ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 9| Issue: 5| May 2023|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2023: 8.224 || ISI Value: 1.188

GREEN INTERNET OF THINGS (G-IOT) FOR SUSTAINABLE ENVIRONMENT

Ravi Prakash[1], Dr. Gurjeet Singh[2]
[1]*Student of MCA 3rd Sem., Lords University, Chikani, Alwar, Rajasthan-301028*
[2]*Dean, Lords School of Computer Applications & IT, Lords University, Chikani, Alwar, Rajasthan-301028*

Article DOI: https://doi.org/10.36713/epra13324
DOI No: 10.36713/epra13324

ABSTRACT

The Internet of Things (IoT) revolution drives innovation in numerous fields of research and daily life by enabling anytime, everywhere access to data in fresh contexts. Through this innovation, there have been previously unheard-of connections between people, objects, places, organisations, and facilities. Despite the many advantages of IoT products and systems, creating, distributing, and using them requires a lot of energy and resources and is accompanied by rising amounts of solid and toxic waste. It is essential to effectively address issues like rising energy consumption, waste, and greenhouse gas emissions if we are to ensure that the potential adverse impacts of technological growth are kept to a minimum. For this reason, we are heading towards a more environmentally friendly future in which green technology, green IoT, and green economies will, respectively, replace current technology, IoT, and economies. This implies that there will be a vast array of potential enhancements to human welfare, which contribute to the development of a sustainable, intelligent world. This study examines the principles and functions of G-IoT in the advancement of society by examining its potential to enhance quality of life, the environment, economic growth, and green global modernization. It also analyses the significance of greening technologies' processes in sustainable development. It has been demonstrated that the G-IoT has the ability to revolutionize and bring about a variety of benefits in various industries using the most recent technological approaches and solutions, while also eradicating or greatly reducing the detrimental effects on the well-being of humans and the environment.

KEYWORDS: ***Sustainable Environment, Artificial Intelligence, G-IOT, Green-IOT***

1. INTRODUCTION

The element in the process of the providing a seamless communication and services consumes more power triggering the sustainability concerns [1]. The energy consumption of the internet of things also introduces toxic pollution and E-waste that affects the surroundings and the ecosystem. The Internet is a reality that is constantly changing, with major changes happening every day. Internet access and broadband connections are easily accessible thanks to their low cost and accessibility. There are more Internet-connected biases now than ever before, which benefits the Internet's effects. The ability to provide better services to the environment as new data becomes available, along with an expansion of the web through the incorporation of physical things, is what powers the Internet of Effects. The consequences then apply to embedded devices that have detectors that can gather, store, and analyse data. Data may be transferred for processing and simplified software can be uploaded as well as operated remotely because they are connected to the Internet. It is anticipated that by 2050, nearly 70% of the world population will live in cities as a consequence of increased levels of urbanization and accelerating migration [11]. The phrase "Internet of effects" refers to a variety of technologies and research fields that enable global connectivity over the vast physical items of the planet. IoT objects are capable of transferring data, exchanging information, and communicating with one another. Consequently, the IoT is viewed by many as the best solution for obtaining perception of real-world physical processes in real-time. The IoT will be built on technologies like RFID (radio-frequency identification), detector networks, biometrics, QR canons (Quick Response canons), and nanotechnologies. In this future, information and communication systems will be covertly incorporated into the environment around us to address a variety of operations, such as smart grid, e-health, intelligent transportation, etc. While retaining the necessary sequestration, IoT fully utilises effects to provide services to all types of processes. Physical and virtual effects have individualities, physical attributes, and virtual personalities, use intelligent interfaces, and integrate seamlessly into the facts network in this dynamic, global network structure with tone-configurability capabilities. In the development process of high-end manufacturing industry, Smart Park has become a new trend and new requirement for the development of industrial park. With the promotion of comprehensive national strength, we are improving our quality-of-life step by step. But at the same time, we cannot damage the ecological environment [2, 6].

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 9| Issue: 5| May 2023|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2023: 8.224 || ISI Value: 1.188

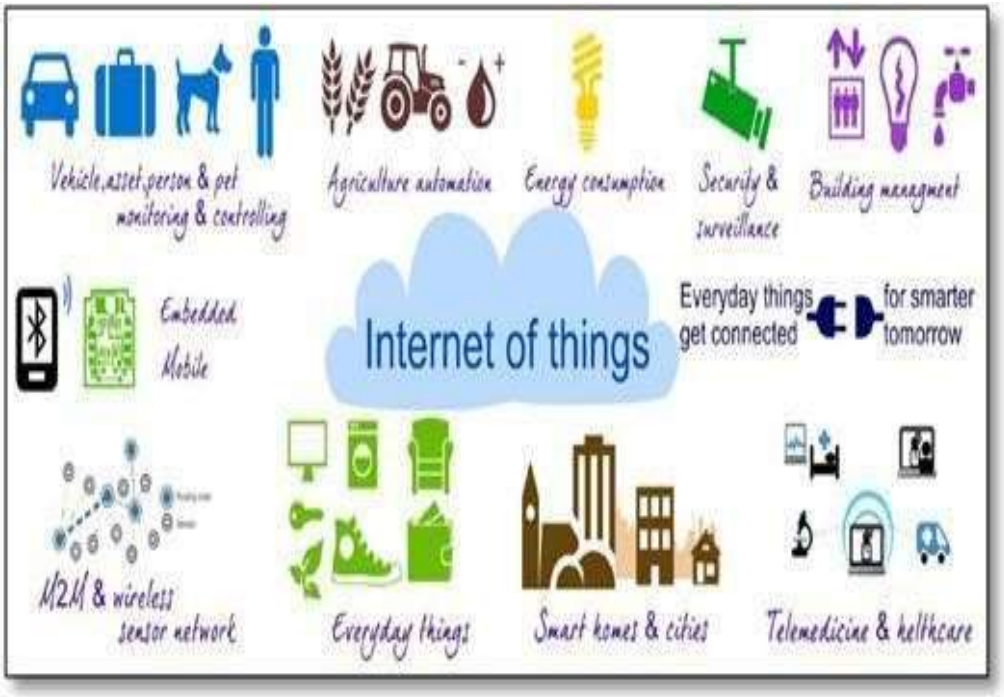

Fig.1: Internet of Things

The fundamental tenet of the Internet of Things is that everything around us—from little homes to enormous buildings, basic household items to complex technological systems, man-made relics to inanimate objects—could be connected, sensed, and jointly communicated across the Internet. The IP address of every IoT-connected equipment will serve as a unique link between them. These items' intelligence will be detected. Micro electromechanical systems (MEMS) used in these detectors will react to changes in temperature, sound, moisture, pressure, agitation, light, time, weight, etc., and execute the appropriate action that has been programmed into them. The Internet of Everything is a system that has been proposed, in which every day inanimate objects like machinery and appliances, as well as people and other living things, will be connected to a network and be able to exchange data.

Absent human involvement, objects and robots will be able to engage and send dispatches to one another. The creation of a system of systems by connecting billions of devices, vehicles and infrastructure everywhere in a city, enable stakeholders to reduce carbon emission, decrease energy and water consumption, increase safety efficiency, and human well-being [10].

2. MATERIAL AND METHOD

The literacy-based algorithms improve the network's efficiency in terms of opinions since they carry out specific actions based on gestures and training materials. Similar methods are crucial for IoT-based dispatches to carry out complicated tasks at the lowest possible cost to the network. In an opportunistic network, an efficient routing protocol with a strong foundation in knowledge of machines was put forth. The proposed solution calculates the likelihood of successful deliveries using a neural network and decision tree. The machine literacy model is trained based on several criteria, and simulation results show that it performs better than other workshop models in terms of successful delivery rates, charges, and packet drop rates. In order to provide real-time processing and reduce the required number of edge bumps, planting edge calculating bumps for large-scale IoT was proposed. The result suggests a three-phase rollout strategy and considers both the IoT's commercial and wireless diversities. In comparison to alternative approaches, the suggested solution reduces the amount of edge bumps and enhances network performance. A dynamic routing opinion-inducing protocol called k- means clustering grounded routing protocol for opportunistic networks that is based on network properties has been presented. The suggested outcome makes use of machine learning techniques [12-17] to provide an improved k-means clustering method for training the network features and chooses the best coming-hop. In terms of hop count, above, delivery rates, and drop rates, the outcome enhances network performance. However, the study does not take into account network conditions or protection against dangerous bumps. As a result, the technique reduces the secrecy and integrity of the network performance. The removal of network irregularities, such as business traffic, from the outcomes of routing is the goal of a real-time deep literacy strategy for intelligent business control. Deep convolutional neural networks with specially dispersed inputs and labours are utilised in the proposed method. Comparing this method to conventional routing protocols, the network detention and packet detention rates are reduced. However, the technique continues to drain detectors' coffers of fresh energy due to a deluge of control dispatches. Additionally, trustworthy dispatches between the bias are ignored, which exposes data and compromises network security. The application of the green technologies is utilized in the following applications such as the industrial automation [3] [9]; it is highly utilized in the agriculture [4] to make it more sustainable. The green technologies also take a vital role in the smart cities development to make it more sustainable and safer [5] [7]. The

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 9| Issue: 5| May 2023|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2023: 8.224 || ISI Value: 1.188

sustainability in the supply chain is achieved by employing the green internet of things [8].

2.1 Research Gap

The existing literature acknowledges the benefits of green technologies but lacks details on challenges and limitations. Further research is required to explore barriers in implementing green technologies across different domains, including technical, economic, and regulatory challenges. It also emphasizes the need to evaluate the environmental impact and energy efficiency of green technologies through empirical studies. The concept of the "green IoT" is briefly mentioned, prompting the investigation of its specific applications and advantages in achieving sustainability. Integrating IoT devices with green technologies can improve resource efficiency and overall sustainability. Closing the research gap will foster the development of environmentally friendly solutions in various fields.

3. RESULT AND DISCUSSION

By strategically delivering active ingredients, nanotechnology as well as nano materials in husbandry aim to reduce the quantity of dispersed substances, minimise nutrient losses in fertilisation, and boost yields through optimised water and nutrient use. It is being investigated whether factory parentage and inheritable metamorphosis are based on nanotechnology bias. For use in bio industrial applications, bio nano composites with improved physical-mechanical properties can be created based on conventionally obtained materials. Crop products, factory protection items, and diseases are among the agricultural nanotechnology activities that are most suitable. The primary industrial goods and diseases based on nanotechnology include viral capsids, nano particles, nano emulsions, and nano capsules. They serve as intelligent delivery devices for nutrients or active ingredients utilised in the complaint and pest control of stores. Nano fertilisers are being widely used.

The large amount of attention and considerable research has been devoted to the evolving communications architectures, green wireless communication, energy efficient routing, relay selection strategies for green communication, energy efficient packet forwarding, and networking games [18].Nitrogen and potash diseases, nano porous zeolite, zinc nano fertilizer, nano herbicide, and nano pesticide are the primary representations. Soil improvement Nano materials can be used for liquid or water retention. Zeolites and nano clays are two examples of how the process works. Zeolites are utilised to retain water or liquid agrochemicals in the soil for their delayed release to the shops, while nano clays can be employed as pollutants to remove a variety of hazardous compounds from the environment. Purification of water and removal of contaminants Nano materials and nano clays can be employed as pollutants to remove various harmful elements from the environment. People Nano sensors, which include electrochemically active carbon, nano fibers, fullerenes, wireless detectors, and smart dust technologies, can be used to monitor the environment, factory health, and growth. Factory-born parents For the transport of DNA or RNA to plant cells, for their inheritable transformation, or to trigger defence responses triggered by pathogens, nano materials can be utilised as carriers. Materials made of nanotechnology Nano materials can be created via tinkered factories, microorganisms, and the processing of agricultural product waste. The major goal of using green nano materials in modern husbandry is to eliminate the use of environmentally hazardous inputs, minimise the waste of expensive fertilisation, and boost input efficiency and yields through need-based management. Green nano materials are accessories created using concepts that are beneficial to the environment. These accessories are essential for reducing GHG emissions to the climate, with the husbandry sector releasing significantly less carbon dioxide (CO2), nitrous oxide (N2O), and methane (CH4). Green nano materials also reduce issues with agricultural practises related to human health and the environment in a changing climate, improve food and nutrient security, and raise agricultural production as required by the rapidly growing world population. In conclusion, safe and energy-efficient products and processes, less waste, decreased GHG emissions, and utilisation of renewable resources are the primary characteristics of green nanotechnology conception. Green Internet of Nano Effects (G-IoNT), a symbiotic method of G- IoT and Green nanotechnology, holds an inherent to make a full world of outstanding breakthroughs in the husbandry sector. Green nano particles, nano sensors, nano robots, and other green nano devices linked with G-IoNT provide a completely new landscape for the 21st century's transformation in animal husbandry and food assiduity.

4. CONCLUSION

Due to the expanding global population and climate change, the agriculture industry and food security are currently experiencing enormous problems. Therefore, the use of IoT and nanotechnologies in this industry can significantly help to address the problem of sustainability. However, just as with the use of any new technology, a trustworthy threat-benefit analysis as well as a thorough cost account analysis must be conducted. Nanotechnology and Internet of Things use in farming and food production has drawbacks akin to implicitly harmful influence on the soil, biodiversity, and water sources, as well as higher GHG emigration rates. As a result, new technical methods such as green nanotechnology and the internet of things (IoT) were created as suitable solutions for efficient and intelligent animal husbandry. The advantages of G-IoT operation in husbandry include increased soil fertility, more effective application of water and diseases, fungicides, and dressings, diversifying of crops and animals, as well as use of automated ranch ministry. This ultimately results in a substantial decrease of the adverse impact of IoT on the terrain, successfully addressing the impact of climate change, which is the biggest problem in the agrarian paradigm. On the opposite hand, green nanotechnology is essential for reducing GHG emissions into the atmosphere, agrarian practises that are harmful to human health and the environment, and a rise in food and nutritional security. G-IoNT, created by combining G- IoT and Green nanotechnology, will considerably help to revolutionise husbandry practises and approaches, making the husbandry sector and food production more efficient, safe, and sustainable as a way forward.

ISSN (Online): 2455-3662
EPRA International Journal of Multidisciplinary Research (IJMR) - Peer Reviewed Journal
Volume: 9| Issue: 5| May 2023|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2023: 8.224 || ISI Value: 1.188

5. REFERENCES

1. *Bol, David, Julien De Vos, François Botman, Guerric de Streel, Sébastien Bernard, Denis Flandre, and Jean-Didier Legat. "Green SoCs for a sustainable Internet-of-Things." In 2013 IEEE Faible Tension Faible Consommation, pp. 1-4. IEEE, 2013*
2. *M. Mozaffari, W. Saad, M. Bennis, and M. Debbah, "Mobile unmanned aerial vehicles (UAVs) for energy-efficient Internet of Things communications," IEEE Transactions on Wireless Communications, vol. 16, no. 11, pp. 7574–7589, 2017.*
3. *Shaikh, Faisal Karim, Sherali Zeadally, and Ernesto Exposito. "Enabling technologies for green internet of things." IEEE Systems Journal 11, no. 2 (2015): 983-994.*
4. *Maksimović, Mirjana, and Enisa Omanović-Mikličanin. "Green internet of things and green nanotechnology role in realizing smart and sustainable agriculture." In VIII International Scientific Agriculture Symposium "AGROSYM 2017, pp. 2290-2295. 2017.*
5. *Maksimovic, Mirjana. "The role of green internet of things (G-IoT) and big data in making cities smarter, safer and more sustainable." International Journal of Computing and Digital Systems 6, no. 04 (2017): 175-184.*
6. *D. Zhang, L. T. Yang, M. Chen, S. Zhao, M. Guo, and Y. Zhang, "Real-time locating systems using active RFID for Internet of Things," IEEE Systems Journal, vol. 10, no. 3, pp. 1226–1235, 2017.*
7. *Silva, Bhagya Nathali, Murad Khan, and Kijun Han. "Towards sustainable smart cities: A review of trends, architectures, components, and open challenges in smart cities." Sustainable Cities and Society 38 (2018): 697-713.*
8. *Manavalan, E., and K. Jayakrishna. "A review of Internet of Things (IoT) embedded sustainable supply chain for industry 4.0 requirements." Computers & Industrial Engineering 127 (2019): 925- 953.*
9. *Zarei, M., Mohammadian, A. and Ghasemi, R., 2016. Internet of things in industries: A survey for sustainable development. International Journal of Innovation and Sustainable Development, 10(4), pp.419-442.*
10. *Sierra Wireless, "Make Cities Safer and More Efficient with Smart City Technology," [Online]:*
11. *M. Kube, "What was new in smart city tech at MWC17?," Gemalto, 2017. [Online]: https://blog.gemalto.com/iot/2017/03/03/new-smart-city-techmwc17/.*
12. *Singh, G., & Nager, P. (2012). A case Study on Nutek India Limited Regarding Deep Falling in Share Price. Researchers World--Journal of Arts, Science & Commerce, 3(2), 3.*
13. *Singh, Dr. Gurjeet, An Analysis of Outliers for Fraud Detection in Indian Stock Market (January 2, 2022). Nagar, P., & Singh, G. (2012). An Analysis of Outliers for Fraud Detection in Indian Stock Market, Researchers World : Journal of Arts, Science and Commerce, Vol.-III, Issue 4(4), 10-15., Available at SSRN: https://ssrn.com/abstract=3998394*
14. *Nagar, P., & Issar, G. S. DETECTION OF OUTLIERS IN STOCK MARKET USING REGRESSION ANALYSIS.*
15. *Singh, G. (2022). Machine learning models in stock market prediction. arXiv preprint arXiv:2202.09359.*
16. *Singh, G., Kalra, N., Yadav, N., Sharma, A., & Saini, M. (2022). SMART AGRICULTURE: A REVIEW. Siberian Journal of Life Sciences and Agriculture, 14(6), 423-454.*
17. *Singh, G. (2023). Earthquake Prediction using Convolutional Neural Network. Disaster Advances, 16(6), 45-52. https://doi.org/10.25303/1606da45052*
18. *M. Maksimovic, Greening the future: Green Internet of Things (G-IoT) as a key technological enabler of sustainable development, Chapter in book: Internet of Things and Big Data Analytics toward Next Generation Intelligence (eds. N. Dey, A. E. Hassanien, C. Bhatt, A.S. Ashour, S. C. Satapathy), Studies in Big Data, Springer, 2017. in press.*