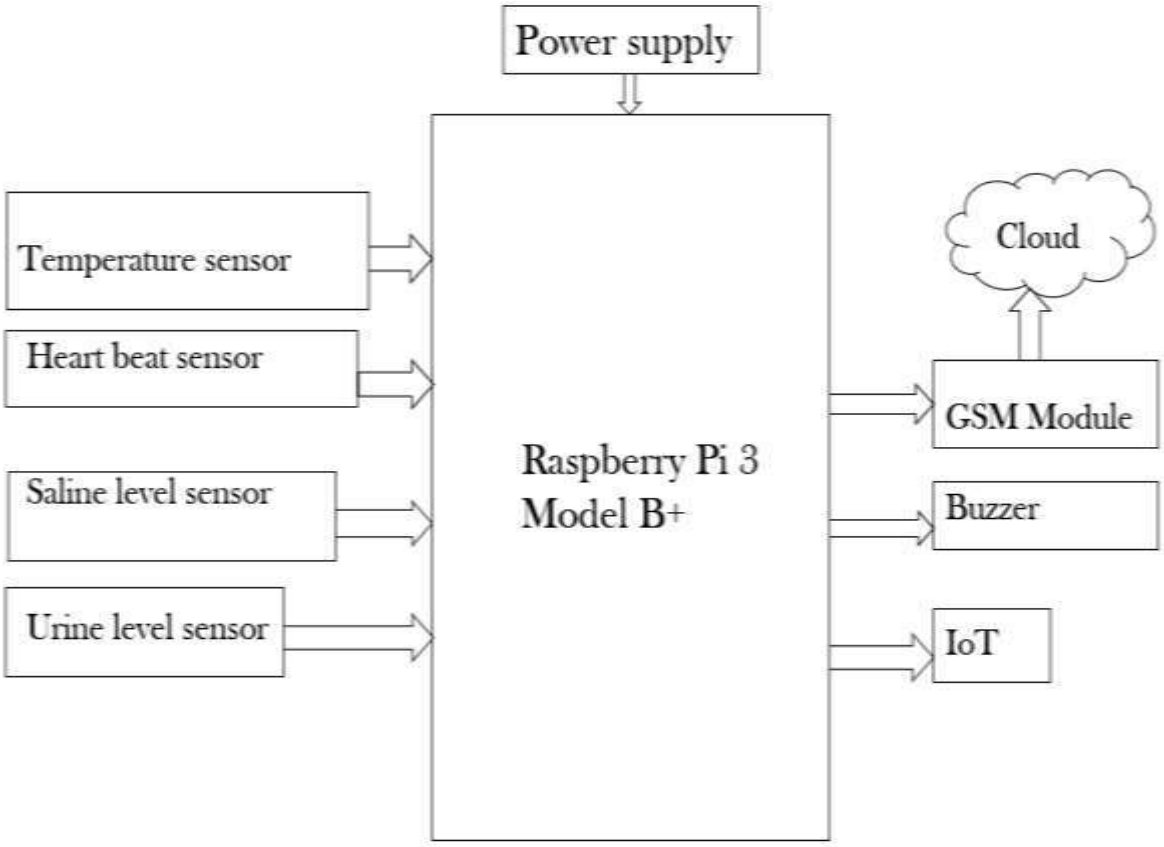
LITERATURE SURVEY

A health parameter analysis and monitoring of coma patients using wearable motion sensor technique, which uses LPC2148 ARM controller and a MEMS sensor to sense the acceleration changes in the person this sensor is placed on the fingers of the patient. Whenever there are an acceleration changes in the patient i.e whenever there is any movement it will be recorded and a phase demodulation principle is used to determine the value and direction. This system consists of four sensor in which two sensors are used for monitoring vitals of the comatose. Temperature and pulse rate are the two vitals recorded and monitored to understand health status of a comatose. The other two sensors are MEMS accelerometer sensor and Eye blink sensor which are used recording any physical changes that occur in a comatose. These signals which provides information are recorded and monitored continuously to understand the body functioning. These sets of sensed signals which are outside normal ranges typically imply the need for some care or possible evacuation to a higher level of treatment during which we alert the doctor. As there is no inbuilt software which is connected to internet, we have to use extra hardware to connect the system to the internet for this a serial communication interfacing is done using a UART which is an integrated circuit that converts signals from sensors to signals suitable for use in digital logic. These measured values are displayed on the doctor’s computer using this serial communication interface. Due to the sensitivity of the MEMS sensor the analysis of the readings from the sensors becomes more complicated and accurate results are not provided. This makes the system unreliable in worst case scenarios.

OBJECTIVE

The main objective of the system to decrease the time delay between actual requirement of time and service provided. A soft real-time health monitoring system based on a web-based monitoring portal is developed for comatose patients. Using the developed system a doctor can monitor conditions of the patients. The system is developed using a Raspberry pi microcomputer and the health related sensors. The system collects the information like heartbeat rate, urine level, temperature and humidity. It alerts doctor if any parameter exceeds the normal limit. Moreover, it also updates status on the database. The proposed system can effectively able to monitor the health condition of a comatose patient in real-time using IoT.

METHODOLOGY



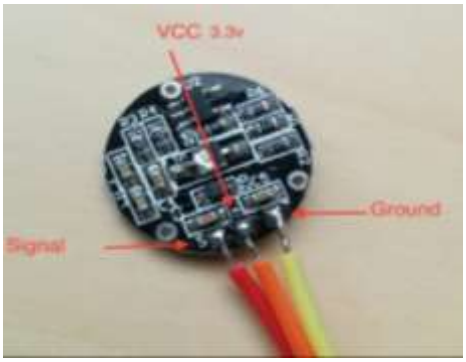
A. BLOCK DIAGRAM

In this paper, blueprint of typical overall performance of a monitoring system for comatose patients using IoT via GSM modem is discussed. When we turn the system on, it gets connected to the website using WIFI, System monitor shows four signs namely heart rate, temperature, humidity, and urine output.

While testing heart rate function, temperature and humidity of the patient, the recorded values gets updated over IOT and displayed on the web page. As we know the patient who is in comatose cannot urinate on their own so a rubber tube is inserted into their bladder to remove urine. This system tests urine level and also updates the value over IOT. In case if the patient regains consciousness and attempts to move, the sensor will detect the motion and update it over IOT and LCD. In this way, our system monitors the comatose patients.

B. RASPBERRY PI

The Raspberry Pi 3 Model B is out and it's amazing! With an upgraded ARMv7 multi core processor, and a full Gigabyte of RAM, this pocket computer has moved from being a 'toy computer' to a real desktop PC. The big upgrade is a move from the BCM2836 (single core ARMv6) to BCM2837 (quad core ARMv7). The upgrade in processor types means you will see ~2x performance increase just on processor-upgrade only. For software that can take advantage of multiple-core processors, you can expect 4x performance on average and for really multi-thread-friendly code, up to 7.5x increase in speed.



C. HEARTBEAT SENSOR

Sensor clips consist of only a pair of IR photo transistor and receiver LEDs enclosed in a specially designed plastic clip housing and cable with stereo jack plug. The probe clip alone does not have any other circuit. To use the probe you must have some suitable application circuit or compatible pulse rate monitor.

D. TEMPERATURE AND HUMIDITY SENSOR (DHT-11)

fig. DHT11 sensor

fig. LM35

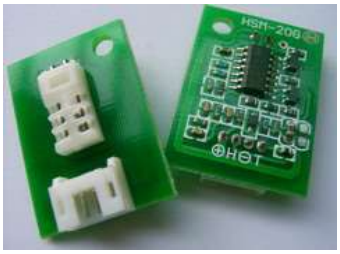
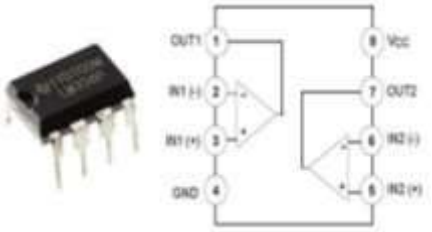


fig. Humidity sensor

DHT-11 sensor is a combination of a LM35 sensor which measures the temperature and a humidity sensor. The LM35 sensor series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 series are precision integrated-circuit LM35 temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature.

A humidity sensor senses relative humidity. This means that it measures both air temperature and moisture. Relative humidity, expressed as a percent, is the ratio of actual moisture in the air to the highest amount of moisture air at that temperature can hold. The warmer the air is, the more moisture it can hold, so relative humidity changes with fluctuations in temperature,



E. SALINE LEVEL AND URINE LEVEL SENSOR (LM-358)

LM 358 consist of two independent, high gain, internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltage. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. In case of saline level this sensor is used to detect low level and generate an alert to help change the saline bottle. In case of urine level this sensor is used to detect high level and generate an alert to help in changing the urine packet of the patient.

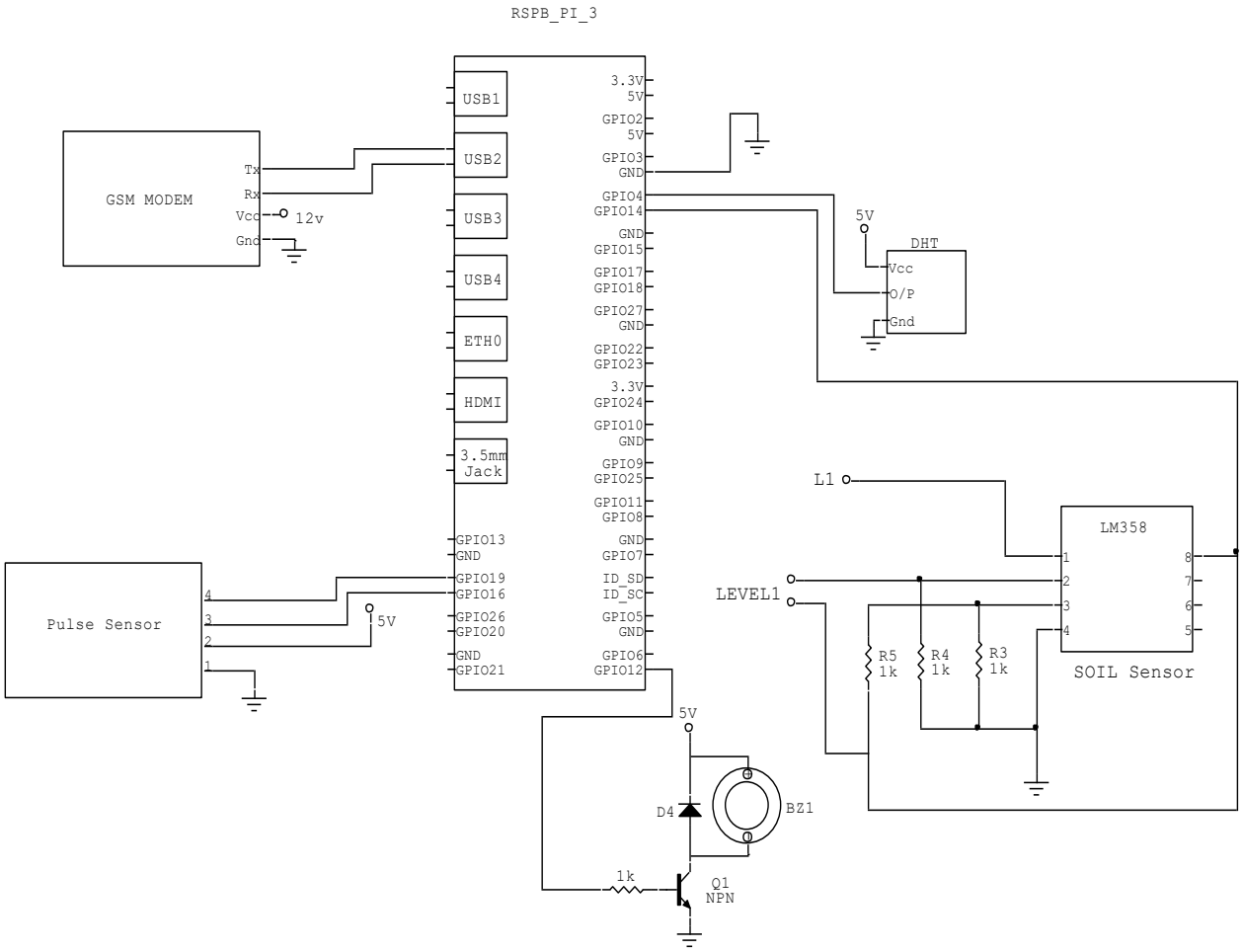
F. BUZZER

An audio signaling device is something like a buzzer or pager. It may be either in mechanical, electromechanical, or electrical energy forms. In alarm clocks and timers, as well as to confirm human input like a mouse click or keyboard, buzzers and beepers are occasionally utilized. This buzzer indicates that the kit is turned on and it is in working condition.

G. GSM MODEM

GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services. GSM supports voice calls and data transfer speeds of up to 9.6 kbit/s, together with the transmission of SMS (Short Message Service). GSM operates in the 900MHz and 1.8GHz bands in Europe and the 1.9GHz and 850MHz bands in the US. The 850MHz band is also used for GSM and 3G in Australia, Canada and many South American countries.

SCHEMATIC DIAGRAM

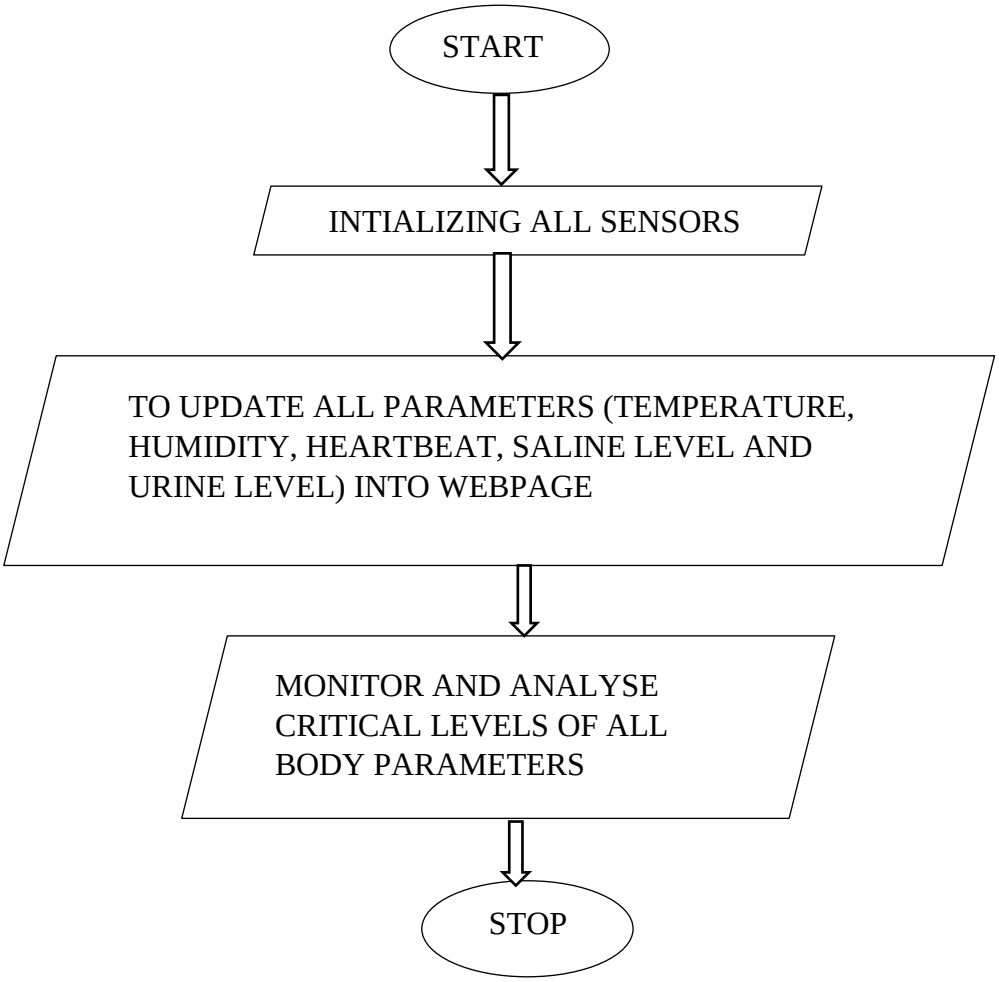


WORKING

The IoT based monitoring system is developed using a Raspberry Pi to which a DHT-11 sensor, two LM358 sensors and a heartbeat sensor are connected to measure the body parameters of a comatose patient. In DHT-11 sensor there are two parts LM35 and humidity sensor, from which temperature and humidity of the patient are measured. As we are using two LM358 sensors, one is used to measure the saline level of the bottle an the other is used to measure the urine level of the patient from the urine bag which is connected to the patient using a catheter. Heartbeat sensor counts the pulse of the patient. All the measured values are updated to the Raspberry Pi microcomputer. The analysis of the body parameters takes place according to the critical levels of the respective sensors in the raspberry pi. If any critical levels are crossed then the message alerts are generated and sent to the registered mobile number through GSM modem. In temperature sensor if temperature exceeds 45 degrees and in humidity sensor if humidity exceeds 45degrees then alert is raised. If the saline level is low and urine level is high then the alerts are raised. If the heartbeat cross 100 beats per minute then the alert is raised. We can check the parameters at any instant from a local webpage using the

respective ip address, a common wifi should be connected to the raspberry pi and any monitoring system in the range.

FLOWCHART



RESULT

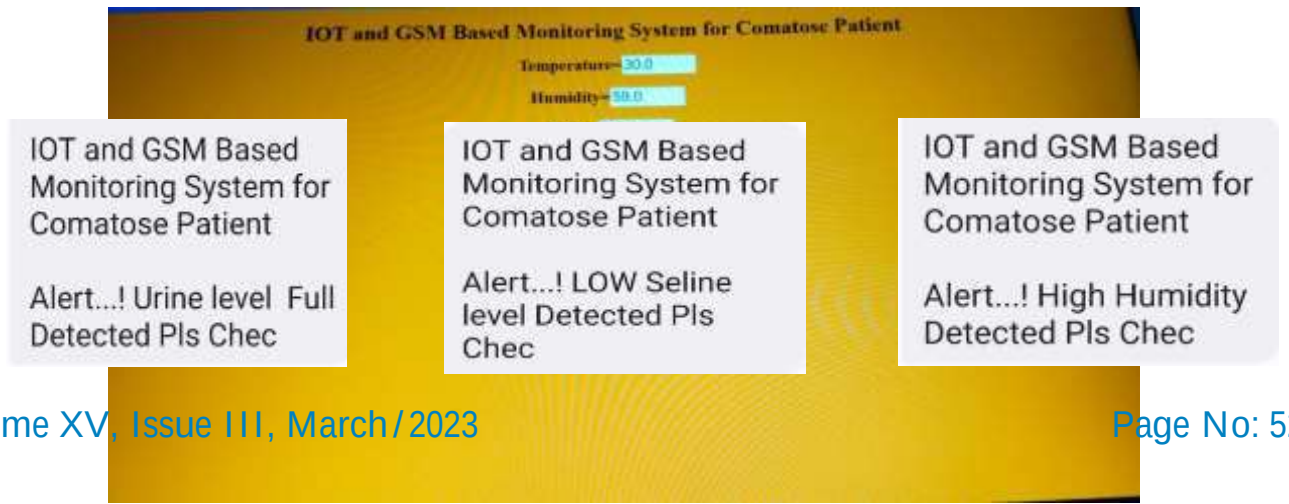
Fig. experimental set-up

Fig. webpage

fig. Critical level alert messages

ADVANTAGES

1. To reduce the man power.
2. Autonomously transfer between different locations.
3. Hospital stays are minimized due to remote patient monitoring.



4. Doctors work load is reduced and also give more accurate results.

APPLICATIONS

1. This system is more useful in Hospital ICU and in ambulance.
2. Helpful in IoT health care which is the most demanding and on going field in medical area.

CONCLUSION

In this research, an GSM based health monitoring system is implemented for the comatose patients. The proposed system has been developed using the Raspberry Pi, Firebase, and a mobile application. The main functions of this system are to check health parameters and store the patient's data in the Firebase, and provide alerts on the mobile application, simultaneously. Doctors and family members of a comatose patients can easily access the stored data using the application and the GSM platform. We have used Raspberry pi microcomputer, which offers more facilities such as easy connections with sensors and wireless internet. The device is used to track the comatose patient's health parameters. It collects the patient's data automatically using the sensors and the data is fed to the Raspberry Pi for processing. The microcomputer transfers the processed data through Wi-Fi to the Firebase cloud where data is stored and sent to the mobile application. In case of any emergency it generates an alert message on the application and web-portal. The developed health monitoring system will assist in avoiding harm to comatose patients through the use of modern technologies. In future work, the system can be upgraded through using machine learning for analysis of the data obtained from the developed health monitoring system.

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