RULE BASED CONTROL STRATEGIES IN INDUSTRY USING SEMANTIC RULE ENGINE:AN IOT GATEWAY

Anap Snehal[1], Devhare Meghana[2], Aher Swetam[3], Gaikwad Sonal[4], Sachin Korde[5]

[1,2,3,4] *Authors of Computer Engineering Department,*
Pravara Rural Engineering College , Loni

ABSTRACT

The Internet of Things (IoTs) refers to the interconnection of billions of smart devices. The growing number of IoT devices with heterogeneous characteristics need that future networks developed to give a new structure tomanage with the expected increase in data generation. The IoT paradigm has to be connected to the Cloud to increase the reach the scale at which it can be implemented. Today due to introduction of 4G the devices connected to the internet are growing rapidly which increases the scope of useful hardware connecting to internet. The IoT can be applied to many day today useful applications such as Industrial Environment, Home automation, Healthcare etc. But as the hardware generates a lot of data per second to the system, it can cause a headache to maintain and analyse such a large data by humans. So to solve this problem we have thought of developing a application which will analyse the data coming from the connected devices and using Machine learning's SVMalgorithm we can distinguish the data in two categories unsafe and safe. After recognizing the safe and unsafe environments using MQ2 and MQ7 gas sensors we are going to send only the alert of unsafe data to the concerned authority via cloud on his mobile phone. This will decrease the amount of data that is to be analysed by a human. We will also send an alert which will help the concerned authorities to take the steps necessary for reducing the mishaps that could occur in the industrial environment.

Index Terms: - *IoT, Sensor Readings, Smart industries, SVM, Cloud Computing and Mobile Computing, etc….*

I. INTRODUCTION

Doing study on the project the data generated by sensors can be analysed by using SVM algorithm.The SVM can be explained as in machine learning, support vector machines (SVMs), are supervised learning models which use supervised machine learning algorithms with associated learning algorithms that analyze data used for classification and regression analysis. We have given some training examples, each marked as belonging to some specific class, an SVM training algorithm builds a model that assigns some category or class to new examples, making it a non-probabilistic binary linear classifier (probabilistic classification setting can be done by using Platt scaling). An SVM is basically a representation of the examples as points in space mapped and the examples of the different categories are divided by a clear gap that is as large as possible. After that new examples are mapped on the same and based on which area that examples get, predictions are done. SVMs can also perform a non-linear classification along with linear classification. For that it uses kernel trick in which mapping of inputs into high-dimensional feature spaces is done. Unsupervised learning methods are used whenever we don't have classified data as training set. In unsupervised methods we make grouping of similar data or data having similar characteristics. And based on this characteristics we give labels to that groups. The support vector clustering algorithm is one of the most widely used clustering algorithms in industrial applications which is mainly used for unlabelled data.

II. RELATED WORKS

These days industries are becoming more and more harmful for human beings. Accidents in industries may lead to deaths of people working in industries and also people living nearby industries. There can be incidents wherein number of deaths due accidents might be alot. This is the major issue in chemical industries. This trouble may be solved with the aid of creating an IOT based system which will alert people during critical conditions.

By creating these system it will help to detect environment in the industry. We will able to analyse the data without human interaction. These system will be able to send alert or data to required authority after unsafe condition. For creating such system we have to make use of cloud as connecting medium between entities.

III. PROBLEM STATEMENT

The progress of IOT has been remarkable.There were 17.6 billion and many more IOT devices worldwide. This numbercanbe reach to 50 billion by 2020, more than six times the human population of 7.6 billion foretasted for that year. This is leading to a lot ofinternet of things data.International Data Corporation forecast thatin 2020 the current 4.4 Zettabyte of IOT data willincrease another 10times.The internet of things structure suffer from curbedstoragespace,constrained communication capacity andlimitedsensorenergybudget etc. These restrictions preventcommunication of IOT data. These kind of data will be out of tracking reach of a human mind and cannot be analysed by a human.

IV. LITERATURE SURVEY

1. N.K.Jha and A.M.Nia, **"A comprehensive study of security of Internetof-Things "** This paper which studies the security related to Internet of Things (IoT), also referred to as the Internet of Objects, is viewed as a translating approach for providing numerous services. This paper explains how cyber-attacks on various IoT structures have increased and how loss of data and money increased. The first goal of this paper was to, briefly describe three widelyknown IoT reference models and define security in the context of IoT platform. Secondly the applications that arise from the use of IoT and potential motivations of the attackers who target this new architecture where discussed briefly. Third different attacks and threats that arise from the use of IoT where discussed briefly. Fourth, be possible security measures that can avoid attacks where discussed briefly.
   Limitations : The Main Limitation of this paper is that it only concentrates on security and not on cloud as well.
2. By Dhananjay Singh, Gaurav Tripathi and Antonio J. Jara**, "A survey of Internet-of-Things: Future vision, architecture, challenges and services "** This paper which studies Internet-of-Things (IoT) and present a approach which will make it more smart and intelligent. This paper presents a unique model for IoT with the help of Semantic Fusion Model (SFM). This SFM model introduces the use of Smart Semantic framework to extract and analyze the processed information from sensor networks and the data generated by it. It introduces a smart embedded system is having linguistic logic and linguistic value based Information to make the system an intelligent system and smarter than the those explained in the paper. This paper also discussion IoT applications, services, visual aspect and challenges for IoT using RFID, 6lowpan and sensor networks.
   Limitations : The Main Limitation of this paper is that it only concentrates on embedded systems not on cloud as well.
3. Dae-Man Han and Jae-Hyun Lim s, **"Smart home energy management system using IEEE 802.15.4 and zigbee "** This paper explains the use of WPAN, WSN and ZigBee networks. This paper designs and explains smart home device descriptions and standard practices for demand response and load management "Smart Energy" applications needed in a smart energy based residential or light commercial environment using ZigBee networks. It explains the design and implementation of control application domains included in this initial version are sensing device control, pricing and demand response and load control applications etc. In this paper they design and implement a smart home interfaces and device definitions to allow interoperability among ZigBee devices produced by various manufacturers of electrical equipment, meters, and smart energy enabling products. It introduces and implements the proposed home energy control systems design that provides intelligent services for users and we demonstrate its implementation using a real testbed.

Limitations : The Main Limitation of this paper is that it only concentrates on ZigBee devices and ZigBee networks and not on cloud as well.

4. Nomusa DLODLO , Oscar Gcaba and Andrew Smith , **"Internet of Things Technologies in Smart Cities"** This paper which mainly concentrates on building smart cities. This paper explains the implementation and design of smart cities applications as applied to the domains of smart transport, smart tourism and recreation, smart health, crime prevention and community safety, governance, monitoring and infrastructure, disaster management, environment management, refuse collection and sewer management, smart homes and smart energy and thus handling the day to day and improving the user experience of IoT devices. The paper presents a technical solution for energy control and comfort in a home for proof of concept of a smart city infrastructure application using IoT devices. It demonstrates how smart applications can manage energy control and comfort in a room that has a varied number of people and electrical appliances, with each being a source of heat and having a separate IoT device to handle it.
   Limitations : The Main Limitation of this paper is that it only concentrates on building smart homes and not on cloud that has to handle the data to achieve it.
5. Praveen Kumar and Umesh Chandra Pati, **"IoT Based Monitoring and Control of Appliances for Smart Home"** This paper which mainly concentrates on monitoring and control of appliances that can be used in a Smart Home. This paper explains a technique of home automation technology which provides smart monitoring and control of the home appliances as well as door permission system to differentiate between a owner and visitor of a home. This paper implements control and monitoring the status i.e. ON/OFF of the appliances thus implementing Internet, electrical switch, and GUI. Using the technology and implementation of the concept of this paper, the consumer can reduce the wastage of electrical power by regular monitoring of home appliances or the proper ON/OFF scheduling of the devices.
   Limitations : The Main Limitation of this paper is that it only concentrates on building smart homes and not on cloud that has to handle the data to achieve it.
6. **"Igor Miladinovic and Sigrid Schefer-Wenzl, NFV Enabled IoT Architecture for an Operating Room Environmente"** This paper which mainly concentrates on to give a new structure to managethe expected grow in data generation by IoT devices. NFV provides the architecture required for Internet of things services by orchestrationofnetworkresourcesand enablingtheautomatedcontrol,management using Web.
   Limitations : The Main Limitation of this paper is that it only concentrates on sending all the data to web and the data is not infered to send only the needed data.

V. IMPLIMENTATION

IOT

IOT and Cloud Computing are hot topics. Today a lot of data is stored on cloud from various IOT devices and sensors attached to it. But a smart system has to be developed which will recognize which data is normal and which is abnormal before sending it to the cloud. To solve this problem, Rule Based Control Strategies in industry using Semantuc Rule Engine: A IoT Gateway system as our project .

In this project we are fetching sensor data using Arduino. This fetched data we are sending to server using ESP8266. Then generate Training dataset with two classes safe and unsafe.Perform Machine Learning using SVM. Based on environmental conditions system sends Abnormal Environment alert to concerned authority using cloud. Then it sends command to IoT after unsafe Environment. Finally perform Command on IoT.

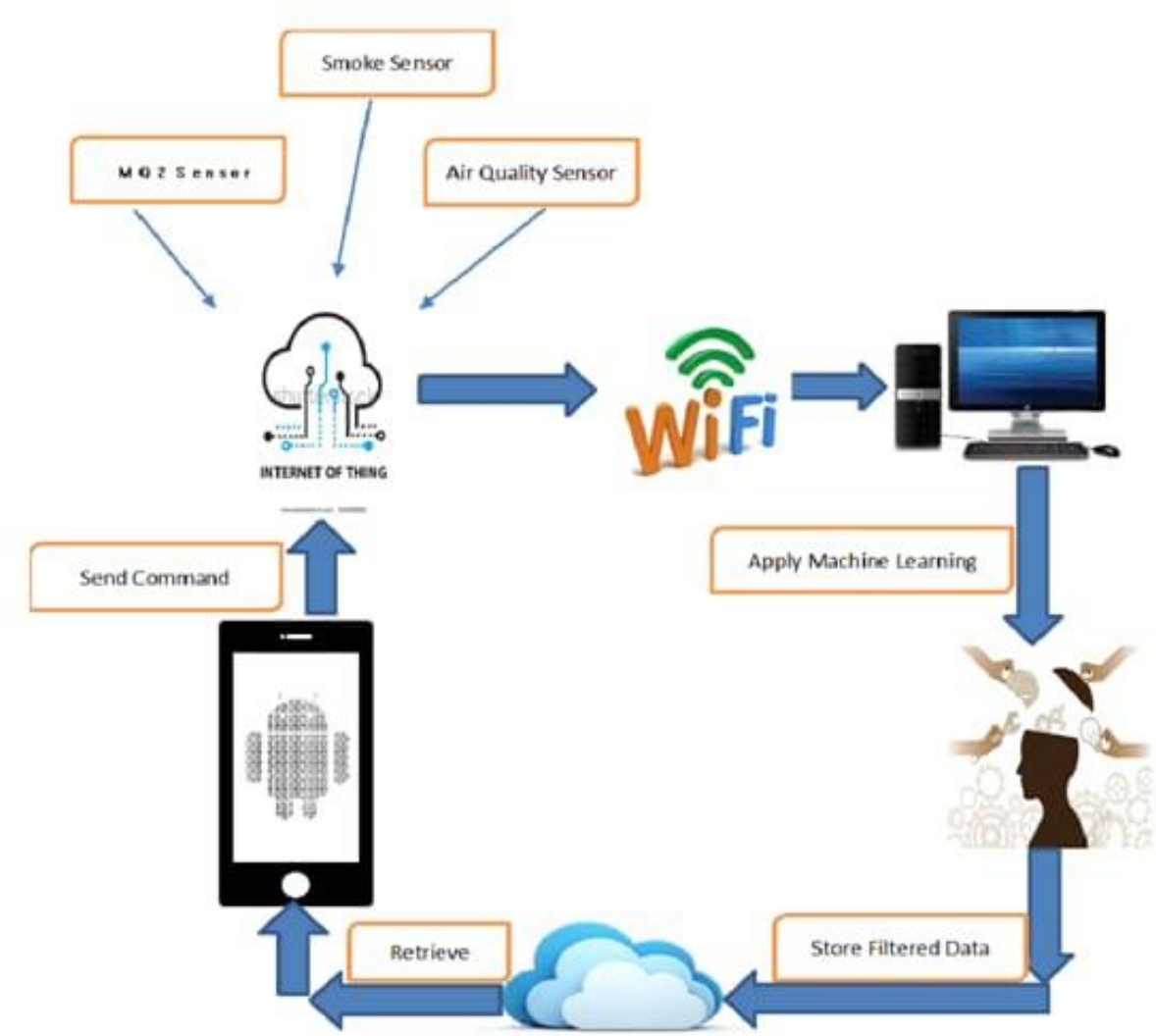

Fig - 1: System Architecture

VI. CONCLUSIONS

In this project, we are developing a novel approach to provide Smart Industrial Environment Detection system. The basic idea of the project is integrating IOT, Machine Learning and cloud computing together to achieve a user independent environment handling and monitoring system. We have assembled mobile computing, cloud computing and desktop together to build a whole new system which is secured and reliable. It is more intelligent in recognizing harmful industrial environments in a day to today industrial infrastructure and save life and money.

VII. ACKNOWLEDGEMENT

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REFERENCES

[1] L. Atzori, A. Iera, and G. Morabito, "The internet of things: A survey," Comput. Netw., vol. 54, no. 15, pp. 2787–2805, Oct. 2010.

[2] L. D. Xu, W. He, and S. Li, "Internet of things in industries: A survey," IEEE Trans. Ind. Informat., vol. 10, no. 4, pp.2233–2243, Nov. 2014.

[3] J.Ye et al., "SemanticWeb technologies in pervasive computing:Asurvey and research roadmap," Pervasive Mobile Comput., 2015.

[4] I. Khan et al., "A data annotation architecture for semantic applications in virtualized wireless sensor networks," in Proc. IFIP/IEEE Int. Symp. Integr. Netw. Manage., 2015, pp. 27–35.

[5] E. Kharlamov et al., "How semantic technologies can enhance data access at siemens energy," in Proc. Int. Semantic Web Conf., 2014, pp. 601–619.

[6] C. E.Kaed,Y.Denneulin, and F. G. Ottogalli, "Dynamic service adaptation for plug and play device interoperability," in Proc. 7th Int. Conf. Netw. Serv. Manage., 2011, pp. 1–9.

[7] S. N. Han, G. M. Lee, and N. Crespi, "Semantic context-aware service composition for building automation system," IEEE Trans. Ind. Informat., vol. 10, no. 1, pp. 752–761, Feb. 2014.

[8] C. El Kaed and M. Boujonnier, "Forte: A federated ontology and timeseries query engine," in Proc. IEEE 3rd Int. Conf. Smart Data, Jun. 2017, pp. 1–8.

[9] R. Want, B. N. Schilit, and S. Jenson, "Enabling the internet of things," Computer, vol. 48, no. 1, pp. 28–35, Jan. 2015.

[10] C. E. Kaed, I. Khan, H. Hossayni, and P. Nappey, "SQenIoT: Semantic query engine for industrial internet-of-things gateways," in Proc. IEEE 3rd World Forum Internet Things, Dec. 2016, pp. 204–209.

[11] P. Nappey et al., "Migration of a legacy plant lubrication system to SOA," in Proc. 39th Annu. Conf. IEEE Ind. Electron. Soc., 2013, pp. 7440–7445.

[12] M. Louvel and F. Pacull, "Linc: A compact yet powerful coordination environment," in Proc. Int. Conf. Coordination Languages Models, 2014, pp. 83–98.

[13] Y. Sun, T. Y.Wu, G. Zhao, andM. Guizani, "Efficient rule engine for smart building systems," IEEE Trans. Comput., vol. 64, no. 6, pp. 1658–1669, Jun. 2015.