IoT ENABLED RISK MONITORING SYSTEM IN COLD SUPPLY CHAIN FOR FOOD PRESERVATION TO PREVENT HEALTH HAZARDS

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Abstract–It is important to maintain the safetyand hygiene of the food to keep it fresh andedible which helps in decreasing the food wastage and to safeguard our health. One solution for this is to maintainsuitable environmental conditions for the storedfoodtocontroltherateofdecomposition.The rearedifferentparameters onwhichfooddecomposition depends, the parameters likehumidity, bacteria, and temperature are majorfactors on which the rate of decomposition offood depends on. If the temperature of thestorage is between 40F to 140F, it is a dangerzone because during that temperature bacteriagrowrapidly,doublingitsnumberin20min. Similarly,thehumidityinthefoodstorageroom shouldbearound50-55%tokeepthequalityofthe food at high, as long as possible. In thisproject we monitor the values of the roomtemperature and gas with sensors like DHT 11,mq-2 and mq-3. And updates the owner whenthere is an abnormally in the sensors with thewebpage or SMS with ESP8266 or GSMrespectively.

Keywords-IOT,Industry4.0

I-INTRODUCTION

The development of the Internet of Things (IoT)enabled many devices to connect and interact[2,3,4]. The smart city applications such as SmartBuilding,SmartIndustry(Industry4.0)andSmartHealthcare monitoring, etc. make use of differentsensor devices such as temperature sensor, an audio sensor, and cameras to monitor and control the environment. The focus of this work is on theintegrated design framework and the technicalroutes for automatic monitoring systems forsafety-critical ICPS, such as process industry,intelligent factories and smart grids[1,2,5]. Suchsystems are usually physically interconnected,very large in scale, geographically dispersed,and have hierarchical structures [10]. From amacroscopicpointofview,plant-widemonitoringenables global capabilities in revealing theabnormalities, coordination, management, andoptimizationinareliablemanner.

II-LITERATUREREVIEW

The fourth industrial revolution aims to achievegreater productivity, also seeking to improve thequality and efficiency of production processes.For this, the use of information and automationtechnologies together becomes indispensable.Collaborative automation through the sharingand use of services has been a recent paradigmin the quest to obtain a distributed, flexible andintegrated network architecture

[2,4].Towards themodernization of various processes involved inmanufacturingaproduct,IOTplaysavitalroleindeveloping the food product under hygienicconditions without any cross contaminationthroughout all the stages. The manual handlingresults in the contamination of the food productduring the various stages of manufacturing [6,7].The intensive research and development effortsdirected towards large-scale complex industrialsystems in the context of Industry 4.0 indicate that safety and reliability issues pose significant

challenges. During online operation, system performance degradation will lead, not only to economic losses, but also potential safetyhazards [8].

III- PROPOSEDSYSTEM

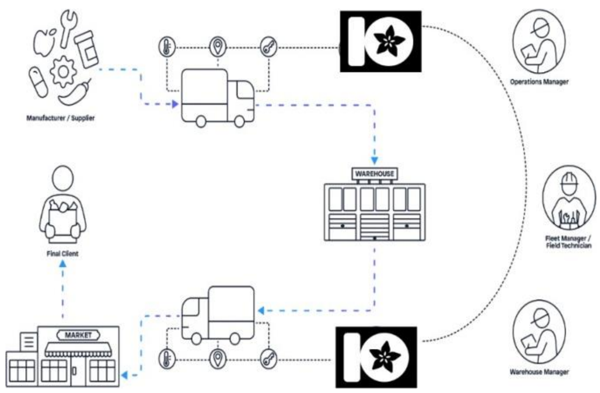
In the proposed system we can monitor the foodcontainertruckbyusingvarioussensors.

First,webuild up a transmitter and a receiver board withArduino and other sensors. We use Zigbee to enable communication between these boards.

All the values on the sensors(information) areautomatically updated on the iot platform in cloud platform. It also sends SMS alerts usingGSMtotheconcernedpeople.

Theadvantagesof the proposed system are food decay can berectified, requires less human intervention,AlertingtheownerusingSMS.

ARCHITECTURE



IV-MODULES

Transmitter-The focus of this work is on theintegrated design framework and the technicalroutes for automatic monitoring systems forsafety-critical ICPS, such as process industry,intelligent factories, and smart grids. Suchsystems are usually physically interconnected,very large in scale, geographically dispersed,and have hierarchical structures. From amacroscopicpointofview,plant-widemonitoringenables global capabilities in revealing theabnormalities, coordination, management, andoptimizationinareliablemanner.

Receiver-Transmitter side also continuouslytransmits the sensor values to the Zigbee.
Thereceiversidegetsthesensorvaluesandsends alert SMS when the values are abnormal withthe help of GSM. The GSM also contains a siminterfacefromwhichSMSalertcanbesent.

V-WORKING

In this proposed method, ARDUINO UNOmicrocontroller is used to interface with thesensors and to the communication devices. Inthese projects we use sensors to monitor thefoodqualityinthecontainerandsendthevaluest o the webpage. We use mq-3 and mq-2 gassensors to detect the abnormal gas inside thetruck. We also use a DHT 11 sensor to detectthe temperature of the truck. When the sensorsdetect the abnormality, the location will be takenwith the help of GPS module and updates it inthe iot module. It also continuously transmits thesensor values to the Zigbee. The receiver sidegets the sensor values and sends alert SMSwhen the values are abnormal with the help ofGSM.

HARDWARE:

ARDUINO-Arduino is anopen-sourceelectronics platform based on easy-to-usehardware and software. Arduino boards are ableto read inputs - light on a sensor, a finger on abutton, or a Twitter message - and turn it into anoutput - activating a motor, turning on an LED,publishing something online. You can tell yourboardwhattodobysendingasetofinstructions to the microcontroller on the board. We canprogram it using Arduino IDE to follow ourinstructions.

GAS SENSOR-The gas diffuses into the sensor,through the back of the porous membrane to theworkingelectrodewhereitisoxidizedorreduced . This electrochemical reaction results inan electric current that passes through theexternal circuit. In addition to measuring,amplifying and performing other signalprocessing functions, the external circuitmaintainsthevoltageacrossthesensorbetwe enthe working and counter electrodes for a two-electrodesensororbetweentheworkingand referenceelectrodesforathree-electrodecell.Atthe counter electrode an equal and oppositereaction occurs, such that if the workingelectrode is an oxidation, then the counterelectrodeisareduction. Weusedmq-2andmq-3gassensorsinthisproject. Itdetectsflammablegassesandalcohol, CH4,Benzineetc.

ESP-12EBASEDNODEMCU-TheESP8266is the name of a micro controller designed byEspressifSystems.TheESP8266itselfisa self-contained Wi-Fi networking solution offeringasabridgefromexistingmicrocontrollertoWi-Fiand is also capable of running self-containedapplications.

GPS-Global Positioning System is a satellitenavigation system that furnishes location andtime information in all climate conditions to theuser. GPS is used for navigation in planes,ships, cars and trucks also. The system givescritical abilities to military and civilian usersaroundtheglobe.GPSprovidescontinuousrealtime, 3-dimensional positioning, navigation, andtiming worldwide. Here GPS is used to identifyand inform the driver about the nearest garageroom and also can be used to inform the owneraboutthelocationofthetruck.

GSM-A GSM modem is a wireless modem thatworks with a GSM wireless network. A wirelessmodembehaveslikeadial-upmodem.Themaindifferencebetweenthemisthat adial-upmodemsends and receives data through a fixedtelephone line while a wireless modem sendsandreceivesdata.

TEMPERATURE SENSOR-In this project weused DHT-11 sensor to sense the surroundingtemperature. It continuously monitors thetemperatureandalertsthetargetedpeoplewhentemperature is abnormal by using the program inArduino. It is also the latest and cost effectivesensor.

SOFTWARE:

EMBEDDEDC-
EmbeddedCisthemostpopularprogramming language in the software field fordevelopingelectronicgadgets.Eachprocessor

used in electronic systems is associated withembedded software. Our entire hardware iscoded using embedded c. It is used to make themicrocontrollers do as we say. In our project weusedittoreadtemperatureandalert, gasvaluesinppmandalertetc.

MICROCONTROLLERSTARTERKIT- For developing an embedded system-basedprojectacompletemicrocontrollerstarterkitisrequired. The major advantage of this kit oversimulators is that they work in real-timeoperating conditions. Therefore, it allows easyinput/outputfunctionalverification.

EMULATORS-An emulator is a softwareprogram or a hardware kit which emulates thefunctionsofonecomputersystemintoanothercomputer system. Emulators have an ability tosupport closer connection to an authenticity ofthedigitalobject.

ARDUINOSOFTWAREIDE-TheArduino Integrated Development Environment - orArduino Software (IDE) - contains a text editorforwritingcode,amessagearea,atextconsole,a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs andcommunicatewiththem.

THIRD-PARTYHARDWARE- Supportforthird-partyhardwarecanbeaddedtothe hardwaredirectoryofyoursketchbookdirectory.Platforms installed there may include boarddefinitions (which appear in the board menu),core libraries, bootloaders, and programmerdefinitions.

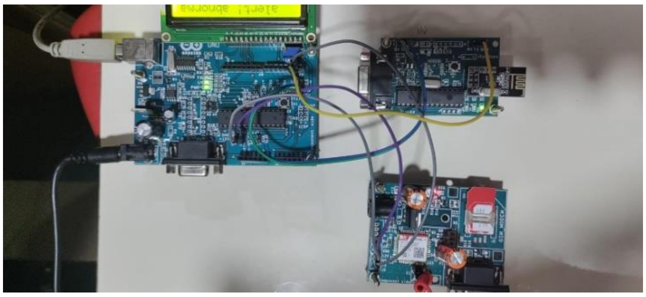
SERIAL MONITOR-This displays serial sentfrom the Arduino or Genuinoboard over USB orserial connector. To send data to the board,entertextandclickonthe"send"buttonorpressenter. Choose the baud rate from the drop-downmenu that matches the rate passed toSerial. Begininyoursketch.

VI- CONCLUSION

TheInternetofThingshasavastrangeofIoTapplicationsinsupplychainmanagement.It facilitates the tracking and monitoring of goods,brings more transparency to the communicationprocess,andincreasestheprecisionofplanning.An IoT-based platform is a great investment forsmall businesses and large companies alike, aslong as you have a clear objective for what youneed the technology to accomplish for you. Theuse of fog computing architecture in the supplychain using network devices and other industrialcontroller unit(sensors) considered as the fogserver is trivial as it reduces the need for humanintervention and thus makes it easy to monitorand update Realtime information to theowners/managersofthesupplychain.

RESULT

The project is designed with the scope of making



supply chain of cold items manageable with using cheap and efficient hardware devices .This project is capable sms and location detection.

FUTUREENHANCEMENTS

For future enhancements the system used tomonitorandupdateinformationaboutthethingsin the container can be controlled with voiceactivation. It allows a larger number of people toaccess digital technology, connect devices andtheinternetmoreeasily.

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