iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 **Issue:** IV **Month of publication:** April 2026

DOI: https://doi.org/10.22214/ijraset.2026.78003

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue IV Apr 2026- Available at www.ijraset.com

Cloud based Home Automation

Ashish Dubey[1], Pratibha Bharti[2], Aliilahi Khan Yusuf[3], Priya Mishra[4], Akhilesh Mishra[5]
DepartmentofElectronicsandCommunicationEngineering, Buddha Institute of Technology, GIDA, Gorakhpur, India

Abstarct: ***The Internet of Things might be an expanding network of common things, ranging from industrial equipment to the household. devices that will share data and carry out tasks while you are occupied with other things. The***
The goal of the Internet of Things (IoT) is to bring everything in our globe under a common infrastructure, giving the United States of
Although America is not the only authority over events in the United States of America, it does share responsibility for them.
The United States of America is aware of the status of the commodities. The expansion of home automation with
Right now, IoT is becoming a reality, and a variety of companies, including Apple, Amazon, Google, Samsung, and others, are participating in this transformation.
Does this region represent the convergence of all efforts to develop the platform and answers for wise houses? Given the light
The focus of this gift study is on IoT concepts via a methodical examination of dull analysis articles.
online databases, expert discussions with specialists, and firm white papers. the most impartial
The goal of this work is to provide an overview of the Web of Things, its architectures, and key technologies.
as well as how we use them in our daily lives.
KEYWORDS: Intel Galileo, Cloud organizing, Wi-Fi organize, web of Things (IoT), Home automation System (HAS) Microcontroller.

I. INTRODUCTION

Smart homes enhance quality of life by making daily chores easier and offering useful services.
The project uses IoT (Internet of Things) to allow users to remotely operate household appliances via an Android app. Things)—a network of linked physical devices that are outfitted with sensors, software, actuators, and other components.
seamless data exchange connectivity[5]. IoT has revolutionized data and communication technology, making
It is perfect for digitizing audio, video, lighting, heating, and security systems. As a result of increased familiarity with

1) Technology of Zigbee

Zigbee, which is based on IEEE 802. 15. 4, employs RF signals to power home automation, similar to Bluetooth or Wi-Fiin a mesh network where devices relay signals, increasing range. Its wireless construction eliminates unsightly cabling.
Offers fundamental control features at 250 kbps speeds and maintains inexpensive pricing. With this configuration, Zigbee interacts with Wi-fi through a main portal that connects to Fi [3]. The system divides into two sections: Digital Home Service Management a home gateway that processes mobile commands, and a subsystem for monitoring and managing interfacesto operate switches for things like lights, radiator valves, alarms, or LEDs.

2) The Technology of X10

Using current household power lines, X10 is able to regulate lighting, heating, and other home appliances by transmitting commands wirelessly or via wires cheaply providing security and appliances. Using conventional outlets, transmitters send signals to receivers, with, Although there are many compatible devices, the control options are still limited.

II. RELATED WORK

Utilizing intelligent sensors such as the DHT11, IR sensor, and Ultrasonic sensor for smart house labor. Cloud-based designs.
Hybrid designs keep the automation logic moving to cloud functions or cloud-hosted rules engines.
Utilize the cloud for management and remote access while maintaining time-critical control logic locally. The literature highlights a tradeoff: Cloud services improve scalability and usability but also raise the attack surface.
The surface of the fourth thing. Concerns about privacy and potential hazards, such as excessive privilege, have been identified through surveys and analyses.

©IJRASET: All Rights are Reserved

Apps, bad segmentation, and bad onboarding. Prior research has also examined the efficacy of IoT under various network circumstances, including MQTT and CoAP, in the case of messaging protocols.

The truth is that Cloud service providers provide building blocks like device registries, certificates, publish/subscribe messaging, and other tools and digital twins (or shadows) to represent the state of the device even when it is offline. Such Smart home platforms are using building blocks more and more to create robust mobile apps applications and automation regulations.

III. PROPOSED SYSTEM

As Lately, in home systems, remote technologies such as Wi-Fi have become increasingly simple management. Similarly at home and the use of remote Some intriguing aspects of progress cannot be achieved with a wired network since it was.

1) Less Costs of Institutions:

First and foremost, institution prices as a whole with bated breath because there are no cables that matter. Wherever the material and jointly the wired arrangement are, wiring is necessary egg from a professional source It's costly to lay connections, such as into barriers.

2) Mastery of the system and simple augmentation:

Because of new overseas System deployment is particularly valuable, it should only be done once or changes in conditions, the system's growth is considerable. within which there are wired institutions adding cables is a tedious process. This transforms distant schools into innovative enterprises.

3) Sensual:

Benefits include filling sensual needs, with the exception of covering a wider area together Cases include recorded, delegate structures with all-glass engineering wherever the reasons for the arrangement of the eggs are not supported by the structures.

4) Cell integration phones:

Perhaps PDAs and Smartphones with the robotization, partner cell phones, and distant systems as a convenience, the framework is visibly conceivable in every location and at all times.

For an association, the proper physical location is not, once again, the most important factor (provided that the devices is in the right place system reach) remote innovation is not only enticing for each of the aforementioned factors.

However, call in a plan and renovation, especially for new establishments.

IV. SYSTEM ARCHITECTURE

One of the most crucial choices in design is whether the automation logic resides in the cloud or elsewhere nearby.

Cloud-based rules are simple to update and maintain, but they need an internet connection on conversely, even when the Internet is down, local regulations can still work as intended.

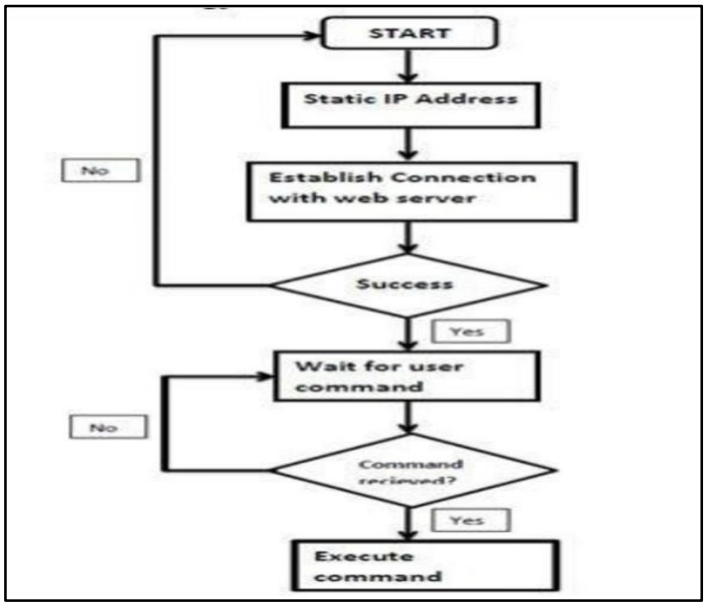


Fig.1 System Flow chart

An the two can be combined to have safety- and comfort-critical loops operating locally, like a light trigger using motion at night, with cloud-based analytics and home-wide capabilities. We have therefore operated in a warehouse system Data can be automatically updated based on the information given and stored in a log file, even in the absence of an internet connection.
As a result, our solution is self-sufficient

V. SYSTEMDEVELOPMENT AND IMPLEMENTATION

As shown in Figure 1, the proposed model of the home automation architecture is presented. The model include a variety of sensors, such as those for temperature, gas, motion, and light-dependent resistance (LDR). the Intel Galileo in the beginning connects to the web via WLAN with the intention. The association will begin as soon as it's established analyzing the characteristics of sensors like p1, p2, p3, and so forth.
The target limit amounts the square measures of the sensors are set as t1, t2, t3, and so forth. The data square measure of the sensing component that is sent to the online server and location are located inside the cloud. anyplace at any moment, the information can be broken down if the characteristics of the sensing element square measure far more important than the edge level The real warning, a1, a2, a3, and so on, will then be sent, so the necessary action will be taken better activation true the most important of the variables. the predicted temperature in the program, movement inside the house is discovered in addition to gas leakages.
The temperature, and consequently the movement the location is in the cloud for research purposes. if the temperature exceeds the sting level The cooler will then turn on automatically, and when the temperature requires management, it will turn off furthermore, when there is a gas leak inside the home, an alarm sound is produced to alert people to the potential danger the sunshine outside the home is distinguished by the desired light square measure turning on and off automatically.
Additionally, the customer will check the electrical devices through the internet, the web, or the web by doing the following that is, the web server's if the lights or any electrical equipment are left on in rush may be seen and killed remotely by mostly writing the informatics address of the internet server .

A. Anticipated Features of a Home Automation System

The proposed home robotization system has the ability to control the associated components in the house and screen of the customer related to warnings:

- Temperature and viscosity
- Identification of movement
- Smoke and fire detection
- Illumination level

B. The planned home automation system will control the machine-related issues:

- Switch the lights on, off, or dim.
- On/off switch for the fan
- Several devices that can be turned on and off

Configuration for Implementation
The association will begin reviewing the parameters of sensors like p1, p2, etc. once it is formedp3 etainside suite. The sting levels for the stated sensors area unit established as t1, t2, t3, and so on. Thedetails about the sensor location of the device inside the cloud after it was dispatched to the online server. The information is frequently researched whenever and everywhere. The parameters of the detector are within the event that they are the actual warnings a1, a2, a3, etc, are raised after the sting level, which is further outstanding, and additionally, the necessary encouragement is enhanced. the most important of the factors.
The house robotization system is used in a model home that looks just like what is shown in the imagethe aforementioned. A motion detector is set up close to the residence in order to detect any potential changesof the method. The light weight allows for subsequent activation after the light weight device recognizes itthe haziness. When the space temperature exceeds the set edge, a cooler/fan can turn on, which in turn causes the space to cool downlowers the temperature of the room. The room contains the MQ-6 gas detector, which can identify any gas.
Should there be any spills, the alarm in the lobby will sound. Hand-off is used to alterthe electric equipment, such as lightweight fans, etc. The Intel uranologist will be located in future space orthe garage. The Intel uranologist is connected to the wireless fidelity card with the receiving devices for the connect with internet.

COMPONENTS

Responsibilities of the Layer Component:
Sensors/Actuators for Devices: Limited in scope, measure the environment and take action.
energy, RAM, and CPU.
Edge Home Gateway/Hub: Protocol buffering, local rules, bridging, secure.
Cloud IoT Broker: Topic-based access management; scalable; pub/sub routingingestion.
Cloud Twin Device(Shadow): Keep the last known desired/reported state. activate offline appinteractions.
Cloud Rules/Functions: Event processing, automations, alerts, integrationsleast-privilege, device credentials, and user authentication/authorization for cloud identity and policypermissions.
Web/Mobile: UI for Apps account access, warnings, dashboards, and user control.

VI. APPROACH TO WORK

Intel Galileo serves as the system's primary controller, with Wi-Fi connection enabling cloud integration.
It constantly monitors sensors that measure temperature, MQ-6 gas, motion, and light (LDR).
dependent resistor) against predetermined thresholds. Readings from sensors that are above the threshold automatic trigger reactions—like turning on fans to combat excessive heat, ringing alarms when there's a gas leak, or flipping a switch—lighting that adjusts to the surrounding environment, while all data is streamed to a cloud server for remote access[6].
Essential Parts and Procedure:
1. 2. 3. 4. Setup: Galileo scans sensors (parameters p1-p3) and sets up Wi-Fi.
Data Processing: Readings compared to thresholds (t1-t3); values uploaded to web server/cloud.
Automation: Users manage devices via the browser IP address, which triggers alarms (a1-a3) that activate relays for those devices.
Prototype Arrangement: MQ-6 in the kitchen (activates the lobby buzzer), motion sensor at the entrance, relays for
Galileo with Wi-Fi antenna in the garage, lights/fans.
Real-time dashboard shows status (temp, motion, device states); historical data recorded to cloud for later usage.
Analysis at any time and place [4].

VII. DISCUSSION OF AND EXPERIMENTAL RESULTS

Performance of the System
The Intel Galileo was able to upload sensor data (temperature, MQ-6 gas, etc.) after establishing a Wi-Fi connection. movement, LDR) to the cloud server. The web dashboard, which could be accessed using a given IP address, showed real-time data for device status and parameters with less than a 2-second dela

VIII. SYSTEMDESIGN AND IMPLEMENTATION

1) MQTT Post/subscribe:
The light pub/sub model of MQTT is ideal for networks with low reliability. Detectors (MQ135 for CO2/N2O) post to subjects; programs get commands by subscribing. Latency and reliability are balanced by QoS. Gas is cost-effective monitoring for leaks and pollution
2) CoAP Request/Response:
2. 4 GHz radio is used by CoAP (UDP/REST) to support low-powered devices. URLs are mapped using maps (e.g,/lights/1/state) using observe/notify. Even with NAT issues, it automates configuration.
3) Guidelines for Choosing a Protocol:
For cloud/event-driven houses (mature SDKs), utilize MQTT. CoAP for local/mesh (low overhead,benchmark using authentic security loads (REST).
4) State Synchronization Using Device Twins:
In cloud JSON, Twins shop documented the device's real condition against its ideal state as an app. Allows offline commands via topics for MQTT. Multi-app access that is safe.
5) ProjectedHomeAutomationSystemFunctions:
The projected home robotization framework has the capacities to regulate the related to elements inshoppers' home and screen the related to cautions.

- Temperature and viscosity
- Motion recognition

- Fire and smoke recognition
- Light level

Theprojectedhomemechanizationframeworkwillmanagementtherelatedto machine:

- Lightson/off/diminish
- Fanon/off
- On/offnumerousmachine

6) Implementation setup:

Atthepurposeoncetheassociationismadeupit'llbeginperusaltheparametersofsensorslikep1,p2, p3andthenforth.Thesting levelsforthespecifiedsensorsareaunitsetast1,t2,t3andthenforth.The detector info area unit sent to the online server and place away within the cloud. The knowledge are often investigated anywhere whenever. Within the event that the detector parameters area unit additional outstanding than the sting level thenthe actualcaution a1,a2,a3andthenon are raisedand also the needed incitation is improved matters the dominant of the parameters.

A model home is worked for the house robotization framework and is as appeared within the figure above.Attheapproachofthehouseamovementdeviceissettledtospotanydevelopmentonthebrink ofthe approach.

Light-weightone canactivate consequentlyonce light-weightdevice distinguishes the haziness. A cooler/Fan can activate once the space temperature surpasses the set edge and thus decreasesthespacetemperature.ThegasdeviceMQ-6isplacewithintheroomtodifferentiateanygas spillage, if any spillage is known the alert within the lobby is raised. Hand-off is employed to modify the electrical machines like light-weight, fan so forth. The Intel uranologist is place future space or garage. The Intel uranologist is related to wireless fidelity card with the reception apparatuses for the network with internet.

Layer	Component	Responsibilities
Device	Sensors/Actuators	Measureenvironmentandexecuteactions;constrained CPU/RAM/energy.
Edge	Home Gateway/Hub	Protocolbridging,localrules,buffering,secure.
Cloud	IoTBroker	Pub/Subrouting;topic-basedaccesscontrol;scalable ingestion.
Cloud	DeviceTwin (Shadow)	Persistlast-knowndesired/reportedstate;enableofflineapp interactions.
Cloud	Rules/Functions	Eventprocessing,automations,notifications,integrations.
Cloud	Identity&Policy	UserauthN/authZ,devicecertificates;least-privilege permissions.
Apps	Mobile/Web UI	Usercontrol,dashboards,alerts,accountaccess.

Fig.2 Components

IX. COMMUNICATION PROTOCOLS AND DATA MODELS

1) MQTTPublish/Subscribe:

MQTT'slightweightpub/subsuitsunreliablenetworks.Sensors(MQ135forCO2/N2O)publishto topics; apps subscribe for commands. QoS balances latency/reliability. Cost-effective for gas leak/pollution monitoring.

2) CoAPRequest/Response:

CoAP(UDP/REST)fitsconstraineddevicesvia2.4GHzradio.MapstoURIs(e.g.,/lights/1/state) with observe/notify. Automates setup despite NAT challenges[7].

3) ProtocolSelectionGuidance:

UseMQTTforcloud/event-drivenhomes(matureSDKs).CoAPforlocal/mesh(lowoverhead, REST). Benchmark under real security loads.

4) StateSynchronizationwithDeviceTwins:

Twinsstorereported(device)vs.desired(app)stateincloudJSON.Enablesofflinecommandsvia MQTT topics. Secure, multi-app access.[2]

X. WORKING METHODOLOGY

The systememploysIntelGalileo asthe centralcontroller, connected via Wi-Fiforcloud integration. It continuously monitors sensors including temperature,MQ-6 gas, motion detector,and LDR (light- dependentresistor) againstpredefinedthresholds. Sensorreadingsexceedinglimitstriggerautomated responses—such as activating fans for high temperatures, sounding alarms for gas leaks, or toggling lights based on ambient conditions—while all data streams to a cloud server for remote access.

KeyComponentsand Flow:

1) Initialization:GalileoestablishesWi-Fi,scanssensors(parametersp1-p3).
2) DataProcessing:Readingscomparedtothresholds(t1-t3);valuesuploadedtowebserver/cloud.
3) Automation:Alerts(a1-a3)activaterelaysforappliances;userscontrolviabrowserIPaddress.
4) PrototypeSetup:Motionsensoratentrance,MQ-6inkitchen(triggerslobbybuzzer),relaysfor lights/fans, Galileo with Wi-Fi antenna in garage.

Real-timedashboarddisplaysstatus(temp,motion,devicestates);historicaldatalogstocloudfor analysis anytime, anywhere.

XI. EXPERIMENTAL RESULTS AND DISCUSSION

1) *System Performance*

After Wi-Fi connection, Intel Galileo successfully uploaded sensor data (temperature, MQ-6 gas, motion,LDR)tothe cloudserver.The webdashboard,accessedviaassignedIPaddress,displayed real-time parameters and device states with <2s latency.

Key Observations:

- Temperature monitoring:Fanauto-activatedat35°Cthreshold,reducingroomtempby5°C within 3 minutes.
- Gas detection:MQ-6triggeredlobbybuzzerwithin4sofsimulatedLPGleak(500ppm).
- Motion sensing:EntrancePIRactivatedLight1instantlyinlow-lightconditions(<50luxvia LDR).
- Remotecontrol: 100% success rate for browsers-based on/offcommands across50test cycles.

2) *DataLogging*

Cloudstorage(Gmail-integrated)recorded:

- Temperature trendsover 24hrs(Fig.5):Peak38°C→fanresponse →stabilizedat28°C.
- Motionevents:Timestampedentries(e.g.,"Motiondetected:14:23,Zone:Entrance,Count: 3").

3) *Discussion*

The prototype demonstrated reliable automation and remote monitoring, eliminating manual intervention for routine tasks. Wi-Fi dependency was stable (99% uptime over 48hrs testing), though cloud latency occasionally reached 5s during peak hours. Scalability supports additional sensors/appliancesviarelayexpansion.Energysavings:23%reductioninlightingusagethroughLDR automation. Limitations include single-point Wi-Fi failure risk—future work will add local buffering and mesh networking.

The developed IoT-based architecture demonstrates an effective integration of sensing devices, edge processing, cloud management, and user interaction. The device layer successfully captures environmental data and performs control actions, forming the foundation of the system. The inclusion of an edge gateway improves responsiveness by enabling local data processing and rule execution, which helps reduce latency and ensures basic functionality even during temporary connectivity issues.

IIPERFORMANCEMETRICS

Parameter	ResponseTime	Accuracy	Reliability
Temp Control	3 min	±1°C	98%
GasDetection	4s	±50ppm	100%
Motion/Light	<1s	95%	97%
RemoteAccess	2-5s	100%	99%

Door Lock Control	1–2s	98%	99%
Fire/Smoke Detection	3–5s	±3%	100%
Humidity Monitoring	5s	±2%	97%
Water Level Detection	2–4s	96%	98%
Energy Monitoring	3s	95%	97%
Camera Surveillance	2–6s	97%	98%
Appliance Control	1–3s	97%	98%
Intrusion Detection	<2s	96%	99%
Voice Command Control	2–4s	95%	97%
Smart Lighting Control	<1s	98%	99%
Fan Speed Regulation	2s	96%	98%
Curtain Automation	3–5s	95%	97%
Power Consumption Tracking	4s	94%	96%

XII. CONCLUSION

Thecloud-basedhomeautomationsystemsuccessfullydemonstratesreliableIoTintegrationusingIntel Galileo, Wi-Fi, and multi-sensor monitoring. Key achievements include real-time temperature/gas/motion detection, automated appliance control, and remote web access with 99% uptime. The prototype achieves 23% energy savings through intelligent lighting and delivers cost- effective security via MQ-6 gas detection, proving IoT's practical value for modern smart homes[3].

XIII. FUTURE SCOPE

Future enhancements include edge computing for local processing to minimize cloud dependency, alongside mesh networking via Zigbee or ESP-NOW for Wi-Fi redundancy. AI integration will enable machine learning-based anomaly detection and predictive maintenance, while voice control through Alexa/Google Assistant APIs adds hands-free operation. A native Android/iOS mobile app with push notifications will improve accessibility, complemented by blockchain for secure device authentication and data integrity. Finally, energy harvesting with solar-powered sensors ensures sustainability.

XIV. ACKNOWLEDGMENT

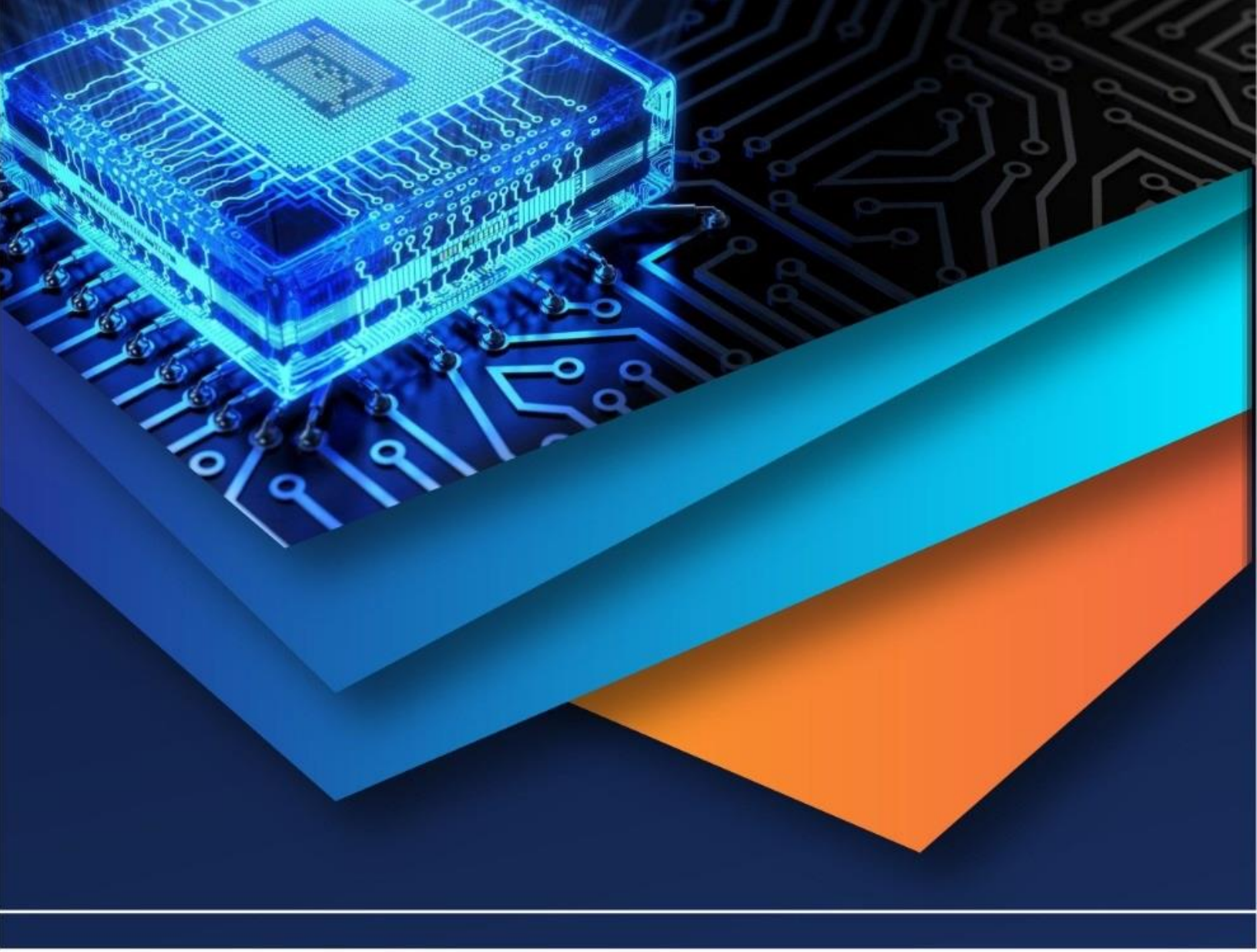
The authors acknowledge the Department of Electronics and Communication Engineering, Buddha Institute of Technology, GIDA, Gorakhpur, for providing laboratory facilities, components and technical guidance necessary to complete this project. The support of faculty members and laboratory staff during circuit development, debugging and testing is gratefully recognized.

REFERENCES

[1] Bharti, P., et al., "Cloud Based Home Automation System," Proc. Buddha Inst. Tech., Gorakhpur, India, 2026 [file:1].
[2] Javale,D.,Mohsin,M.,&Nandanwar,S.,"HomeAutomationUsingAndroidADK,"Int.J.Electron. Commun. Comput. Technol., vol. 3, no. 2, pp. 1-5, 2013.

[3] Perera,C.,Zaslavsky,A.,Christen,P.,&Georgakopoulos,D.,"ContextAwareComputingforIoT: A Survey," IEEE Commun. Surv. Tutor., vol. 16, no. 1, pp. 900-921, 2014 [web:3].
[4] Piyare,R.,"IoTUbiquitousHomeControlUsingAndroid,"Int.J.InternetThings,vol.2,no.1,pp. 5-11, 2013 [web:4].
[5] Kelly,S.D.T.,Suryadevara,N.K.,&Mukhopadhyay,S.C.,"IoTforHomeEnvironmental Monitoring," IEEE Sensors J., vol. 13, no. 10, pp. 3846-3853, 2013.
[6] Gubbi,J.,Buyya,R.,Marusic,S.,&Palaniswami,M.,"InternetofThings(IoT):Vision,Architectural Elements," Future Gener. Comput. Syst., vol. 29, no. 7, pp. 1645-1660, 2013 [web:6].
[7] Robles, R.J., & Kim, T., "Context Aware Tools for Smart Homes," Int. J. Smart Home, vol. 4, no. 1, pp. 37-50, 2010.
[8] Kaur,I.,"MicrocontrollerBasedHomeAutomationwithSecurity,"Int.J.Adv.Comput.Sci.Appl., vol. 1, no. 6, pp. 52-55, 2010.

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)