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IOT-ENABLED SHIPPING CONTAINER WITH ENVIRONMENTAL MONITORING AND LOCATION TRACKING

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ABSTRACT

Internet of Things (IoT) interconnects physical devices and objects that offer services to enrich the user experience. By 2020, it is estimated that up to 50 billion IoT devices will be deployed to offer new services. For instance, empowering traditional transport systems with IoT ensure greater visibility and traceability to remotely monitor the transported objects. In traditional shipping and freight systems, containers carrying donated organs should be sealed carefully, kept below a certain temperature, and placed in a physically safe place to minimize the chances of damage due to jerking and accidental falling. This paper presents a system of a smart shipping container that uses IoT, Cloud computing and remote monitoring of shipping containers.

During the shipping process, the IoT-enabled container provides continuous monitoring and readings related to temperature, humidity, location, luminosity, vibration, and open/close conditions. Here we use few sensors like vibration Sensor, GPS , DHT11 Sensor, Door switch ,Buzzer and GPS Unit .Whenever the temperature or humidity is not in the range of the given ranges then , automatic push alerts and notifications are sent to stakeholders when certain conditions or violations occur. Examples of these violations may include the opening of a sealed container or exceeding a preset maximum temperature. We have designed, developed, and tested the system under various real conditions.

INTRODUCTION

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. "Uno" means "One" in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions, see the index of Arduino boards.

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected

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automatically. External (non-USB)power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm centre-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5Vpin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

NodeMCU is an open-source firmware and development kit that plays a vital role in designing an IoT product using a few script lines.

Multiple GPIO pins on the board allow us to connect the board with other peripherals and are capable of generating PWM, I2C, SPI, and UART serial communications.

Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board,which can be programmed(referred to a microcontroller) and a ready-made software called Arduino IDE (Integrated Development Environment),which is used to write and upload the computer code to the physical board Hardware Requirement:

After learning about the main parts of the Arduino UNO board, we are ready to learn how toset up the Arduino IDE. Once we learn this, we will be ready to upload our program on theArduinoboard.The Internet of Things (IoT) is the network of physical objects devices, instruments, vehicles, buildings and other items embedded with electronics, circuits, software, sensors and network connectivity that enables these objects to collect and exchange data. The Internet of Things allows objects to be sensed and controlled remotely across existing net work infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency and accuracy.

The concept of a network of smart devices was discussed as early as 1982, with a modified Coke machine at Carnegie Mellon University becoming the first internet-connected appliance [3], able to report its inventory and whether newlyloaded drinks were cold. Kevin Ashton (born 1968) is a British technology pioneer who is known for inventing the term "the Internet of Things" to describe a system where the Internet is connected to the physical world via ubiquitous sensors.

IoT is able to interact without human intervention. Some preliminary IoT applications have been already developed in healthcare, transportation, and automotive industries. IoT technologies are at their infant stages; however, many new developments have occurred in the integration of objects with sensors in the Internet. The development of IoT involves many issues such as infrastructure, communications, interfaces, protocols, and standards.

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BLOCK DIAGRAM OF PROPOSED SYSTEM

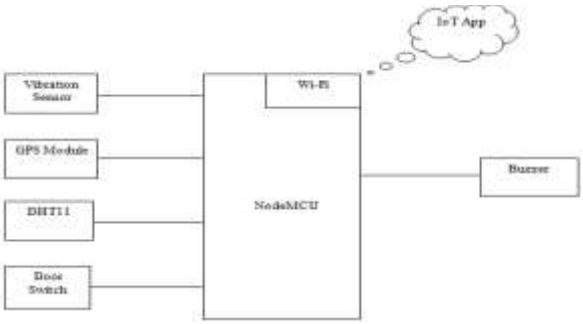

Fig.1: Block Diagram

PROPOSED SYSTEM

- To sense the Shipment Container, a door switch is attached to the door of the shipment container which monitors whether the door of the container is opened/closed, when the door is open the buzzer will make sound.
- A DHT11 sensor is connected inside the shipment container to monitor the temperature and humidity of the container, if the temperature and humidity is not in the range then the buzzer will start beeping/buzzing.
- After this it detects the location i.e., latitude & longitude of the container.
- If any vibration is detected inside the shipment container then vibration sensor detects and then the buzzer will beep/buzz.
- As there is a wifi module present in the circuit ,a message Acknowledgement is sent to the stakeholders by using IoT.

Virtual Pins is a way to exchange any data between your hardware and Blynk app. Think about Virtual Pins as channels for sending any data. Make sure you differentiate Virtual Pins from physical GPIO pins on your hardware. Virtual Pins have no physical representation.

Virtual Pins are commonly used to interface with other libraries (Servo, LCD and others) and implement custom logic.

The device can send data to the App using Blynk.virtualWrite(pin, value) and receive data from the App using BLYNK_WRITE(vPIN).

Non-momentary switches take one push to turn on, another to turn off. TVs and stereos use non-momentary switches for their power buttons.

There are many different kinds of push button switches and at Future Electronics we stock many of the most common types. We carry some of the top pushbutton switches manufacturers and suppliers including: Altech, C & K, Carling, Cherry Electric, E-Switch, EECO, Grayhill, Marquardt Switches, NKK Switches, Schurter and TE Connectivity

Best of all our electronic push button switch offering comes in a range of sizes from miniature to industrial power switches. There are even illuminated pushbutton switches available. Use our parametric filters to refine your electric push button switch search on our website. You can select by number of positions, by circuitry, by actuator style and by termination among others.

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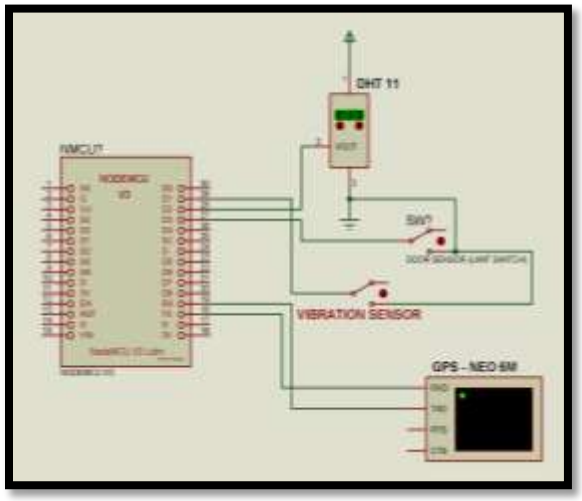
CIRCUIT DIAGRAM



RESULTS

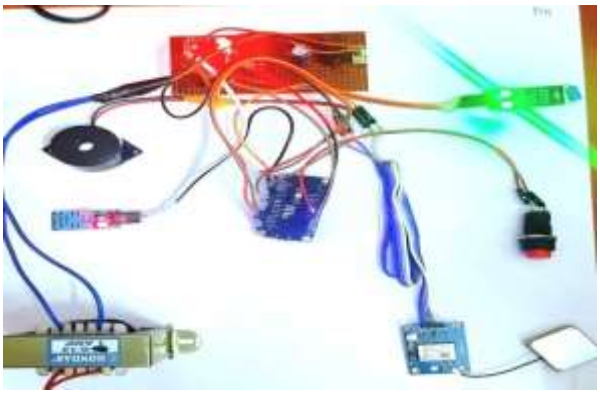


Fig.2: Shipment Monitoring Circuit

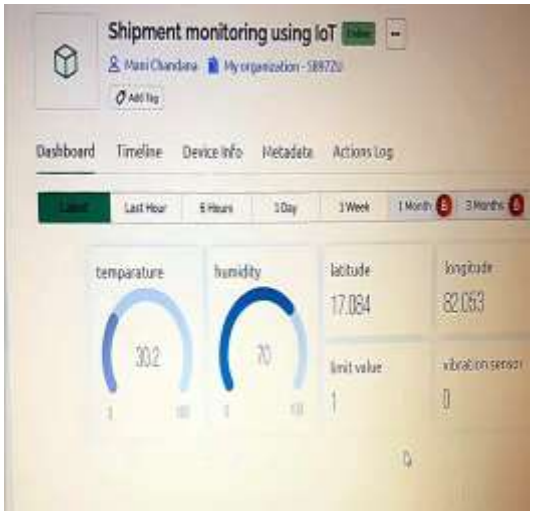


Fig 3. Shipment Monitoring identification in IoT app

APPLICATIONS

- IoT devices increase engine efficiency.
- Decrease maintenance costs.
- Reduce the frequency and severity of breakdowns.
- The internet of things connects physical objects to a network.

ADVANTAGES

- Optimize Shipping Routes.
- Improve Efficiencies.
- Shipment Safety.
- Reduce Costs.
- Live tracking of the shipment.
- Improve Customer Service.

CONCLUSION

The presence of IoT development has created open doors for shipment of holders dwelling short lived new food sources while avoiding risk of accidental damages. In standard transportation system, to send transient new food assortments across the metropolitan networks/countries, the food things got impacted inferable from the movements in biological conditions. For this issue, IoT based adroit compartment structure is a talented course of action view.In this paper, a totally helpful hardware and programming designing, plan, execution, and working model of a canny compartment system that show all of the capacities and features of the system is presented. It has proposed a dashboard (accessible through PDAs or web programs) for plan, client affiliation, and nonstop checking of steel trailers. It organizes

unmistakable data of transportation holders with the general cloud-based structure to push alerts and notification to accomplices when certain circumstances or encroachment happen normally.

FUTURE SCOPE

The system of a smart shipping container that uses IoT, Cloud computing for effective and remote monitoring of shipping containers. During the shipping process, the IoT-enabled container provides continuous monitoring and readings related to temperature, humidity, location, vibration, and open/close conditions. Additionally, automatic push alerts and notifications are sent to stakeholders when certain conditions or violations occur. Examples of these violations may include the opening of a sealed container or exceeding a preset maximum temperature.

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