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Smart Design and Implementation of home Automation System using WIFI

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***Abstract* - The idea of delivering home automation is not a new trend in smart-home technology but has been thrown into the forefront recently. Lighting, heating, air conditioning, and security are all controlled and automated. Wi-Fi is frequently utilized for remote monitoring and control of most devices. The internet is used to monitor and operate the system. It serves as a gateway to a centralized hub, from which a system may be controlled via a user interface. The state of the devices is monitored during the system's operation, and the same information is indicated and shown on the LCD panel for monitoring purposes if the status of the devices changes. The server also receives the same information. The monitoring process is carried out with three sensors: a gas sensor for LGP leakage, a PIR sensor for intrusion detection, and a FIRE sensor for detecting fire in the building. In addition, whenever any of the sensors is triggered, the data is communicated to the owner through a GSM modem. Each sensor has its priority, and the appropriate action has been performed based on the state.**

***Index Term* - LCD, LGP, FIRE Sensor, Wi-Fi, PIR Sensor**

I. INTRODUCTION

Early home automation systems included labor-saving equipment such as gas or electric-powered household appliances, and in 1957, home automation system technologies with an electronic system were invented. Control and automate all of your appliances, including those that are far away. Imagine being able to control the room's temperature, brightness, and heating from your own location, or cooling the area in less than 5 minutes before entering it. The bulk of automated systems offer security, assuring the location's safety. From a security camera to a water heating system that can alert you to the state of the system quickly. Your house will be constantly monitored so that you can react fast. The gadget, which is connected to the server through the internet, is controlled using a Smartphone. Each piece of data is updated in a fraction of a second, allowing the microcontroller to react quickly in the case of an occurrence. A system located outside of the facility can monitor the same. The system can operate eight devices and track three sensors from this location. Each sensor's threshold value is updated, and if it hits that value, the microcontroller will take action to remedy the problem. Assume that a Gas sensor is utilised to detect gas leaks in the air. Similarly, a PIR sensor is utilised to determine whether any human radiation is present in the premises while the owner is not present, and last but not least, FIRE. The temperature and fire in the inner premises are detected using a sensor. If this is the case, the microcontroller will activate the water sprinkler system to put out the fire. Home automation and self-control in the twenty-first century provide greater conveniences. The current home automation system relies on well-known cable connectivity. The issue does not occur until the system is designed and installed during the building's physical construction. For older structures, the cost rises dramatically. The wireless system is employed in our daily lives and has shown to be quite useful for automation systems.

II. RELATED WORKS

WSNs and biometric technologies are used in this revolutionary smart home design. Biometrics are used for home entrance authentication, which increases security while also making it easy to go through the door. When biometric technology is applied in a larger and more complete way, the study finishes with a vision for the smart home's future. A user can use line communication to control many devices in their house remotely. The consumer may operate the gadgets using a smartphone app, a portable wireless remote, and a computer-based application. It teaches you how to use a smartphone to control and secure a variety of household equipment. The Arduino Uno is frequently used in combination with a smartphone running the Android operating system. [1] By sending a command to the Microcontroller UNO, the user may interface with the Android smartphone, which will subsequently control other appliances or collect data from the sensors. The technology allows you to remotely monitor and control the device's status. With the help of the internet, this is achieved. Customers may use this software to access their devices from anywhere.[2]

III. PROPOSED SYSTEM

A.Weight sensor

We should know how much gas is in the cylinder before arranging a refill from a distributor, and the quantity of gas in the cylinder should be checked on a regular basis for this reason. A load cell with the required weighing capacity for a residential cylinder is utilised, along with a weighing device module for calibration. The L6D weight device module is enforced by the system. [3] To detect the gas level, the load cell signal drives a relay circuit, which creates two logic pulses (for =7 kg and =0.5 kg) that are linked to the MCU port pins. If the weight device is unable to identify an empty cylinder, a leaf switch is closed, signalling a signal to the microcontroller, and the operation is carried out as instructed by the user.

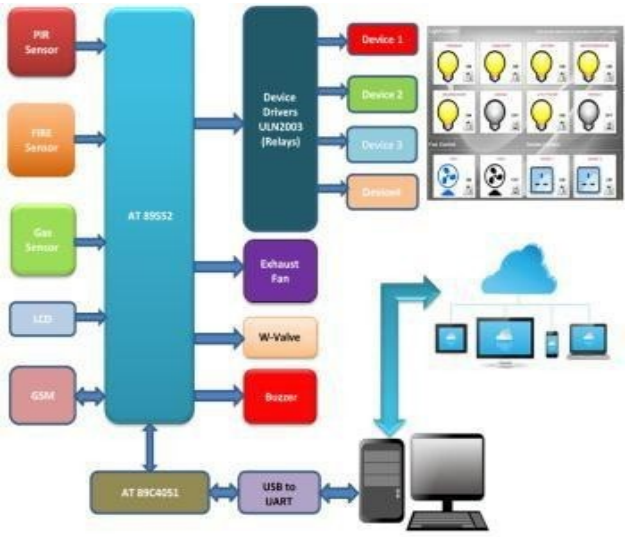

Fig. 1 System Design

B.GSM Module

The gas device detects the presence of gas, the weight device determines the gas level in the cylinder, and the microcontroller can take corrective or needed actions. The present owner or roommates must be informed of all of this. The GSM module is used to send a message to the user's mobile phone. [4] When the gas sensor detects a leak, the Microcontroller sends a signal to the GSM module, which sends a text SMS as one of the tasks. The GSM module requires only one SIM card. This module can take any carrier SIM card.

C. Display

The system is used to regulate and monitor operations, thus it's critical to have information displayed inside the system that shows a range of notifications including gas leak detection, cylinder booking in the case of cylinder filling, and microcontroller actions. The system uses a (LCD) with one of every 16X2 characters in operation on a +5 voltage unit and in 8-bit mode to show necessary messages.

D. *Relay driver*

The ULN2003A is a seven-node NPN Darlington transistor capable of 500mA at 50V. It contains common-cathode flyback diodes for shifting inductive loads.

Fly back is the quick voltage surge visible throughout an inductive load when its supply power is abruptly reduced or terminated. It can be used to interact with a motor driver in general when the motor demands high ratings not available via conventional interfacing devices.[5]

IV. RESULTS AND DISCUSSION

When putting this system in place, there are three things to keep in mind. The gas sensor detects a gas leak in the first example, and the gas valve is actuated to halt the leak. [6] The flow diagram demonstrates how the basic sensor detects gas leakage and sends the information to the microcontroller for further action, which includes sending an SMS and turning on the exhaust fan.

As shown in Figure 2, as soon as the gas sensor detects a leak, the port 2 bit P1.0 turns low, indicating the presence of gas.[7] The low causes the microcontroller to take the appropriate measures to halt the leak. Until the specified sensor triggers P1, the other port bits of P1 are in the same state. When compared to other types of programming methods, this way allows the microcontroller to work less since each condition is written as a function that is run whenever the event happens.

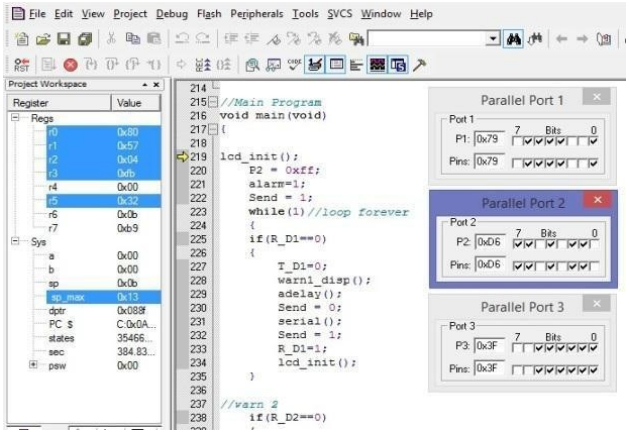

Fig. 2 Gas Detection System

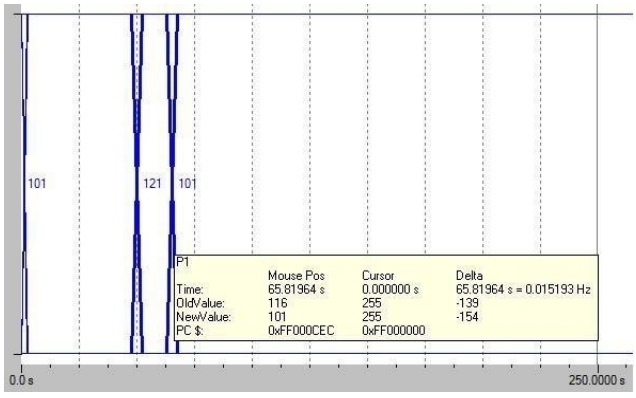

Fig. 3 Gas Detection Trigger pulse

The actual triggering value for an event that we have interpreted as a gas leaking pulse from the sensor is shown

in figure 3 by the trigger pulse from port P1, bit P1.0. [8] In the second scenario, a PIR sensor detects the presence of an intruder in the premises, and the sensor output changes are compared to a predetermined value called the threshold value. If the sensor detects a change in the environment that is likely to exceed the threshold value, the microcontroller port bit P2.1 is set to high to low pulse. Now the microcontroller performs the required tasks as intended. With the owner's consent, it is configured to send an SMS to him about the intrusion on his property.

In figure 4, PIR sensor Detection Simulation is shown. This system uses a PIR sensor to detect human presence, which would be attached to the microcontroller's port 2.4 pin. In the third example, a fire sensor is utilised to detect a fire in the premises, the sensor output is supplied to the microcontroller, and as soon as the controller is activated, the water spraying system comes into play and sprays the water. [9] This is accomplished by using a variety of sensor nodes and spraying units.

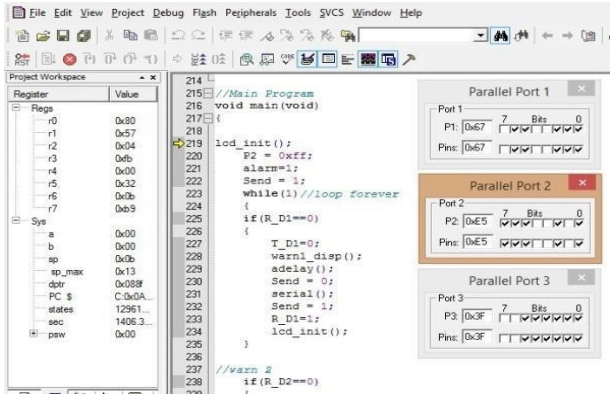

Fig. 4 PI Sensor detection simulation

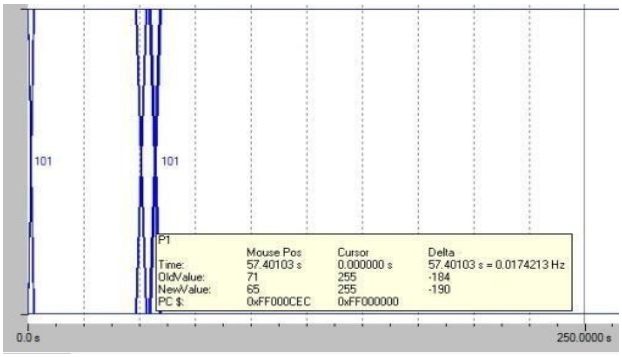

Fig. 5 PIR Detection Trigger Pulse

The major goal of this article is to build and construct a smart home control and monitoring system. The architecture includes a microcontroller that allows users to interact with the system and transmit control signals to the controller, which controls other embedded devices and sensors. [10] When the microcontroller is turned on, the phrase "WELCOME TO HOME AUTOMATION" appears on the LED. If an event. occurs, such as a gas leak, a fire, or an intruder, all of this information is updated on the LCD, along with the activation of the buzzer. It performs the necessary procedures right away and sends the information through GSM SMS. This data is likewise updated on the server [11]. The circuit is built using an 89S52 microcontroller, as illustrated in Figure 11. The LCD is used to display the current circumstances depending on sensor events. The simulation depicts the initial state, which reads "Welcome to the Gas Monitoring System.

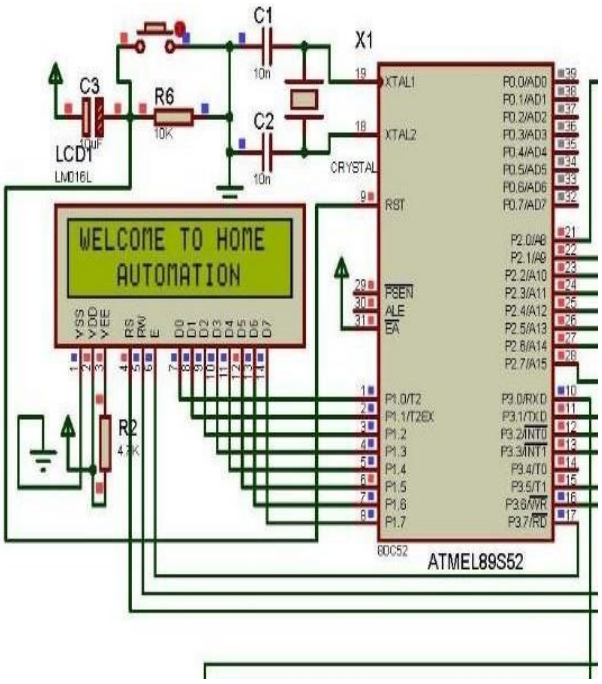

Fig. 6 Initial condition and normal mode

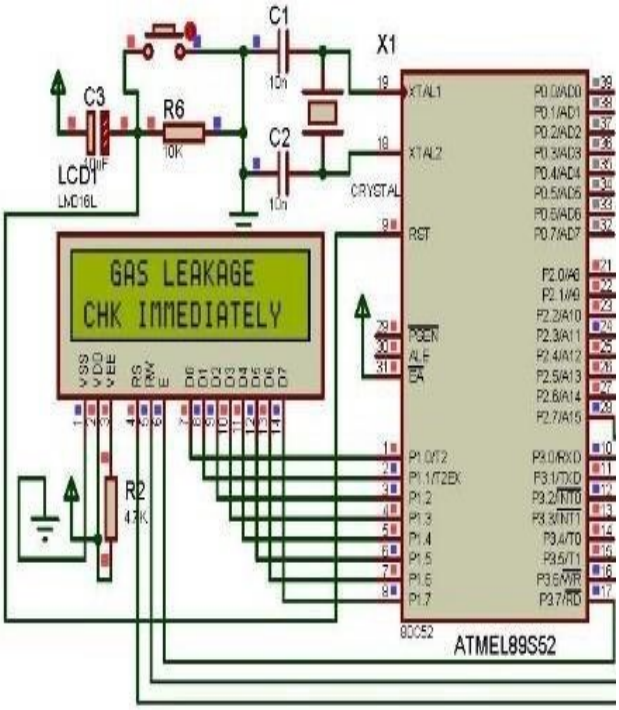

Fig. 7 PC Connectivity

As illustrated in Figures 7 and 8, the LCD here displays the gas leaking status detected by the gas sensor MQ4. When the sensor detects a gas leak, port bit 2.0 changes from low to high, sending a pulse to the microcontroller, which displays the gas leakage check on the screen with an audible sound and sends an SMS to the user. [12] The microcontroller will also close the gas valve to prevent the leak. When the sensor detects an intruder, this high to low

pulse will activate the microcontroller, which will display the intruder on the screen with an audible tone and send the SMS to the user. This project uses a Passive Infrared Sensor [PIR sensor] to detect human presence, which is linked to port pin 2.5 of the microcontroller. When it detects a human in its range of view, it sends an interrupt to the microcontroller. The main goal is to create an alarm-based security system that uses electricity as an input, and the sensor detects motion and displays a message on the LCD that says "INTRUDER DETECTED CHECK IMMEDIATELY," which will be updated to the person by SMS via the GSM system. A buzzer is linked to the same port 2.5 pin microcontroller to notify this. As seen in Figure 14, the LCD indicates the status of the detected fire as detected by the sensor. This high to low pulse sets bit 1.2 to low, sending a pulse to the microcontroller, which displays the fire on the screen with an audible sound and sends an SMS to the user. When a fire breaks out, it just takes a minute for an area to be completely consumed in flames. [13] Identifying a growing fire emergency in a timely way and alerting the building inhabitants and fire emergency organisation is an important part of fire safety. A control unit that houses the detecting chamber and a network of sample tubes or pipes are the two primary components of this device. They are line-of-sight devices that work on the principles of infrared, ultraviolet, or a mix of both. [14] It sends a signal to the fire alarm panel after sensing. The automatic sprinkler system will alert residents, and another important output function is an emergency reaction notice that says "FIRE DETECTED." CHECK IMMEDIATELY" SMS is sent to occupant through GSM system.

As Figure 9 shows how the information from each sensor is updated in the cloud server with the aid of a server, allowing the user to operate his home appliances from a distance. [15] If any of the sensors detects an incident such as a gas leak, a fire, or an intruder in the premises, the system updates the information and sends an SMS to the user. The user interface is the other half of the system, and it allows the user to monitor the devices attached to this module and turn them on or off according on the user's needs. [16] This gives the user a user-friendly system with two benefits: one, he can detect any occurrence using the sensor, and two, he can operate the devices from a remote location.

TABLE .1
COMPONENTS REQUIRED FOR REAL TIMESETUP

Sl. No.	**Description**	**Specification**
1	Microcontroller	89S52.
2	Gas Sensor	MQ4
3	PIR Sensor	HC-SR501
4	Flame Sensor.	YL-38
5	Relay Driver	ULN2003A.
6	GSM Modem	SIMCOM 900 Series.
7	LCD	16x2.
8	Relay	12v SPST.
9	Gas Valve	24v 6Watts.
10	Exhaust Fan	12v 0.5Watts
11	SMPS	5V, 12V & 24V

Before setting up the entire circuit, we take all of this information into account. Furthermore, as we have seen in this study, LCD is employed to display event information. The following modules are powered by an SMPS and must be kept at 5 volts: LCD, GSM Modem, MQ4 Gas Sensor, PIR Sensor, Fire Sensor, and 89S52 Microcontroller Table 1 lists the components necessary for real-time setup[17]

The table 2 shows different voltage and current ratings of the modules used in this system, with its min and max voltage as well as current values

TABLE 1
COMPONENTS VOLTAGE AND CURRENT RATING

Sl. No.	Module Name	Voltage Rating		Current Rating	
		Min	Max	Min	Max
1.	89S52	3V	6.6V	0.5mA	25mA
2.	ESP8266	3.3V	3.6V	30mA	80mA
3.	MQ4	3V	5V	40mA	250mA
4.	ULN2003A	5V	50V	25mA	500mA
5.	LCD16x2	4.5V	5V	0.25mA	25mA
6.	Exhaust Fan	8V	16V	0.25mA	25mA
7.	SIM COM 900	3V	12V	125mA	210mA
8.	SMPS	5V	24V	2A	3A
9.	Relay	8V	14V	80mA	300mA

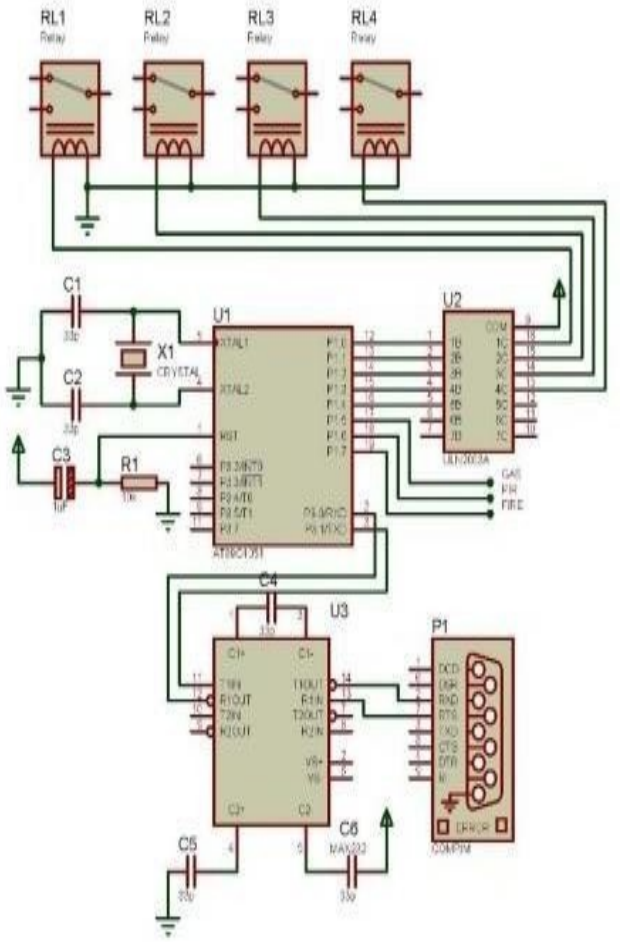

Fig. 8 PC Connectivity

V. CONCLUSIONS

Our suggested system for gas monitoring, leakage, automatic booking, and human booking isdescribed in this study. The project's major goal is to minimise the number of deaths caused by gas leaking fromcylinders as well as user irresponsibility. The mechanism here regulates the flow of gas from the cylinder to the stove or any other appliance that requires LPG gas. If the system detects a gas leak, it will automatically shut off the gas cylinder valve using a solenoid valve; if this fails, the controller will automatically turn on the exhaust fan to remove the gas from the surrounding area. The second benefit of this method is that it may order a replacement cylinder as soon as the cylinder weight falls below 20% of the overall weight[18]. The third benefit is that it allows the user to manually book the cylinder by just pressing a button. The circuit is also developed and tested using the proteus design tool. The code is also written in the keil-c programming language. As demonstrated in this paper, the final module is developed and displayed as a 3D module. Furthermore, the full information is updated in a cloud server, where it is gathered whenever it is required. In the way described above, IOT methods are employed to accomplish the same goal. The simulator programme proteus is used to build the system. The suggested system performs two different tasks. When it detects a human in its range of view, it sends an interrupt to the microcontroller. The main goal is to create an alarm-based security system that uses electricity as an input, and the sensor detects motion and displays a message on the LCD that says "INTRUDER DETECTED CHECK IMMEDIATELY," which will be updated to the person by SMS via the GSM system. A buzzer is linked to the same microcontroller port 2.5 pin to notify this.

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REFERENCES

[1] Miranda, M. A., Macias-Velasco, J. F., & Lawson, H. A. (2021). Pancreatic β-cell heterogeneity in health and diabetes: classes, sources, and subtypes. *American Journal of Physiology-Endocrinology and Metabolism*, *320*(4), E716-E731.

[2] Babalola, O. M., Garcia, T. J., Sefcik, E. F., & Peck, J. L. (2021). Improving Diabetes Education in Mexican American Older Adults. *Journal of Transcultural Nursing*, *32*(6), 799-809.

[3] Zaccardi, F., Kloecker, D. E., Buse, J. B., Mathieu, C., Khunti, K., & Davies, M. J. (2021). Use of metformin and cardiovascular effects of new classes of glucose-lowering agents: a meta-analysis of cardiovascular outcome trials in type 2 diabetes. *Diabetes Care*, *44*(2), e32-e34.

[4] Kannan, S., Idrees, B. A., Arulprakash, P., Ranganathan, V., Udayakumar, E., & Dhinakar, P. (2021). Analysis of convolutional recurrent neural network classifier for COVID-19 symptoms over computerised tomography images. International Journal of Computer Applications in Technology, 66(3-4), 427-432.

[5] Ojugo, A. A., & Ekurume, E. (2021). Predictive Intelligent Decision Support Model in Forecasting of the Diabetes Pandemic Using a Reinforcement Deep Learning Approach. *Int. J. Educ. Manag. Eng*, *11*(2), 40-48.

[6] Mohana, J., Yakkala, B., Vimalnath, S., Benson Mansingh, P. M., Srihari, K., ... & Sundramurthy, V. P. (2022). Application of Internet of Things on the Healthcare Field Using Convolutional Neural Network Processing. Journal of Healthcare Engineering, 2022.

[7] Khunti, K., Knighton, P., Zaccardi, F., Bakhai, C., Barron, E., Holman, N., ... & Valabhji, J. (2021). Prescription of glucose-lowering therapies and risk of COVID-19 mortality in people with type 2 diabetes: a nationwide observational study in England. *The Lancet Diabetes & Endocrinology*, *9*(5), 293-303.

[8] Syed, S. A., Sheela Sobana Rani, K., Mohammad, G. B., Chennam, K. K., Jaikumar, R., Natarajan, Y., ... & Sundramurthy, V. P. (2022). Design of Resources Allocation in 6G Cybertwin Technology Using the Fuzzy Neuro Model in Healthcare Systems. Journal of Healthcare Engineering, 2022.

[9] Greiver, M., Havard, A., Bowles, J. K., Kalia, S., Chen, T., Aliarzadeh, B., ... & de Lusignan, S. (2021). Trends in diabetes medication use in Australia, Canada, England, and Scotland: a repeated cross-sectional analysis in primary care. *British Journal of General Practice*, *71*(704), e209-e218.

[10] Hannah, S., Deepa, A. J., Chooralil, V. S., BrillySangeetha, S., Arshath Raja, R., ... & Alene, A. (2022). Blockchain-Based Deep Learning to Process IoT Data Acquisition in Cognitive Data. BioMed Research International, 2022.

[11] Ferrari, M., Speight, J., Beath, A., Browne, J. L., & Mosely, K. (2021). The information-motivation-behavioral skills model explains physical activity levels for adults with type 2 diabetes across all weight classes. *Psychology, Health & Medicine*, *26*(3), 381-394.

[12] Shah, N., Karguppikar, M., Bhor, S., Ladkat, D., Khadilkar, V., & Khadilkar, A. (2021). Impact of lockdown for COVID-19 pandemic in Indian children and youth with type 1 diabetes from different socio-economic classes. *Journal of Pediatric Endocrinology and Metabolism*, *34*(2), 217-223.

[13] Mansi, I. A., Chansard, M., Lingvay, I., Zhang, S., Halm, E. A., & Alvarez, C. A. (2021). Association of statin therapy initiation with diabetes progression: a retrospective matched-cohort study. *JAMA internal medicine*, *181*(12), 1562-1574.

[14] K Srinivasa Reddy, Vinoth P Vijayan, Ayan Das Gupta, Prabhdeep singh, R G Vidhya, 2022, implementation of super resolution in images based on generative Adversarial Network, proceedings in IEEE Explore.

[15] Qawqzeh, Y. K., Bajahzar, A. S., Jemmali, M., Otoom, M. M., & Thaljaoui, A. (2020). Classification of diabetes using photoplethysmogram (PPG) waveform analysis: logistic regression modeling. *BioMed Research International*, *2020*.

[16] Pethunachiyar, G. A. (2020, January). Classification of diabetes

patients using kernel based support vector machines. In *2020 International Conference on Computer Communication and Informatics (ICCCI)* (pp. 1-4). IEEE.

[17] Gupta, S., Verma, H. K., & Bhardwaj, D. (2021). Classification of diabetes using Naive Bayes and support vector machine as a technique. In *Operations Management and Systems Engineering* (pp. 365-376). Springer, Singapore.

[18] Choubey, D. K., Kumar, M., Shukla, V., Tripathi, S., & Dhandhania V. K. (2020). Comparative analysis of classification methods with PCA and LDA for diabetes. *Current diabetes reviews*, *16*(8), 833- 850.