e-ISSN:2582-7219

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

Volume 7, Issue 4, April 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.521

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly, Peer Reviewed & Referred Journal|

| Volume 7, Issue 4, April 2024 |

| DOI:10.15680/IJMRSET.2024.0704006 |

UV Index Monitoring System

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ABSTRACT: The "UV Index Monitoring System using IoT" is a comprehensive research work aimed at addressing the critical need for real-time monitoring of Ultraviolet (UV) radiation levels and environmental conditions. The system employs the Node MCU ESP8266 microcontroller, UV Detection Module, and DHT11 sensor to collect data on UV rays and temperature. The gathered information is transmitted to a dedicated Android app through the Internet of Things (IoT) infrastructure. The UV Detection Module, capable of measuring UV rays, is integrated with the NodeMCU, which acts as the central processing unit. Additionally, the DHT11 sensor is utilized to monitor ambient temperature. These sensors work collaboratively to provide accurate and timely environmental data. The NodeMCU is programmed to acquire sensor readings, process the data, and transmit it to the cloud. The dedicated Android app, developed for user interaction, receives and displays the UV index and temperature in a user-friendly interface. Users can access this information remotely, facilitating awareness of UV exposure and environmental conditions in real-time. This UV Index Monitoring System not only enhances public awareness of UV radiation risks but also serves as a valuable tool for individuals, outdoor enthusiasts, and healthcare professionals. The integration of IoT technology allows for seamless data transmission, making the system versatile and accessible. Overall, this project contributes to the advancement of environmental monitoring systems, promoting health and well-being in an increasingly interconnected world.

KEYWORDS: Internet of Things, NodeMCU, Sensors, Machine learning, Index Monitoring.

I. INTRODUCTION

In the recent years, the evolution of embedded based technologies in the Industrial environment has incorporated with IoT applications. The RFID and Wireless sensor based systems [1] are the suitable technologies of Industrial security purposes before the invention of IoT. The Wireless based network applications plays a vital role in Industry, home and personal communication systems automation in a successful manner. The Embedded based industrial automation system requires real-time communication and control systems in the factory. They need to ensure the accurate control and rapid communication in industrial motion control system [2]. In this type of application, the communication system performance and efficiency will be evaluated to ensure it is applicable to the industrial networks.

II. OVERVIEW OF THE PROPOSED SYSTEM

In the advancement of automation in the industrial environment is incorporated with IoT to provide solutions to the security issues, reducing the time and increasing the production. The IoT plays a vital role in the development of Industries [3]. This paper reviews the security issues among the IoT data collections and exchanges.

It consists of Smoke sensors, Proximity sensors, Infrared sensors, Piezo sensors, Temperature sensors, Humidity sensors, Intrusion sensors, Vibration sensors, Pressure sensors, Optical sensors and Image sensors. The outputs of these sensors are fed into the Processing Unit through Analog to Digital Converter (ADC). The Microcontroller acts as a processing unit of this proposed system. The sensors output has been processed and it takes the necessary actions, decisions and alerts in a proper way through IoT. The Intrusion Detection System (IDS) plays a vital role to detect attacks in the network. In earlier days the industrial alerts are based on the manual operations. The notifications for any circumstances in industry are not provided in a real time. Time consumption also high due to the manual intervention and there are no proper actions to be carried among the industrial environment. These issues can be overcome by the implementation of IoT in industrial areas [4] [5]. This proposed system can automatically monitor the industrial applications and generate Alerts/Actions and take intelligent Decisions.

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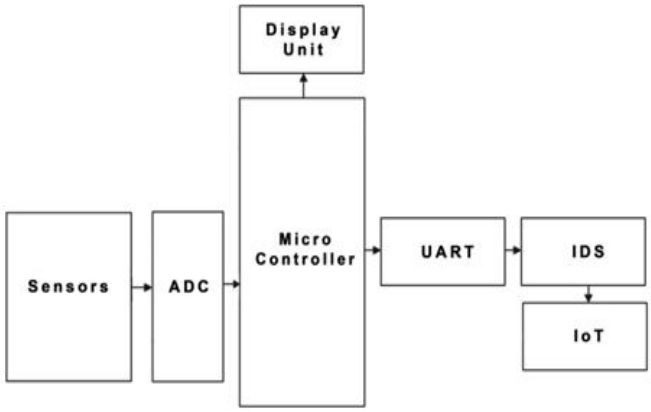

Fig. 1. Block diagram of Proposed System

III. INTRUSION DETECTION SYSTEM AND MACHINE LEARNING APPROACHES OF IOT

A major issue on the industrial area is a security among the control devices. In the proposed system, the input/ actions are getting from the various sensors. This embedded based system consists of sensors, control devices are available in the network connections. An Intrusion detection system is a security mechanism that works mainly in the network layer of IoT [6]. The Intrusion detection system plays a major role to avoid the fault data entering in to the control devices in the network connections. The data analysis can be studied through the popular machine learning approaches. The Random forest Brain storm optimization, Support Vector Machine (SVM), J 48, CART, Navie Bayes and Filtering & Forwarding approaches are the popular machine learning algorithms works under the concepts of Intrusion Detection System (IDS). The unauthorized attacks could be preventing by IDS and analyzing the system performance in the network connections. The attacks like DoS, Probe, R2L and U2R have studied with the precision, accuracy and recall of the system performance metrics. The software part of the system to be carried out with the help of MATLAB. The performance metrics of every machine learning algorithms had discussed and the implementation of suitable algorithm for this proposed system also studied.

The IDS towards random forest brain storm optimization algorithm creates decision trees on data samples and then gets the prediction from each of them and finally selects the best solution by means of voting[7].SVM algorithm is suitable for classification and regression testing in IDS[8]. J 48 is to generate the decision trees and called statistical classifier. CART is also alternative decision tree algorithm [9]. Navie bayes is a collection of classification algorithm, here every pair of feature can be classified is independent from each other. The Filtering and forwarding approaches is also important statistical algorithm. These algorithms are plays a vital role in IDS to prevent the fault attacks of the control devices in the IoT based embedded networks. A model of accuracy calculation in IDS with the Brain storm optimization technique (BSO).The Table (1) and Figure (2) shows the accuracy classifications of the attacks like DoS , R2L,Probe and U2R in BSO techniques.

TABLE 1: ACCURACY CLASSIFICATIONS OF BSO

Methods	DoS	R2L	Probe	U2R
TANN	89.96	80.12	91.16	61.12
BPNN	81.16	88.56	88.54	26.72
FC-ANN	95.04	92.76	49.72	82.78
Brain Storm Optimization (Selection)	96.69	93.71	94.46	93.52

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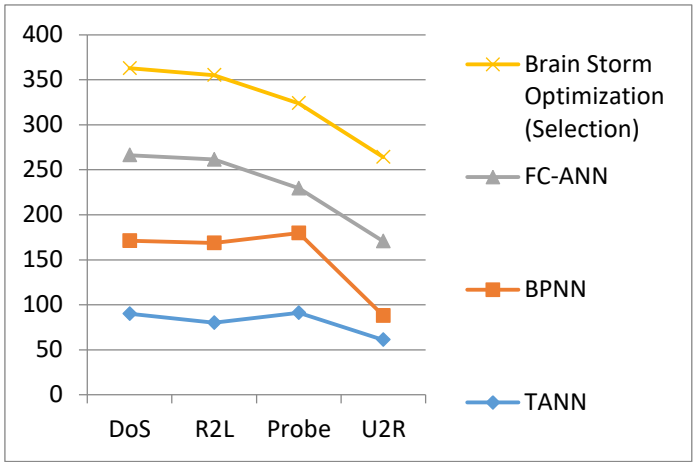

Fig 2. Accuracy Classifications of BSO

IV.CONCLUSION

The automation is an important role in the industrial environment. In the earlier situations the industry could by monitored by CCTV. The Real time alerts or actions are received through these devices. The proposed embedded system network security issues are to be solved by IDS along with the machine learning algorithms. The accuracy of the fault attacks can be recognized by best suitable Brain storm optimization algorithm. This proposed system is used in industry to monitors as well as to inform the responsible person to take appropriate measures through IoT. The aim of this system implementation is used to reduce the time consumption, human intervention and provide the alerts in accurate manner and take the intelligent decisions among the industrial environments.

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