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Data monitoring system using IOT System

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ABSTRACT: The Internet of Things (IoT) is now changing the globe and fostering a variety of kinds of connectivity. Today, communication between machines and between machines and humans is only feasible thanks to the Internet of Things. The Internet of Things (IoT) has dominated the market for the past 15 years, with applications in everything from wearable technology to smart, connected homes to healthcare. Industry 4.0 is the name given to the most current development in the market. Cyber-physical systems (CPS) in the industry independently evaluate the production and manufacturing processes. In a wireless sensor network, the sensor collects information from the object and sends it to the router. That Sensor may differ based on its intended function. With so many connected devices, the Internet of Things (IoT) will generate a tremendous amount of data. To extract hidden information from the generated data, we must employ a variety of methods. Much data may be monitored and managed via Wi-Fi, the Internet of Things (IoT), cloud computing, and cyber-physical systems (CPS).

Keywords—Industry4.0,InternetofThings(IoT),MQTelemetryTransportprotocol(MQTT),Wi-Fi,ESP8266,wearableIOTdevice

I. INTRODUCTION

The architecture,protocols, applications, security, real-worldimplementation, andfuture trends of IoTare elaboratelyexplained in[1].Technologies are rapidly changing today. People are moving toward an "always connected" system. Wired andwireless networks are available, for particularly addressing procedure open standards are allowed and defined. Concepts related to the"FutureInternet"arebeingresearchedinrecenttime. Invariousindustries,thereisagrowinginterestinusingIoTtechnologies.Lotsof industrial IoT projects have been done in, food processing, surveillance, agriculture, environmental monitoring, security, and manymore[2]. By the end of 2020 Somewhere 26 to 50 billion “things” connected to the internet. IoT has given us a promising way to buildpowerful industrial systems and applications by using wireless devices, Android, and sensors[3].Today Everyone wants to connecttheirsystemtocloudandmakeitpowerful.NotonlyElectronicsandITfieldpeople,manyotherindustriesalsowanttointegratetheir manufacturing line with IoT devices to control and monitor data in real time scenario from anywhere from the earth without anyhurdle. IIoT is the basic premise for the implementation of Industry 4.0[4]. IoT is continually evolving and is a hot research topicwhere opportunities are infinite.[5].MQTT is the one of the best IoT protocol which is implemented in IoT to exchange the data fromthe sensor to cloud and cloud to the sensor. For industry safety purpose it's almost necessary to watch all activity going through anindustry inner environment for the better safety of employees working in the industry. The IoT can connect real-world elements andsettheintelligentcomponentinacommunicationsystem.Therefore,IoTisakeywhichcanenablethedifferenttypesofadvantageous applications and services which can support, environment transportation, economies, and health that we never thinkbeforesometime.

Figure.1TheloTgeneralscenarios[1]

The TCP/TP was defined long time ago. This protocol plays an important role in the digital communication area. Therefore,the IoT will connect a number of devices, which will make a tremendous traffic of data. It also needs a huge

amount of storagecapacity to store that data. Hence, the new standard design and protocols are necessary for safe data transmission in IoT technology.Improvement of IoTdepends on the different types of useful applications and businessmodelswith advances in thetechnology ofIoT.
Withtheindustry'sbroadestIoT-readyportfolioofwiredandwirelessconnectivitytechnologies,microcontrollers,processors,sensorsandanalogsignal chainand powersolutions[6].

Layer	Protocols
Application Layer	CoAP, MQTT, XMPP, AMQP, RESTFUL, Websockets
Transport Layer	UDP, DTLS
Internet Layer	RPL, 6LoWPAN
Physical/Link Layer	IEEE 802.15 Series, IEEE 802 11 series

Figure.2IoT layersandstack[7]

Figure 2 shows the different IoT layers which make the whole IoT data transmission easy and secure. Each and every layerhas its unique task to perform. The protocol is defined as the special set of rules and regulations that endpoint in a telecommunicationconnection. It uses when they need to communicate with one another Opposite side endpoint which connected to the same or differentnetwork. At the end of whole the discussion we can conclude that with the help of data acquisition we can have the lots of data at theend point.So asper our requirementwecanfilteroursearchresultfromdifferentnodesand the junctions.

II. RELATED WORK

However, in the new era of internet technology, there are various protocols has been introduced in last 5 to 6 years. AdvancedMessageQueuing Protocol (AMQP),MQTelemetry Transportprotocol(MQTT), ConstrainedApplication Protocol(CoAP)andmany more. For the best data transferring and secure messing services, MQTT(MQ Telemetry Transport) comes in the picture. MQTT(Message Queue Telemetry Transport) AMQP and MQTT protocols give surety that, when a client reconnects to a server, it does notrepeatmessagesandresumesthepreviussessionwiththemessage broker[8].

AMQP will not be used for industrial safety system because connect and disconnect will change the information sequence from FIFO(First Input First Out) to LIFO (Last Input First Out). HTTP will not be used for the system because it is request-response typeprotocol, also it consumes more bandwidth so more energy it requires so it is not used. CoAP will not be used for safety systembecause packet loss rate under degraded network condition as well as the implementation of CoAP is more complex due to itsunavailabilityisopensource[9].

III. METHODOLOGY

In 2016, one research paper was published which shown the one concept of making smart cities as a part of Industry 4.0[10]. itwas published by Kallappa, B. B. Tigadi.By connecting different IoT devices this system can be expected to change logistics andtransportationsystemwiththebestinfrastructure.

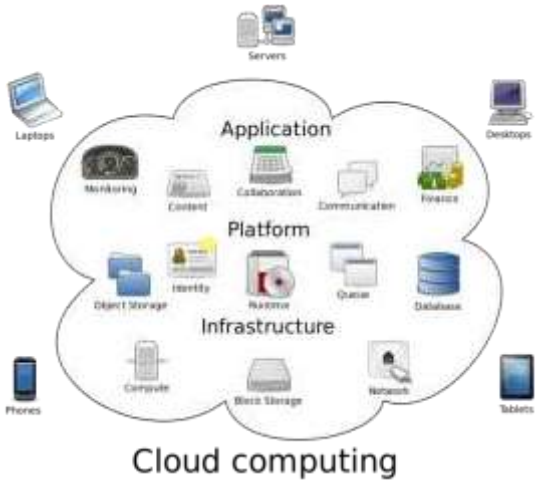

Figure.3TheconceptofFOGComputing

Herewecan seethatinasmartrouter,manyprocessesarewillgoingtotakeplaceintheround ofthenetworkorasmartdevice.

Industry4.0alsousingthisFOGComputingconceptint he industry.Whereitcanpowerfullydividethesourcedata .Onlythedatawhichisusedwillbeprovidedtomanage mentlevel,controlandfortheanalysis[12].

In this paper, they have covered the concept of Industry 4.0 and the Smart City idea. Although the definition is different, theprinciples are should be the same. They have tried to see the Industry 4.0 industry as the first step of smart cities, like the smartcampus, smart building, smart street etc. Another important part is also FOG Computing. That exactly transmits only the necessarydata to the server. The first city in the Czech Republic which is going to be the 1st smart city smart city is Pikes. cloud computing isconsidered asapromisingsolutionto deliver servicesto end usersand provideapplicationswithelasticresourcesatlowcost.[13].

Big data analysis is briefly explained here[14] by Sunghae Jun. Data analysis is the most important part of the IoT network.We are in the age of big data [15],[16]. Big data has three typical characteristics which are volume, variety, and velocity [17]. That is,the size of big data is extremely large, the data types of big data are diverse such as number, text, and figure. In addition, the dataprocessing of big data is so rapidly. So we should consider these characteristics when we analyze the big data. The BDL is a techniqueof learning from big data [18].Once Data acquisition is done data should be analyzed for the final result. In this paper, they havecover the topic of Big data learning. Data analysis was done on the basis of IEEE and KIPRIS Paper and patent. They have shown thedifferentTop-rankedkeywordscontentand afterthatmake theSNA graphco-relatedwith that data.

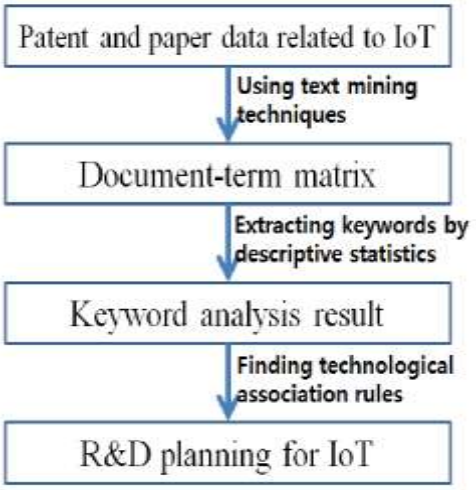

Figure.4 IoTanalysisbyBDL[14]

First, they have searched papers and patents documents related to IoT from the databases such as IEEE explore, USPTO,KIPRIS. These data are too big because they include text, number, and others. So now they applied the BDL to analyze paper andpatent data. After that, they transform the text data into structured data which is called as document-term matrix [19].In the Matrix therow and column are definedas the document and term respectively. For this transformation, they have usedtextmining techniquesand social analysis by “tm” and “sna” packages of the R project [19], [20]. By descriptive statistics for keyword analysis, they extracthighrankedkeywordsinthe end.

IV. RESULTS AND DISCUSSION

Table.1Top-rankedKeyWords:Patents[14]

Rank	**FrequentTerm**
1st	Control,data,device,information,intelligent,management,monitoringsystem,technology
2nd	Terminal
3rd	Gateway,equipment
4th	Communication,platform,service
5th	Access,network,wireless

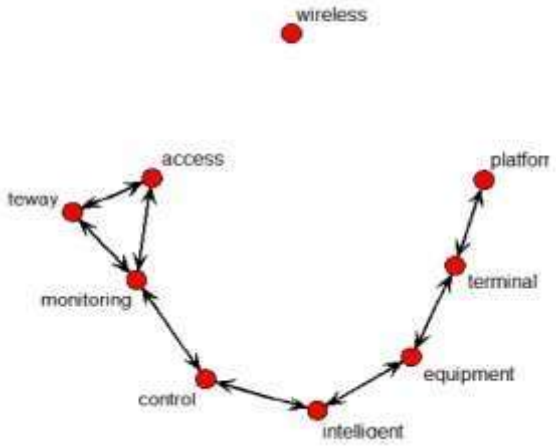

Figure.5SNAgraphfromcorrelationIoTPatents[14]Table.2Top-ranked KeyWords:Papers[14]

Rank	**FrequentTerm**
1st	Application,information,network
2nd	Data,system,technology,smart
3rd	Management,architecture,communication
4th	Model,framework,social,use,device, object,security
5th	Service,cloud,analysis,design,global, semantic,integration,sensor

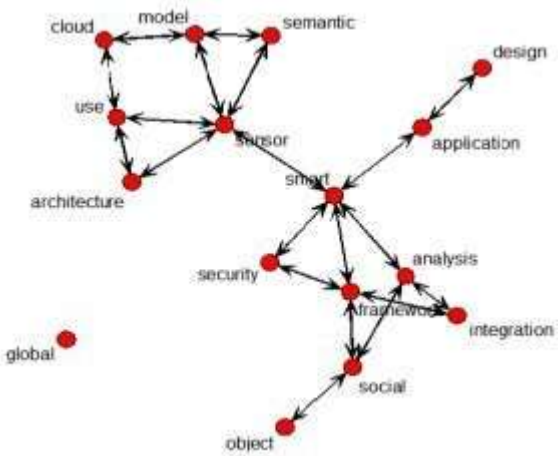

Figure.6 SNAgraph fromcorrelationofIoTPapers[14]

Above both, the graphs show the data evolution of the Patents and papers top ranked keywords. They have made structureddata for descriptive statistics, and SNA. Also, the results of statistics and SNA graph provided the understanding the technologicalrelationship inIoTtechnology.Fromthisone,wecansaythatthereisl otsofresearchscope availableinBigdata analysisinIoT.

V. CONCLUSION

The IoT gives assurance to deliver a change in separate‟ quality oflife and enterprises‟ concept. With the help of a wideextending, andlocally intelligent network of smart devices, the IoT has the potential to enable extensions and enhancements tofundamental services in logistics, transportation, education, healthcare and security other areas, while providing a new ecosystem forapplication development. Just as the Internet aspect happened the Internet of Things has touched every conditions of our lives in lesstime. In this work I have presented a model of IOT based data acquisition and analysissystem for the different applications ofeducational purpose & other organizations. I can conclude that Industry 4.0 is going to be the biggest platform to perform the task intoday's industry. There are three major states for IoT implementation: Data acquisition, security, and data analysis. While transferringthe growth of IoT, Security of the data is the most important for reliable data transferred between the millions of smart application.Here I haveconcentrated on MQTT protocol on application layer for safe data transmission. By the different methods of big dataanalysis, a person can separate the particular data as per he wants. This one isDifferent from other IoT review papers because itmainlyfocusesonindustrialIoTapplicationsandBig dataanalysisandpossibleresearchopportunitiesforfut ureindustrialresearchers.

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