IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 9, Issue 3, March 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.488

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.488 |

|| Volume 9, Issue 3, March 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0903168 |

Urban Forest Automation and Unauthorized Restrictions Using IOT

Hariharan.T [1] , Pranith Kumar.V [2], Sujaya.S.N [3], Shiny R.M [4]

UG Student, Department of Computer Science and Engineering, Velammal Institute of Technology, Chennai, Tamilnadu, India [1,2,3]

Assistant Professor, Department of Computer Science and Engineering, Velammal Institute of Technology, Chennai, Tamilnadu, India [4]

ABSTRACT: Rapid urbanization, population growth and rural-to-urban migration, especially in fast-developing economies haveresulted in a fast decline in forest cover and green space in a large number of urban centers around the world. Recent reports suggest that Chennai has a green cover of only 20.6% and has a declining trend of dense and very-dense forests. In fact, India ranks one of the highest among the large countries in terms of reduction in tree cover extent. This is an alarming situation and does not bode well for human health and ecosystem, in general. Immediate and long-lasting steps are needed to check the diminishing green cover in most ofthe metropolitan cities of the world.

Thus it is important to increase the forest cover even in urban areas. One of the method to increase the forest cover in urban areas is through Miyawaki method. This main objective of this method is to increase the forest cover by using the unutilized lands in urban areas and thus it is possible to create forests within 20-30 years if it is efficiently maintained. This project will try to increase the tree cover extent in urban areas, maintain them and even protect those from unauthorized persons.

KEY WORDS: IoT, Wireless Sensor Networks, Miyawaki forests.

I. INTRODUCTION

The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines or objects that are provided with unique identifiers and the ability to transfer data over a network without requiring human - to-human or human-to-computer interaction. A thing in the internet of things can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an Internet Protocol (IP) address and is able to transfer data over a network.

An IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors and communication hardware, to collect, send and act on data they acquire from their environments. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analysed or analysed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another. The devices do most of the work without human intervention, although people can interact with the devices - for instance, to set them up, give them instructions or access the data. The connectivity, networking and communication protocols used with these web-enabled devices largely depend on the specific IoT applications deployed. IoT can also make use of Artificial Intelligence (AI) and Machine Learning to aid in making data collecting processes easier and more dynamic. The internet of things helps people live and work smarter, as well as gain complete control over their lives. In addition to offering smart devices to automate homes, IoT is essential to business. IoT provides businesses with a real-time look into how their systems really work, delivering insights into everything from the performance of machines to supply chain and logistics operations. IoT enables companies to automate processes and reduce labour costs. It also cuts down on waste and improves service delivery, making it less expensive to manufacture and deliver goods, as well as offering transparency into customer transactions. As such, IoT is one of the most important technologies of everyday life, and it will continue to pick up steam as more businesses realize the potential of connected devices to keep them competitive.

IoT encourages companies to rethink the ways they approach their businesses and gives them the tools to improve their business strategies. Generally, IoT is most abundant in manufacturing, transportation and utility organizations, making

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.488 |

|| Volume 9, Issue 3, March 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0903168 |

use of sensors and other IoT devices; however, it has also found use cases for organizations within the agriculture, infrastructure and home automation industries, leading some organizations toward digital transformation. IoT can benefit farmers in agriculture by making their job easier. Sensors can collect data on rainfall, humidity, temperature and soil content, as well as other factors, that would help automate farming techniques.

The ability to monitor operations surrounding infrastructure is also a factor that IoT can help with. Sensors, for example, could be used to monitor events or changes within structural buildings, bridges and other infrastructure. This brings benefits with it, such as cost saving, saved time, quality-of-life workflow changes and paperless workflow. A home automation business can utilize IoT to monitor and manipulate mechanical and electrical systems in a building. On a broader scale, smart cities can help citizens reduce waste and energy consumption. IoT touches every industry, including businesses within healthcare, finance, retail and manufacturing.

Some of the advantages of IoT include the following:

- ability to access information from anywhere at any time on any device;
- improved communication between connected electronic devices;
- transferring data packets over a connected network saving time and money; and
- automating tasks helping to improve the quality of a business's services and reducing the need for human intervention.Some disadvantages of IoT include the following:
- As the number of connected devices increases and more information is shared between devices, the potential that a
hacker could steal confidential information also increases.
- Enterprises may eventually have to deal with massive numbers – may be even millions - of IoT devices, and collecting andmanaging the data from all those devices will be challenging.
- If there's a bug in the system, it's likely that every connected device will become corrupted.
- Since there's no international standard of compatibility for IoT, it's difficult for devices from different manufacturers tocommunicate with each other.

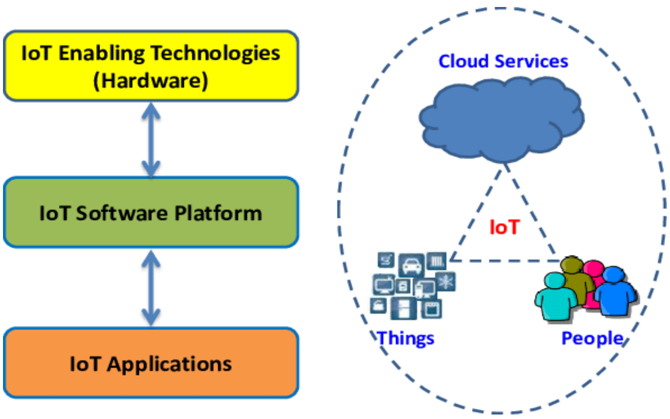

Fig 1 :Architecture of IoT

II. LITERATURE SURVEY

In the year 2017, Hong Sun a , Xin Tian a, Zengyuan Li investigated forest changes over Jinhe town of Inner Mongolia among 2001, 2004, 2008, 2013 and 2015 by use of multi-temporal Landsat Thematic Mapper-5 (TM), Chinese high

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.488 |

|| Volume 9, Issue 3, March 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0903168 |

resolution satellite data, Gaofen-1 (GF-1) remote sensing and forest inventory data. Vegetation fractional coverage (VFC) was extracted by the dimidiate pixel model. Forest above-ground biomass (AGB) was estimated by k-nearest neighbor (k-NN) with fast iterative features selection (KNN- FIFS). The results showed that, due to the serious forest fire disaster which taken plaihquce in 2003, the local VFC declined in the high level (60% <VFC<=80%) areas which decreased by 786.33km^2 , accounting for 17.90% of the total area. Further analysis for the years after the fire showed that the forest recovered well, with the high level areas increasing to 2977.99 km2 in 2015. The total forest AGB was increased from 1,792,900 tons in 2008 to 1,903,000 tons in 2013, with an average annual growth of 300,200 tons.

Water is a limited resource that is essential for sustaining life but is often wasted. By monitoring water consumption in realtime, users become aware of the amount of water that they utilize. In the year 2018 James Adrian B. Somontina, Felan Carlo C. Garcia presented a water monitoring system that determines the volume of water consumed for the following events: use of faucets, toilet flush, and shower. The system utilized a non-intrusive, single point sensing technique. The sensor was interfaced to a microcontroller to monitor fluid dynamics in real-time. Data was collected and processed by a microcomputer that uploads to a graphics user interface for easy viewing and online access. Random forest was used so that the system can identify and determine how much water each faucet or fixture uses. The volume of water used for every event was determined with 92.91 % accuracy and the fixture recognition algorithm resulted in 63% precision.

In the year 2020, Shivam Pareek , Shreya Shrivastava , Sonal Jhala proposed a system to monitor forest using IoT and image processing. Forests are the indispensable resource of our life as they cover one third of the land on earth. They provide us with plenty of amenities required to sustain our life. However, for the past few decades, the forest area has been degrading immensely. Recently forest fire has become the greatest menace to our planet. In 2019 Amazon rainforest wildfire destroyed thousands hectors of forest. To get a control over it, a well-organized forest monitoring system is created. This system is based on the emerging technology of IoT and image processing. In our system, these technologies are utilized with the Wireless Sensor Network (WSN). This system provides a continuouslive data of the forest environmental conditions.

Several important issues are affecting the forest environment due to deforestation and natural disasters (for example forest fires, or increased gas emissions). In the year 2019, Alina-Elena Marcu, George Suciu, Elena Olteanu proposed an intelligent forest environment monitoring solution based on the Raspberry Pi Model 3, analogical and digital sensors and signals analysis algorithms. Parameters such as temperature, gas concentrations, soil humidity etc. are monitored with sensors while background sounds are analyzed with a classification algorithm on the basis of which the generated event can be classified into one of the following categories: Chainsaw, Vehicle, or Forest background noise. The user's accessibility to the collected data is ensured via Internet and a mobile applications that allows the user to receive notifications, whenever fire, pollution sources, or illegal deforestation are detected. The Sea Forest environment monitoring solution is an IoT project, addressed to public and private forest owners as well as to national environmentaland disaster response authorities.

Vegetation phenology is the timing of seasonal events, such as the onset and offset of green-up, that can be used to monitor the response of climate variations on short- and long-term periods. In particular, accurate detection of seasonal phonological events is an important variable in ecosystem simulation models and general circulation models based on the regional and global climate conditions. However, phonological filed observation is collected in limited areas and time periods. In the year 2018 Bora Lee, Eunsook Kim, Jong- Hwan Lim, Bumsuk Seo proposed an alternative approach has using satellite remote sensing data, it allows for the most efficient spatial- temporal observation. A remote sensing-based vegetation index (VI) has been used to monitor phonological and seasonal changes in vegetation development. The normalized difference vegetation index (NDVI) and enhanced vegetation index (EVI) are most widely used. Forest ecosystems account for 63.7% of land area in South Korea, covered by deciduous, coniferous, and mixed forest types. Seasonal change in coniferous forest is not easily observed compared to deciduous trees, the start of the growing season is different. Homogeneity of the target area is essential to accurate phenology based on the remote sensing vegetation index. However, the pixel size between the remote sensing pixel and filed survey point is often unmatched in many regions. An adapted method required to extract phenology from one pixel including various ecosystem types. Our objectives were: 1) Test three different methods for extracting phenology events, particularly at the start of growing season (SOS); 2) determine whether NDVI or EVI represent the phenology of forest ecosystems; 3) match a resized digital forest type map to remote sensing pixel size; and 4) find the represented pixel among the pixels of the field observation location and eight neighbors.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.488 |

|| Volume 9, Issue 3, March 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0903168 |

III. PROPOSED METHODOLOGY AND DISCUSSION

Existing system and it's drawbacks: As population is growing day by day, natural resources are getting exhausted. It is our responsibility as an individual to help and save our natural resources. Water scarcity is increasing at an alarming rate. A large amount of water is unnecessarily wasted while irrigating the fields which create water logging. The growth of the crop is stalled since adequate amount of water is not supplied to it. Moisture content is also not known. No light in the forest during the night time makes it difficult for the authorized users to maintain them. These are the things which are very challenging to maintain the forest. The present existing system needs manual labor for monitoring the forest. There are even high chances of wrongly passing the messages between the authorities. Thus the proposed system aims to manage the forest without much human intervention involved using IoT.

Proposed system : The project uses the automated system for maintaining the forest. The system consists of water level sensor, soil moisture sensor, LDR sensor and a fingerprint sensor. The system supplies water to the plants automatically whenever it is required. The water level in the common tank is also monitored using water level sensor. With the help of IoT the system passes the information to the authority to fill the tank when the water level is low. The moisture content in the soil is also monitored by soil moisture sensor. Based on the moisture level, water can be supplied accordingly. During the night time, LDR sensor is attached to the system which provides the necessary light to the forest based on the intensity required. The project also provides the security to the urban forest by using biometric system which allows only the authorized persons to enter into the forest. With the help of IoT, this system collects the details of the authorized persons and stores it in the database. The system checks whether the fingerprint matches with the data stored in the database and opens the gate to enter them into the forest.

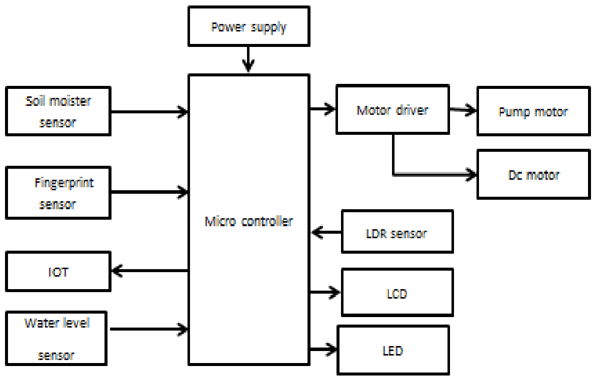

Figure 2 : Architecture Diagram

LDR sensor module

- LDR stands for Light Dependant Resistor.
- This sensor works on the principle of photo conductivity.
- The LDR sensor emits light whenever it can't sense any light source around it. This can be used to provide the necessary lightduring night time in the forest.
- Some of the other real time applications of this sensor are street lamps, alarm clock, burglar alarm etc.,

Moisture level detection module

- The moisture level sensor detects the amount of moisture content present in the soil.
- If the moisture content of the soil is in shortage the analog values goes high and the plants in the forest are watered.
- If the moisture content of the soil is high then it shows low analog values and doesn't water plants.
- Thus the sensor automates the watering system for plants using the moisture content values of the soil.

Water level detection module

- Level sensors detect the level of substances that flow including liquids, granular materials and powder.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.488 |

|| Volume 9, Issue 3, March 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0903168 |

- There are two types of level sensors - continuous and point values.
- This systemuses point value water level sensor to detect whether the water level in the tank is high or low.
- This module aims to detect the level of water in the tank and update the details to the required authorities.

Authentication module

- This module aims to provide security to the forest by allowing only the authenticated users.
- It uses biometric systemto authenticate persons inside the forest.
- The finger prints to be authenticated are stored initially.
- During authentication it verifies the individual's finger print to let the gate open.
- The datas are updated to the required authorities on a routine basis.

IV. EXPERIMENTAL RESULTS

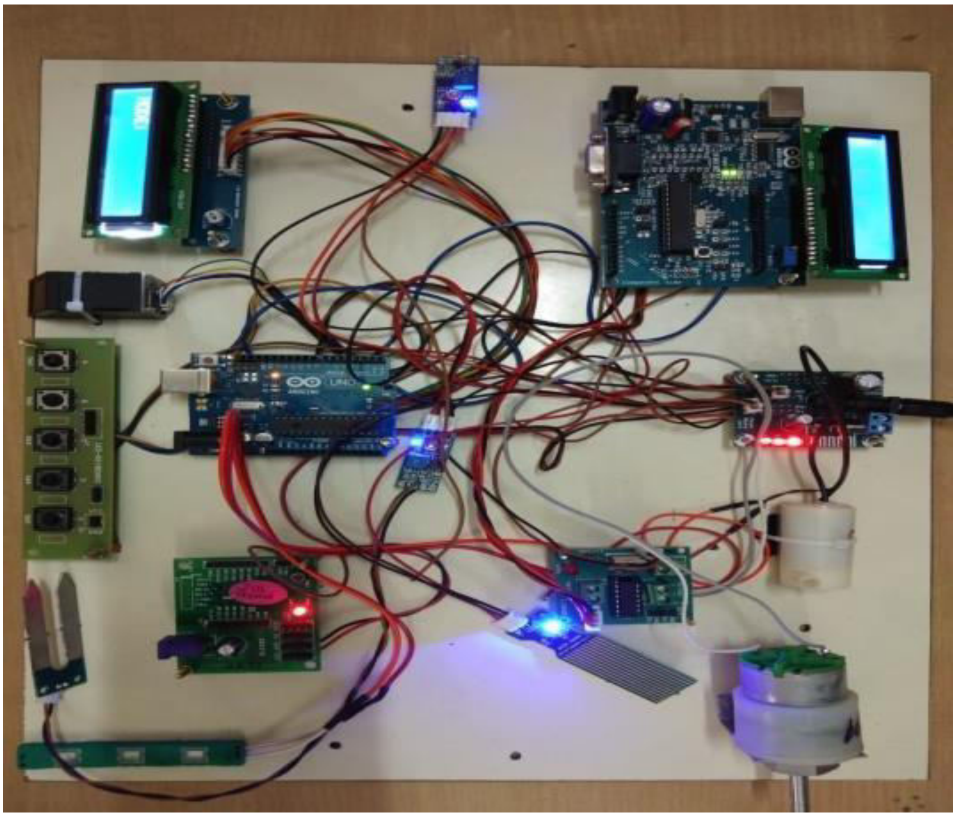

Figure 3 : Overall view of Forest Monitoring System

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.488 |

|| Volume 9, Issue 3, March 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0903168 |

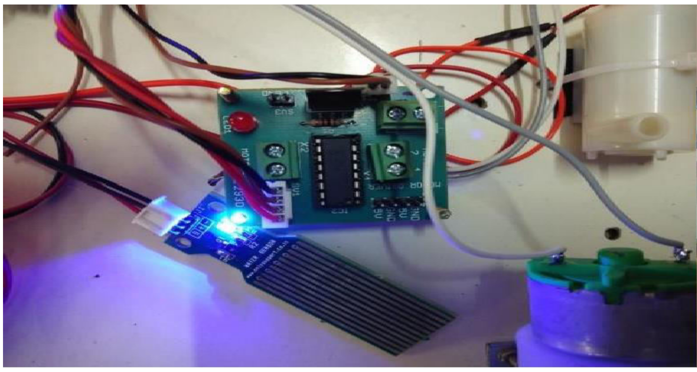

Figure 4 : Water level detection module

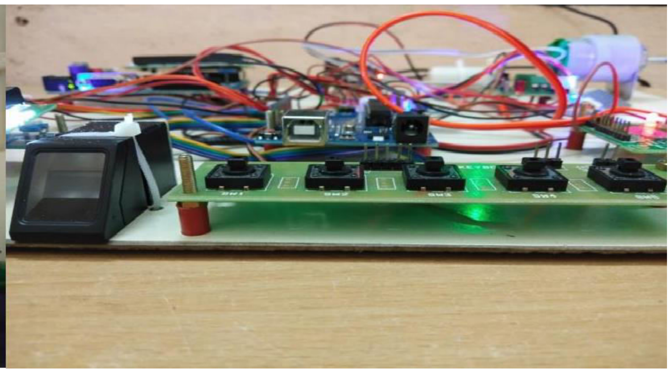

Figure 5: Authentication module

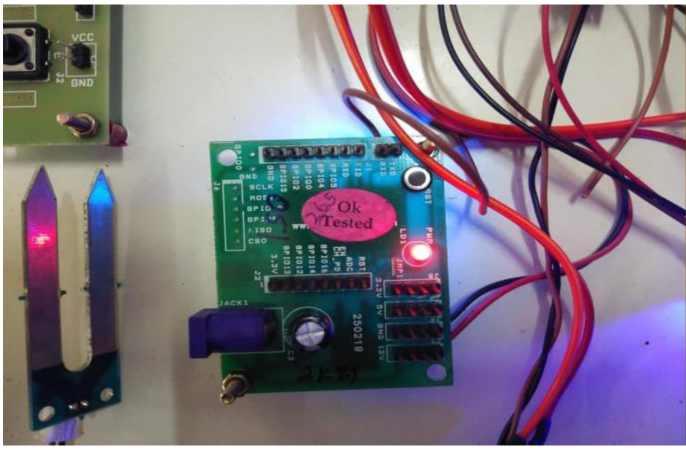

Figure 6: Soil moisture level detection module

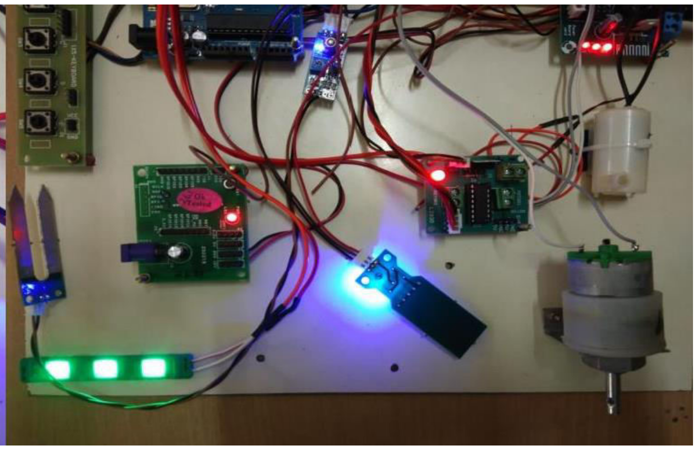

Figure 7: LDR sensor module

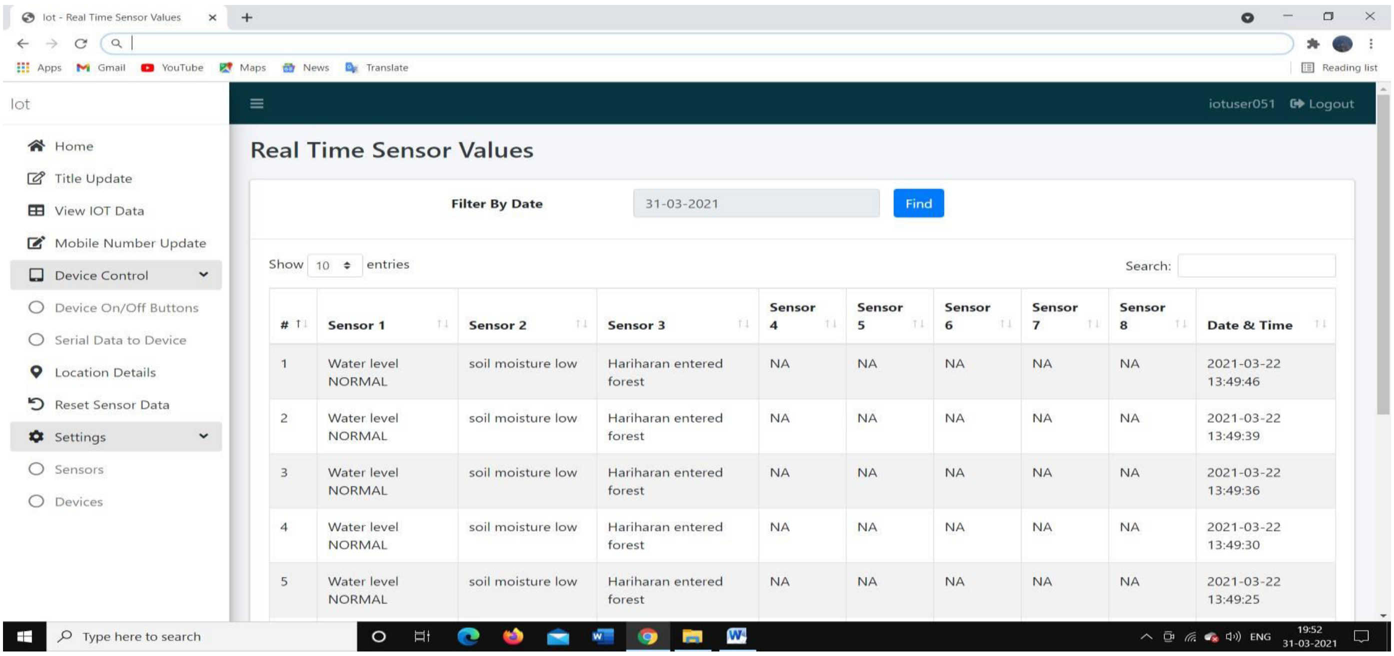

Figure 8: Updated real time sensor values

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 7.488 |

|| Volume 9, Issue 3, March 2021 ||

| DOI: 10.15680/IJIRCCE.2021.0903168 |

V. CONCLUSION AND FUTURE ENHANCEMENTS

The proposed system tries to monitor and maintain the forest using IoT. It authenticates only the authorized persons to enter the forest, waters the plants automatically when required, provides light during night for better security and also detects the level of water in the tank. These values are also passed as a message to the authorities to monitor. Through this method it is able to reduce the manual work for maintaining the forests.

The future work of the project is to implement all these functions in real time. Some of the future works includes fixing these sensors in the urban forests created and trying to monitor the forests without much of human work force, trying to provide a better security along with the biometric system present, implementing the whole forest system in a large level. The future works must also aim to increase the forest cover extent by using unutilized lands in urban areas and monitor those using an integrated forest automation system.

REFERENCES

[1] Zunjian Bian, Biao Cao, Hua Li, Wenjie Fan, Qing Xiao and Qinhuo Liu IEEE 2020. "The Effects of Tree Trunks on the Direct ional Emissivity and Brightness Temperatures of a Leaf – Off Forest Using a Geometric Optical Model "

[2] N.Ahmed, D. De and I. Hussain, "Internet of Things (IoT) for smart precision agriculture and farming in rural areas", IEEE Internet Things J., vol.5, no.6,pp. 4890 – 4899, Dec 2018.

[3] Arasvathi, Nahalingham and Chelsea, Ferdyanti Kosasih "Study and Implementation of Internet of Things (IoT) Based Forest Fire Automation System to Detect and Prevent Wildfire". INTI Journal, 1 (15), pp. 1-5, 2018.

[4] Average Water Use Per Person Per Day, data360.org, viewed 8 June 2018, .

[5] Bayo, A., Antolin, D., Medrano, N., Calvo, B., and Celma, S., "Development of a Wireless Sensor Network Systemfor Early Forest Fire Detection", Smart Objects: Systems, Technologies and Applications (RFID Sys Tech), VDE CONFERENCE PUBLICATIONS, pp.1–7, 2010.

[6] D. T. Bui et al, "A hybrid artificial intelligence approach using GISbased neural-fuzzy inference system and particle swarm optimization for forest fire susceptibility modeling at a tropical area", Agricultural and forest meteorology, 233, pp.32-44, 2017.

[7] T. Cao – hoang and C. N. Duy, "Environment monitoring system for agricultural application based on wireless sensor network," in 2017 Seventh International Conference on Information Science and Technology (ICIST), Da Nang, 2017, pp. 99 -102.

[8] Caruana and A. Niculescu-Mizil, "An Empirical Comparison of Supervised Learning Algorithms," Cornell University, Ithaca, New York, USA.

[9] V. Chowdary and M. K. Gupta," Automatic Forest Fire Detection and Monitoring Techniques: A Survey", Intelligent Communication, Control and Devices, pp.1111-1117,2018.

[10] CUI Dong-xu, LI Wen-bin, ZHANG Jun-guo, The Monitoring of Host Computer for Forest Fire Detection System based on Wireless Sensor Network [J].Computer Science , vol.26, n 9, 2009, pp. 26-29.

[11] M. S. Farooq, S. Riaz, A. Abid, K. Abid and M. A. Naeem, " A survey on the role of IoT enabled agriculture for implementation of smart farming", IEEE Access, vol 7,pp. 15637 – 156271, 2019.

[12] J. Froehlich, E. Larson, T. Campbell, C. Haggerty, J. Fogarty, and S. Patel 2009. "HydroSense: infrastructure-mediated single-point sensing of whole-home water activity". In Proceedings of the 11th international conference on Ubiquitous computing (UbiComp '09). ACM, New York, NY, USA.

[13] Human Development Report 2006, United Nations Development Program.

[14] I. Krivtsova et al. "Implementing a broadcast storm attack on a missioncritical wireless sensor network" In: InternationalConference on Wired/Wireless Internet Communication, 2016. p. 297-308.

[15] Mu, S.J., J.L. Li, Y.Z. Chen, et al. ³Spatial Differences of Variations of Vegetation Coverage in Inner Mongolia during 2001-2010´Journal of Geographical Sciences, Science Press, China, pp. 1255-1268, 2012.

[16] Son B., Her Y., Kim J., "A Design and Implementation of Forest Fire Surveillance System based on Wireless Sensor Network for South Korea", International Journal of Computer Science and Network Security, Vol 6 No. 9B, September 2006.

[17] Weidang Lu, Xiaohan Xu, Guoxing Huang, Bo Li, Yuan Wu, Nan Zhao, F. Richard Yu IEEE 2020. "Energy EfficiencyOptimization in SWIPT Enabled WSNs for smart agriculture".

[18] Yan, M., Z.Y. Li, E.X. Chen, et al. ³Changes in Vegetation Fraction of Root River Forest Reserve in Daxinganling of InnerMongolia, ´Chinese Journal of Ecology, Science Press, China, pp. 508-515, 2016.

[19] Yongsheng L., Yu G., Guolong C., Yusheng J., Jie L." A Novel Accurate Forest Fire Detection System using Wireless SensorNetworks", Seventh International Conference on Mobile Ad-hoc and Sensor Networks, IEEE Computer society, pp.-52-59, 2011.