



# A novel development of electric outlet using IOT

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## ABSTRACT

The perception of conveying console toward dwelling from beginning to end the progression of making use of the IoT within the progress of an electrical scheme is the major heart of the revision. It is protected resting on the expansion of boundary speculation in favor of module building, and distribution of modernization speculation with the IoT. It required to settle happening the next: the intent of the scheme with IoT; the urbanized electrical scheme; the act of the scheme within provisions of commencement in addition to reply instance; as well as the important differentiation taking place the answer instance according to a cluster. The productivity of the revision results through the RAD method. The Node MCU microcontroller was implicit within the Arduino IDE along with requirements for internet association during arrangement toward be prohibited via the put in submission in addition to preserving slightly work the hole apart from the reserve use an android elegant handset. SSID, as well as the wifi code word, was located along with the customer boundary meant for the app to be calculated using the MIT app originator furthermore craze tell since the release IoT stage. The product used for the commencement instance illustrates the internet momentum sooner than the commencement instance. The place designed for the usual plan in favor of the response instance of the four model collection region is inside the third boundary of consumer awareness of 10 seconds. The examination of variation illustrates with the intention of the F price is under the F serious price next to the stage of the implication of 0.01. Consequently, there is a refusal major disparity within reply instances according to clusters.

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## 1. INTRODUCTION

The IoT is a set of consistent calculating strategies, automatic in addition to digital equipment, substance, and nature otherwise persons have UIDs in addition to the aptitude toward broadcast

statistics more than a system lacking the call for human-computer acquaintances [1]. These strategies as well converse by comparable strategy, in addition, to taking action resting on all other's data they obtain. The equipment acts greatly of the effort exclusive of personal involvement, at the



same time as citizens be able to, designed for a model, converse through the equipment, position up and about, and launch them directions before admittance the statistics [2]. The contact, set-up furthermore statement code of behavior old by way of the web-enabled strategy are alert mostly resting on the range of IoT relevance [3].

Many lessons have been accomplished toward there a structure during organizing toward building up a machine using IoT. By IoTs succeeding, they make use of things has misused on or after the supercomputer toward all tool person utilizes. [4,5]. IoT facilitates groups en route for the fix with act together among all additional daylight toward supply population as well as clients through in sequence, statistics, moreover assets. IoT is identified because of the large amount of exciting current efforts during the recent period of calculation. IoT inquires about making available mankind by way of trouble-free along with improved living. It permits public, substantial procedure, and statistics, with submission toward relation more than the internet on the way to permit isolated management of incorporated resources with related resources [5,6]. IoT equipment is capable of facilitating personal effort during in-sequence requirements, making use of in turn, affording in sequence on the way to the close situation. solitary of the requests of IoT to aid the individual during sequence gathering be managed before observing actions to be illegal during normally old strategy [5,7]. At the start, the IoT is mainly essential on behalf of production moreover developed. Its equipment is frequently submitted toward at the same instance since M2M, except at this time it be regarding substantial residence along with workplace by neat strategy, manufacture it amazing that's vital used for approximately everybody [8]. By way of ongoing scientific advancement, the IoT is all the time more creature functional within a selection of ground, such as residence computerization.

Residence computerization assists customers toward observe unusual types of electrical pieces of equipment. Residence computerization utilizing the shade set-up is a scheme to utilize PC otherwise portable strategy on the way to observe fundamental house roles in addition to qualities starting somewhere during the earth, mechanically

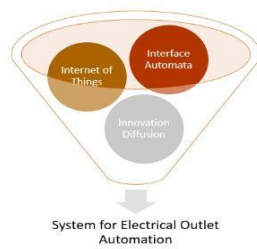
passing through the internet [9]. The method change starts extra coordination outstanding toward its capability toward contact furthermore activate anyplace above the internet [10]. Residence computerization exercises in-house organizer. From beginning to end the exercise of an immobile before the wireless boundary, the customer is capable of organizing their house campaign. Internet attached completed internationally illegal scheme. probable by the exercise of portable procedures as well as PCs [11]. IoT completed residence computerization potential approximating calculating electrical with electronic quarters piece of equipment similar to fan, illumination, flames alarm, in addition to kitchen regulator distantly over the confuse [12]. IoT can change some material things in addition to existing prohibited after they are associated with the Internet. through the make use of an IP address allotted toward a tool, it is capable of surviving watched moreover contacted slightly [13]. Given the impression of being further than the domicile along with the giving of numerous revisions on the subject of IoT, the examiner urbanized an electrical opening method through IoT with the purpose of could explain the act in response to the requirements of dwelling computerization. particularly, it required the way to respond to the subsequent difficulties: (1) what is the intent of the scheme by IoT?; (2) how willpower the electrical scheme survive urbanization?; (3) what is the presentation of the structure inside provisions of commencement instance along with answer instance?; in addition to (4) what is the major differentiation lying on the reply occasion according on the way to collections?

## 2. METHODOLOGY

Concerns linked to pressure-reasons stuff are leisurely organism lecture to via knowledge in addition to IoT expertise has somehow offered to relieve to persons. Distant mechanization in addition to intelligence was completed potential from side to side of this equipment [14]. Line machines were old inside the expansion of boundary speculation designed for module structure. Behind, the "belt" furnish an actor-slanting alternative designed for strategy as well as the military which appearance the planning for IoT [15].

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**Fig 1:** academic Paradigm

In addition, DOI speculation is single of the oldest public knowledge assumptions. This takes place starting message to make clear how a design before entity increases energy over occasion furthermore distributes (or else extends) above exacting residents otherwise group set of connections. The conclusion consequence of this dispersion is with the intention of since measurement of a collective arrangement, citizens assume an innovative design, and perform otherwise manufactured goods. The input on the way to taking is to the design otherwise creation is required to examine when innovative or otherwise inventive. It is through this with the aim of transmission can survive completed [16,17]. In favor of the customer intend chapter, the key proposed, list flowchart with the isometric presence of the tool be sketched toward shape the procedure's condition. The lessons innovate an opening to be able to be prohibited through an android application during internet admission en route for be in charge of the machine within the area in addition to would serve up since a tool as well as automatic in the direction of routine control (on/off) the electrical opening. It pays attention to lying on a scheming machine somewhere to be blocked inside toward the exit.

During the creation segment, the policy in favor of the NodeMCU was executed through the examiners utilizing Tuniot. The customer boundary agenda be after that implicit using MIT App discoverer on behalf of the android app. next the passage was linked to the NodeMCU as well as permanent within the modular small package. The modular envelopes provide because of the case of the machine which collected the subsequent: NodeMCU, wifi microchip, 3-way control, 5v direct relay as well as electrical ropes. For the duration of be performance toward being familiar with it the scheme would convince the typical reply instance of

Consequently, the academic construction or else model exposed inside Fig 1 of this study represents the structure intended for electrical opening mechanization in an infused presumption of IoT which is alleged in the direction of present modernism toward lecture to the requirements of the person intended for ease in addition to no difficulty of liability equipment.

The lessons old the effort flow of the scheme growth by the RAD replica [18] since exposed within Fig 2. In favor of necessities preparation, the investigators recognized the hardware in addition to software supplies of the missions. The NodeMCU [19], ThingSpeak [20], MIT App discoverer [21] along with Tuniot in favor of ESP8266 wifi microchip [22], are the major obligation of the arrangement. The production of these lessons is useful in the direction of the home customers in which the urbanized scheme would diminish fire-related belongings within their family unpaid toward unplugged machines and offer security within houses alongside mistakes.

the customer intent as well as structure stages, the sample was advanced in addition to experience used for the most favorable presentation. The organization is toward existing close to the major cause of existing next to the machine similar to space breaking in an element that would exist closed inside the opening of the scheme. on one occasion the machine is stopped inside the scheme's electrical passage, and the consumer can at the present distantly revolve on/off the machine. After that, in the direction of concluding the presentation of the machine, the subsequent piece of equipment be old: light, electric fan, cellular handset mount plus 0.5hp space training component by two dissimilar internet relations: PLDT house strand on 15 Mbps plus elegant cellular statistics on 5 Mbps.

Lastly, within the estimate chapter, the investigators set up the intent in addition to forming the example of the scheme. Difficult plus estimate of the commencement as well as answer instance of the organizations

an IoT tool. The major dissimilarity of the retort instance connecting furthermore inside collections



is as well-resolute by ANOVA. The machine is incomplete for the machine to function in 10 amperes per hollow. Piece of equipment to surpass the most capability preserve smash positive the IoT tool.

### 3. RESULTS AND DISCUSSIONS

In current the consequences of the IoT electrical passage expansion, the intent of the scheme through IoT, the growth of the electrical opening scheme by IoT, the presentation of the scheme within conditions of commencement instance in addition to answering instance, in addition to the major variation lying on the answer instance according toward clusters.

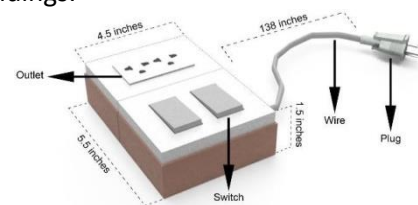
#### Design of the System using IoT

Fig 3 demonstrates the mass figure of the scheme. The USB adapter changes the 220 AC control supply to 5v, to control the NodeMCU. At what time set in motion within an android handset via the on/off control on or after the android app, the NodeMCU will indication the two-channel 5v communicate driver function via the 5v tiny control supply. The relay driver decides which relay to set in motion toward revolve the passage resting on before off from first to last the 3-way control.

**Figure 3:** Block Diagram of Electrical Outlet System using IoT

The procedure's major module is the NodeMCU microcontroller. It was selected via the investigators unpaid toward its controlling microprocessor ability by intrinsic TCP/IP moreover WiFi sustains the length of a good quality microprocessor, lacking the require designed on behalf of serious handing out in addition to multi-threading. It is analogous to Arduino Uno other than it has a smaller amount of GPIO, and ADC in addition to PWM choice than the Uno. It chains sequential message procedures to allow the customer to attach a GPIO extender before one more microcontroller condition is desirable. similarly, the Raspberry Pi was also measured other than not charging successfully toward this scheme. The adaptability furthermore small rate accessible via NodeMCU is to a large extent extra chosen via the investigators. The purpose of the microcontroller was considered in the shape of the scheme. Inside the encoding surface, it is

asynchronous in addition to event-driven. Numerous purposes have stricture designed for take back roles, such functionality was measured, however into the original setup, the structure accomplish not necessitate compound as well as serious system. The 5-volt 2-direct relay roles organize release plus electromechanically lock routes. Relays observe one electrical route via the chance along with the final of associates inside one more. It revolves resting on along with off the scheme mostly standing on top of MCU authority. The machine was calculated and designed for effortlessness, stretchy moreover relief of bring into play. This IoT-based electrical opening organization old amicroprocessor within its covering in addition to is therefore reprogrammable, manufacturing it extra stretchy. This knows how to enlarge during single things toward extra electrical openings, as well as be capable of being alone works. Inside adding, each appearance of block resolve be provided intended for via single passage since an effect of through widespread hole standard inside the Philippine surroundings.

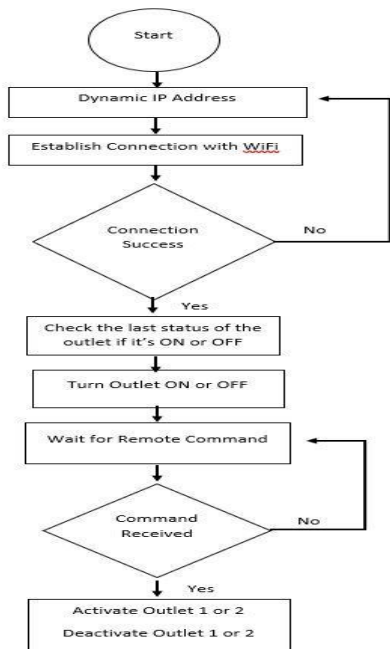


**Fig 4:** Plan surge

In Fig. 4, the flowchart of the plan is exposed. The agenda is in progress via the transfer of an active IP address to set up a link to the internet. on one occasion the link is doing well, the machine makes sure the previous standing of the passage condition is going on or otherwise off, or else it leaves reverse to the transmission of the IP address. after the position was tested, the machine turn on the passage after that it remain designed for the control of the customer on or after the android app to revolve the opening resting on otherwise off. After the switch is pushed, it fires the indication to set in motion the elected passage designed for the piece of equipment to revolve on/off.

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**Figure 5:** Isometric Layout of the Device

The isometric presence of the tool is revealed in Fig 5. The artificial modular envelope which supplies the covering is a rectangular prism with a distance end to end of 5.5 inches, between 4.5 inches plus an elevation of 1.5 inches. on the summit of the prism be the channels in addition to control. close to the prism is the 138 inches numeral 14 electrical wire by the fond of chap cap.

**Expansion of the Electrical channel arrangement by IoT**

This chapter gives details on the dealings of the exact apparatus. The examiners are on the way to start through second-hand the breadboard, series inside adding to LEDs to make the certain situation the association is recognized. Fig 6 illustrates the behavior of definite first cabling plus hard. The connection for the relay wiring was permanent and primarily pursue via the cabling designed for the MCU. The existing cable is associated with the inhabited hollow of opening 1 in addition to a frequent column to the populated hollow of channel 2. Commencing the impartial procession it is associated with the ordinary 0 hollows of the 3-way control 1 as well as toward a frequent procession on the way to the general 0 hollows of



**Figure 6:** Initial Wiring conducted for testing using 5v power supply

control 2. Commencing opening 1 explorer of the 3-way control 1, it was associated on the way to in general release hollow of Relay 1. Beginning the, in general, stopped relay 1 toward the hollow 3 explorers of the 3-way control 1, the frequency of the 1 was linked to the in general hollow of opening 1 toward whole the path.

Because the present is an ordinary procession link of the impartial stroke inside frequent 0, the examiner's associated hole 2 explorer takes place in the 3-way control 2. It was a strike to the in-general release hole of transmit 2. next, on or after the in-general stopped up of transmit 2 toward the hole 3 explorers of the 3-way control 2. next, it was associated toward the frequent of transmit 2 toward the impartial hole of opening 2 to the whole path. The control of the NodeMCU was completed via the USB 5v in addition to making use of a 220v toward 5v component on the way to influence positively the 2-channel communicate component wrt the earth. The NodeMCU at this time can strengthen the transmit in favor of the ON also OFF of the 1 along with 2.





**Figure 7:** Casing and Components inside the Modular Box

As soon as the machine was concluded, the sequence of the preliminary experiment was accomplished via the investigator. Within the original aim, the investigator told the NodeMCU 3.3V just before controlling the relay which stands starting the condition of the relay it knows how to be mechanical via volts which is as well the control productivity of the NodeMCU.



**Figure 8:** Outside view of the Electronic Outlet System

Within the first experiment manner, a single hollow execute glowing except the additional hole barely reacted toward the control. It was too experiential to obtain a longer instance used for communicating the way to react toward the control throw via the microprocessor. Consequently, the canvasser examines the circumstances plus establishes them elsewhere to the 3.3 volts control cannot completely continue the transmission.

As a result, the canvasser endeavors to make use of the tiny control deliver component to exchange the 220AC shortest foundation toward 5 volts. Conveniently, the key practical effort is amazingly within the arrangement. Next, the exterior old designed for the tool hollow is the commonplace electrical modular sachet old designed for barrier escalating. The machinery was situated surrounded by the pack, a quantity of machinery was rotated,

and many old bonds incorporated within the component in addition to quite a few chains were soldered. Fig 7 illustrates the case in addition to module location in the interior of the modular pack, at the same time as Fig 8 explains the exterior vision of the exterior.

**Figure 9:** Android App Programming using the MIT App Inventor 2



Present were 2 encoding actions accomplish. The primary is the encoding on behalf of the android request with the MITapp discoverer 2 in addition to the subsequent encoding that was designed and used for the NodeMCU. Fig 9 demonstrates the definite system in addition to the boundary of the MIT app originator at the same time as Fig 10 demonstrates the definite border productivity of the agenda. inside the line, in attendance be a whole two (2) couple of taking place as well as off switch instead of the two (2) channel. The customer would compress the taking place otherwise off input depending taking place their preferred control. The next encoding was intended for the NodeMCU in addition to the Arduino IDE was old. For the duration of this planning phase, the wifi recommendations were inputted. The course was relocated from the first to the last USB to the NodeMCU.

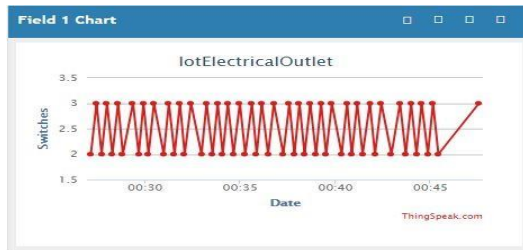
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**Figure 10:** User Interface of the Application

In favor of the interfacing period, the android mobile phone function and the opening were interfaced using the internet throughout the release IoT stage. Purposely, the investigator's old ThingSpeak since the untie IoT stage en route for making API answer. Fig. 11 illustrates the ThingSpeak examination plan designed for 1 passage. The 2 here the y-axis is the on top of control though 3 is the off control. The x-axis illustrates the instance the examination was executed.



**Figure 11:** ThingSpeak Trial Chart

Ahead of the estimate course, arrangement taxing was executed designed for the trying of foundation moreover answer point in time, the investigators experienced the opening as well as guidebook control condition it takes action consequently. Fig 12 illustrates the definite difficulty with a tiny light.



**Figure 12:** System Testing

### 3.3 Performance of the System

The examiners appraised the commencement in

addition to answering instances of the organization via tape the instance in next. Designed for the commencement instance, this was experienced in viewing the length subsequent with ISP1 and ISP2. The organization was set in motion on or after the instance it was stopped inside toward the AC passage on the way toward the instance the tool was set to recognize domination beginning the customer.

| Recorded Activation Time in Seconds |                      |                        |
|-------------------------------------|----------------------|------------------------|
|                                     | ISP1                 | ISP2                   |
| Trial                               | Home Fiber at 15mbps | Cellular Data at 5mbps |
| 1                                   | 10.30                | 18.90                  |
| 2                                   | 9.01                 | 15.90                  |
| 3                                   | 11.15                | 15.70                  |
| 4                                   | 13.80                | 19.99                  |
| 5                                   | 12.40                | 17.20                  |
| Mean                                | 11.33                | 17.54                  |

**Table 1:** Activation Time

The investigators mode 10 examinations via 2 different internet relationships. Table 1 demonstrates the confirmations and creates an example intended for 5 experiments for each internet column. It was renowned with the intention of through ISP1 the direct instance was 9.01, the best instance was 13.80, and next, the signify is 11.33 secs. Through ISP2 the direct instance proof was 15.70, the best-ever occasion is 19.99, as well as the indication, are 17.54 secs. through the statistics documentation, it is measured to the momentum of the internet involves the commencement instance of the structure.

The investigators as well estimate the reply occasion of the scheme using 4 unusual machines designed for difficulty. The investigator's old light, cellular handset mare, stimulating fan in addition to atmosphere condition part. The internet link old inside this experiment is the PLDT house string which provides additional positive consequences lying on the commencement occasion manner. Table 2 illustrates the signify of on top of in addition to off test intended for 25 era manner happening 4 unusual machines. The indication designed for lying on plus off test inside secs of the scheme by light is 7.63 secs. in addition to 9.43 secs. by a regular of 8.53 secs. In favor of the cellular handset mare, 8.32 as well as 9.46 in that order, by a regular of 8.89 secs. In tough the stimulating fan, the stand



for is 9.91 secs. along with 8.91 secs. on behalf of inedible by a regular of 9.41 secs. The atmosphere training part acquires 9.79 in addition to 10.25 in that order by a regular of 10.02secs.

**Table 2:** Response Time

| Response Time in Seconds |      |       |              |
|--------------------------|------|-------|--------------|
| Appliances Sampled       | Mean |       | Average Mean |
|                          | On   | Off   |              |
| Lamp                     | 7.63 | 9.43  | 8.53         |
| Cellular Phone Charger   | 8.32 | 9.46  | 8.89         |
| Electric Fan             | 9.91 | 8.91  | 9.41         |
| Air Conditioning Unit    | 9.79 | 10.25 | 10.02        |

W.r.t the customer's 3rd boundary of latency/rejoinder instance awareness which is approximately 10 secs. boundary the customer's concentration in the direction of the circumstance [23]. The investigators measure up to the evidence under the 10 secs boundary standard signifying of light cellular handset mare in addition to stimulating fan. The standard signifies intended for the atmosphere training component which is 10.02 be able to, in addition, be carefully suitable.

**3.4 Major differentiation lying on the retort instant**

**Table 3:** examination used for important dissimilarity with ANOVA

| foundation of discrepancy | quantity of independence | amount of rectangles | Mean Squares | F-Value  |         |
|---------------------------|--------------------------|----------------------|--------------|----------|---------|
|                           |                          |                      |              | Computed | tabular |
| Between Groups            | 3                        | 31.61                | 10.54        | 3.34     | 3.99    |
| Within Groups             | 96                       | 302.85               | 3.15         |          |         |
| Total                     | 99                       | 334.46               |              |          |         |

The information second-hand to experiment with the major variation of the 4 example clusters was the reply occasion on or after the examination of the presentation. Table 3 demonstrates the consequences of the statistics examination through ANOVA. Since exposed within Table 3, the stage of implication old is 0.01 by the equivalent F serious cost starting the F allocation bench of 3.99 next to the level of liberty of (3.96). The calculated 3.34 F assessment is < the F serious which resources to the

unsound premise preserve be traditional Consequently, it has been completed to here is refusal major dissimilarity among the 4 example clusters.

**5. CONCLUSION**

The electrical passage scheme using IoT has Node MCU's most important hardware module with the intention of giving out the intelligence of the organization. The machine has to be linked to the internet inside arrange toward be prohibited via the movable request set up within an android stylish telephone in addition to distantly functions the opening despite of reserve. The expansion of the electrical passage scheme through IoT is in progress on or after the recognition along with the achievement of the resources desirable. The software expansion designed for the Node MCU microcontroller was implicit within the Arduino IDE in addition to the SSID along with the Wi-Fi code word was the place. The customer boundary designed for the submission was calculated using the MIT App originator in addition to fixation chat since the unfasten IoT stage. The routine of the machine was experienced via evaluating the commencement along with answering instances of the organization. Designed for the commencement instance, the regular illustration with the purpose of the superior the velocity of the internet the quicker the commencement instance. The signify averages of the 4 example collection vicinity used for the reply point in time are every surrounded by the 3rd customer awareness bound of 10 secs, representing machine productivity is in the suitable boundary. The ANOVA illustrates to the Frate on an implication end of 0.01 is lower than the F decisive rate. Then, the void premise is conventional maintaining the intention of there being no major differentiation within the answer instance for each cluster.

**REFERENCES**

1. TechnoSIP. **Internet of Things (IoT)**. Available Online at <https://www.technosip.com/internet-of-things-iot/>
2. M. Rouse. **Networking and communications - Internet of Things (IoT)**. *IoT Agenda*. June 30, 2018. Available Online at <https://internetofthingsagenda.techtarget.com/>





definition/Internet-of-Things-IoT

3. Smart Card America. **Internet of Things (IoT).**

Available Online at <https://www.technosip.com/internet-of-things-iot/>

4. K. Suresh, PVGD P. Reddy, P. Pushkal. **Smart Home Services Using Cloud and Internet of Things.** *International Journal of Advanced Trends in Computer Science and Engineering*, Volume 8, No.4, July–August 2019.

doi.org/10.30534/ijatcse/2019/79842019

Available Online at <http://www.warse.org/IJATCSE/static/pdf/file/ijatcse79842019.pdf>

5. R. Stephen and D. vinoth Kumar. **Deist: Dynamic detection of sinkhole attack for the internet of things.** *International Journal of Advanced Trends in Computer Science and Engineering*, 5 (12), 19358-19362. 2016. doi:10.18535/ijecs/v5i12.16. Available Online at <https://www.ijitee.org/download/volume-8-issue-5>

6. A. A. A. Gad-Elrab, A. E. Shereen, N. I. Ghali, A. A. S.Zaghrout. **A Dynamic Genetic-Based Context Modeling Approach in the Internet of Things Environments.** *International Journal of Advanced Trends in Computer Science and Engineering*, Volume 8, No.6, November–December 2019. doi.org/10.30534/ijatcse/2019/03862019.

Available Online at <http://www.warse.org/IJATCSE/static/pdf/file/ijatcse03862019.pdf>

7. S. G. Bunawan, M. Aldenny, D. I. Setiani, G. Wang. **Architecture Internet of Things Based on Cluster Housing Security System Using Fog Computing.** *International Journal of Advanced Trends in Computer Science and Engineering*, Volume 8, No.6, November – December 2019. doi.org/10.30534/ijatcse/2019/68862019. Available Online at <http://www.warse.org/IJATCSE/static/pdf/file/ijatcse68862019.pdf>; <https://>

8. S. Ranger. **What is the IoT? Everything you need to know about the Internet of Things right now.** *ZDNet*, February 3, 2020. Available Online at <https://www.zdnet.com/article/what-is-the-internet-of-things-everything-you-need-to-know-about-the-iot-right-now/>

9. M. Kanchana, B. A. Kannan, and D. Jaiganesh. **Home automation security and storage**

**system using cloudcomputing.** *International Journal for Scientific Research & Development (IJSRD)*, Vol. 3, Issue 1, pp.93-97. January 2015. Available Online at <http://>

10. K. N. Vinay Sagar and S. M. Kusuma. **Home automation using the Internet of Things.** *International Research Journal of Engineering and Technology (IRJET)*, Vol. 2, Issue 3, January 2015. Available Online at <https://www.irjet.net/archives/V2/i3/Irjet-v2i3317.pdf>

11. Electronics, Projects, Focus (ELPROCUS). **Wireless Home Automation using IoT.** 2019. Available Online at <https://www.elprocus.com/wireless-home-automation-using-internet-of-things/>

12. A. Lady. **PIR Motion Sensor.** 2019. Available Online at <https://learn.adafruit.com/pir-passive-infrared-proximity-motion-sensor?view=all>

13. International Data Corporation (IDC). **IDC Forecasts Worldwide Spending on the Internet of Things to Reach \$772 Billion in 2018.** December 7, 2017. Available Online at <https://www.idc.com/getdoc.jsp?containerId=prUS43295217>; <https://www.businesswire.com/news/home/20171207005963/en/IDC-Forecasts-W-worldwide-Spending-Internet-Things-Reach>

14. K. Stansberry, J. Anderson and L. Rainie. **The internet will continue to make life better.** *Pew Research Center, Internet & Technology*, October 28, 2019. Available Online at <https://www.pewresearch.org/internet/2019/10/28/4-the-internet-will-continue-to-make-life-better/>

15. M. Papert and A. Pflaum. **Development of an ecosystem model for the realization of internet of things (IoT) services in supply chain management.** *Electronic Markets*, 27(2), 175-189. 2017. Available Online at [https://ideas.repec.org/a/spr/elmark/vyid10.1007\\_s12525-017-0251-8.html](https://ideas.repec.org/a/spr/elmark/vyid10.1007_s12525-017-0251-8.html)

16. A. M. Al-Momani, M. A. Mahmoud and M. S. Ahmad. **Modeling the adoption of internet of things services: A conceptual framework.** *International Journal of Applied Research*, 2(5), 361-367, 2016. Available Online at <http://www.allresearchjournal.com/archives/?ArticleId=1933&issue=5&part=F&vol=2&year=201>



17. Boston University School of Public Health. **Behavioral Change Models – Diffusion of Innovation Theory**. Available Online at <http://sphweb.bumc.bu.edu/otlt/MPH-Modules/SB/BehavioralChangeTheories/BehavioralChangeTheories4.html>
18. C.T. Lucidchart. **4 Phases of Rapid Application Development Methodology**. 2018. Available Online at <https://www.hokuapps.com/blogs/rapid-application-development/>
19. NodeMCU. **NodeMCU Documentation**. 2019. Available Online at <https://nodemcu.readthedocs.io/en/master/>
20. Mathworks. **ThingSpeak**. 2019. Available Online at <https://www.mathworks.com/help/thingspeak/>
21. AppInventor. **App building made easy**. 2019. Available Online at <http://www.appinventor.org/>
22. Easy Coding. **Tuniot for Esp8266**. 2019. Available Online at <http://easycoding.tn/index.php/nodemcu/>
23. Z. Yang and T. Nakajima. **Connecting smart objects in IoT architectures by screen remote monitoring and control**. *Computers*, 7(4), p. 47. 2018. Available Online at <https://doi.org/10.3390/computers7040047>

