

**An ANN Based Approach for efficient power consumption
Monitoring: IoT Power Consumption algorithm**¹Pratibha Tiwari, ²Satish Dehariya¹Department of Computer Science and Engineering, SATI, Vidisha (m.p.), India²Department of Computer Science and Engineering, SATI, Vidisha(m.p.), India

Abstract: IoT is a cutting edge technology, where many applications are built on the top of usability of internet. It help in device monitoring, its electricity consumption and how it can be used for further planning of household energy consumption. Internet help in sharing information with a frequent interval of time. Smart home and energy consumption monitoring help in planning for further usage, cost utilization etc. In previous usability approach, there are technique such as genetic algorithm, Apriori frequent pattern finding approach, Some hybrid approach is used. A lacking in finding exactness in the solution provided is lacking in approaches. They exhibit low accuracy monitoring with other consumption parameter. In this paper an Enhance ANN approach which is based on finding optimal usage is performed. Working towards the noise removal and then finding optimal data usage in power consumption is performed by the work. The experiment evaluation is performed on Java framework and parameter such as accuracy, precision etc were performed for efficiency monitoring of proposed work. A real time hardware implementation further left for the future work.

Keywords: Energy consumption, ANN, Apriori Algorithm, IoT Devices, Smart Home, Energy Consumption

Introduction

IoT is an emerging scenario where power consumption is again a usable application which can help in understanding the scenario over the smart home system. IoT make use of IP address Ipv6 which help in usage of high range and length of data passing through it. Data sharing over the devices using IP is again an important aspect in smart home application utilization[1].

Reducing power consumption of these radios when creating a connected product will not only help lengthen the time between charges, but also extend the device lifespan. (Reducing power consumption is also better for our environment.) Below are a few strategies to deploy when developing an IoT product while leveraging three different types of connections[2].

When it comes to the development of connected products, most creators will choose to build a radio based on the needs of the application. BLE radios work well for small, low-powered devices, but need a gateway to communicate with the internet[3]. Wi-Fi devices require a Wi-Fi network and router to communicate. Cellular devices are freed from the constraints of Wi-Fi, enabling much more remote applications, but as you move from Bluetooth to cellular, the power required to send and receive messages increases accordingly [4].

Wi-Fi power consumption correlates directly to the amount of data the radio is transmitting. High bandwidth applications, such as downloading web pages or streaming music, will consume much more power than low bandwidth applications like transmitting sensor data. For high bandwidth applications, it is ideal to connect directly to an AC power supply or have a charge management circuit that allows for frequent recharging of the device to ensure the device stays powered-on[5].

Related Work

In previously given technique a related work technique which help in power consumption monitoring is discussed. Power consumption using IoT smart home help in proper data dissemination monitoring. This section discuss about the previous work which help in power monitoring on IoT smart home devices[6].

The IP-based Internet of Things (IoT) alludes to the inescapable cooperation of savvy gadgets and individuals empowering new applications by methods for new IP conventions, for example, 6LoWPAN and CoAP. Security is an absolute necessity, and for that we require a safe design in which all gadget co-operations are shielded from joining an IoT system to the safe administration of keying materials. Nonetheless, this is testing in light of the fact that current IP security conventions don't offer all required capacity a lilies and commonplace Internet arrangements don't prompt the best execution. We propose and analyze two security designs giving secure system get to, key administration and secure correspondence. The main arrangement depends on another variation of the Host Identity Protocol (HIP) in light of pre-

shared keys (PSK), while the second arrangement depends on the standard Datagram Transport Layer Security (DTLS)[7].

Numerous specialized groups are overwhelmingly seeking after research subjects that add to the Internet of Things (IoT). Today, as detecting, activation, correspondence, and control turn out to be always modern and pervasive, there is huge cover in these groups, some of the time from marginally alternate points of view. More collaboration between groups is supported. To give a premise to talking about open research issues in IoT, a dream for how IoT could change the world in the inaccessible future is first exhibited. At that point, eight key research subjects are counted and investigate issues inside those themes are talked about. [8,9]

The complete section discuss about the IoT enabled techniques and the application area, where IoT is implemented. It is being observed that IoT help in communication with devices by assigning a unique IP address to each device. Our further work is going to provide an algorithm which help in data communication and finding electronic component usage using IPv6 protocol[10].

PROPOSED METHODOLOGY

In order to find the optimal solution for the energy consumption monitoring over the given platform, there is an enhance ANN(Artificial neural network) based approach is proposed, which help in efficient monitoring of energy consumption on household devices.

There are following point step which is involved in power consumption monitoring over the large dataset extracted from IoT enables household devices.

Algorithm steps which taken for processing the proposed approach.

- The proposed system will have ANN approach for the data analysis and prediction.
- A usage of tan-sigmoid transfer function (tensing) was used in the hidden layers while linear transfer function will used for the output layers.
- A provision of training and testing phase in the ANN approach is going to perform in the system.
- An automated alert generation and monitoring usage interface is going to show the effectiveness of our approach.
- Our proposed work is going to work on feed forward selection algorithm using the feature of ANN.
- Propagation, finding patterns and usage according to requirement.
- Weight update: Multiply its output delta and input activation to get the gradient of the weight.
- Apply sigmoid function over the propagation data obtained.
- Finding outcome alerts.
- Notify to users.

A Designed step algorithm which is presented in below section which help in execution of the presented scenario.

Pseudo Code Algorithm:

Input: IoT device data, energy consumption log, Min weight threshold value=18, ANN parameters

Output: High usage device voltage, parameter outputs

Steps:

Begin [

Finding device information ();

Int log[]=AccessLog();

Foreach(log 1-n)

{

Finding the log distance();

logImpact();

logVerify(weight,log)

{

```

If(log>=weightmin)
{
Return usage alert;
MonitorHighUsage();
MonitorLowUsage();
}
Return deviceId;
}
ComputeParam();
Return computational parameters;
}
] End;

```

The above steps and pseudo code shows the execution of the proposed system which help in energy consumption analysis[11]. It is the ANN based approach which help in finding hidden values, their correlation and further monitoring devices having high usage in energy consumption.

EXPERIMENT SETUP & RESULT ANALYSIS

A experiment using the Windows OS, high configuration RAM and 1 TB of hard disk is used, where Java platform and apache wamp is used for dataset processing. The discussed feature selection algorithms were implemented using language Java. Swing includes graphical user interface (GUI) widgets such as text boxes, buttons, split-panes, and tables. Swing widgets provide more sophisticated GUI components than the earlier Abstract Window Toolkit. Proposed as well as existing algorithms were applied one by one in both the proposed framework from dataset [12].

Results Analysis : Here a result observed in experiment shows the computation performed. In the table 1 below, an observation is made over the given dataset with the existing greedy based technique, also the proposed technique MIDRA (META INFO DATA RULE ANALYSIS) is observed in table 1 and following results are observed.

Algorithm computation	Existing Accuracy in %	Proposed Accuracy in %	Existing technique Precision in %	Proposed Technique Precision in %
Identity 1	68.6	71.33	83.1	86.5
Identity 2	76	73.2	81.3	88.9
Identity 3	87	91.2	89	89.90

Table 1: Computational parameter result observed with existing algorithm

In the table 1 above, it shows the experiment and result observed from the performed **Precision in %** approach. It shows the experiment result in 2 parameters. A comparison graphical analysis is performed which shows the efficiency on computational of our proposed technique over existing Apriori algorithm[13,14]. On comparing the results of the existing and proposed algorithm we have conclude that the result of our proposed approach are better than the existing approach. Hence we can say that our proposed approach is better solution for the future use. Now we can see the variations in the existing as well as our proposed approach.

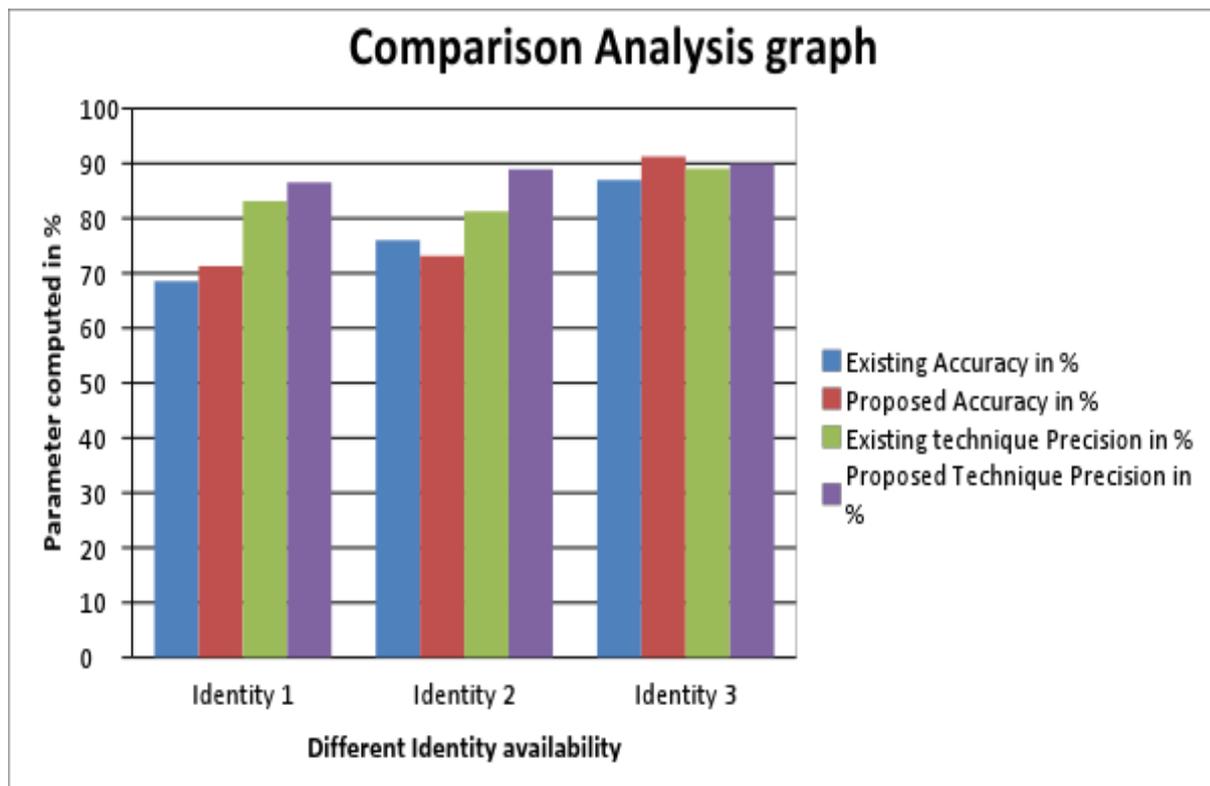


Figure: Comparison graph between given parameters

Conclusion: & Future work

Power consumption is an important research which is regardless of the type of connection behind an IoT product, minimizing power use can be a challenge. However, it is also critical to keeping energy and component costs under control. Radios are a key component of the energy budget for IoT products and the strategies outlined above, combined with smart design and component selection, will help developers navigate the early days of product development to ultimately create cost-effective IoT products that last longer between charges. In the following proposed technique a presented approach which is based on ANN algorithm for noise removal and energy consumption monitoring is used. A Device data analysis, IoT energy consumption monitoring is used to understand smart home scenario. A large data with different classified dataset is again taken into consideration and processed using algorithm. The computation monitoring shows the effectiveness of approach while comparing with existing algorithm monitoring solution. A work which can further extend is hardware implementation and monitoring the traffic data real feed. Thus an enhancement can be done in this direction. As the discussion is made while working with textual and multi-media data to work towards data processing. Identifying Semantic, similar data textual and from the multiple format is done. A further aspect of working with is given here: A scenario with real time usage of the proposed technique can be taken into consideration, which can help in working with the generated online platform. Working with large dataset is also one of the future working direction, which can prove our work accuracy. Final version can further be computed with more available technique in the same area of computation. There are algorithm and concept which deals in automation, communication while working with IoT network. A further work is finding an algorithm, which can classify the data of given communication, performing decision based on the communication obtained data.

References

- [1] Jatinder Singh, Thomas Pasquier, Jean Bacon, Hajoan Ko, and David Eyers, "Twenty security considerations for cloud-supported Internet of Things", Internet Of Things Journal, IEEE 2015.
- [2] Md.Sarwar Kamal, Sazia Parvin, Kashif Saleem, Hussam Al-Hamadi, Amjad Gawanmeh, "Efficient Low Cost Supervisory System for Internet of Things Enabled Smart Home", ICC2017: WT04-5thIEEE International Workshop on Smart Communication Protocols and Algorithms (SCPA 2017).
- [3] Guanglou Zheng, Rajan Shankaran, Mehmet Orgun, Li Qiao, and Kashif Saleem, "Ideas and challenges for securing wireless implantable medical devices: A review," IEEE Sensors Journal, 2016.

- [4] Raja Wasim Ahmad, Abdullah Gani, Siti Hafizah Ab Hamid, Mohammad Shojafar, Abdelmuttlib Ibrahim Abdalla Ahmed, Sajjad A Madani, Kashif Saleem, and Joel JPC Rodrigues, "A survey on energy estimation and power modeling schemes for smartphone applications," *International Journal of Communication Systems*, 2016.
- [5] João Santos, Joel JPC Rodrigues, Bruno MC Silva, João Casal, Kashif Saleem, and Victor Denisov, "An iot-based mobile gateway for intelligent personal assistants on mobile health environments," *Journal of Network and Computer Applications*, vol. 71, pp. 194–204, 2016.
- [6] João Santos, Joel JPC Rodrigues, João Casal, Kashif Saleem, and Victor Denisov, "Intelligent personal assistants based on internet of things approaches," *IEEE Systems Journal*, 2016.
- [7] Qi Jing, Athanasios V Vasilakos, Jiafu Wan, Jingwei Lu, and Dechao Qiu, "Security of the internet of things: perspectives and challenges," *Wireless Networks*, vol. 20, no. 8, pp. 2481–2501, 2014.
- [8] John A. Stankovic, "Research Directions for the Internet of Things", National Science Foundation under grants CNS-1239483, CNS-1017363, and CNS-1319302. Copyright (c) 2014 IEEE
- [9] Design and Implementation of a Simple User Interface of a Smartphone for the Elderly 2014 IEEE 3rd global conferences on consumer electronics(GCCE)
- [10] Securing the IP-based internet of things with HIP and DTLS, April 2013
- [11] Directions for the Internet of Things 2014 IEEE
- [12] Omar Said, "Development of an Innovative Internet of Things Security System", *IJCSI International Journal of Computer Science Issues*, Vol. 10, Issue 6, No 2, November 2013
- [13] Thomas Kothmayr, Corinna Schmitt, Wen Hu, Michael Brunig, Georg Carle, "DTLS based Security and Two-Way Authentication for the Internet of Things", *Elsevier Journal of AdHoc Networks* in May 2013.
- [14] Z. Shelby, K. Hartke, C. Bormann, B. Frank, Constrained Application Protocol (CoAP), IETF draft, RFC Editor (March 2013).