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SMART CONTAINER

Bala Aditya[*1], Nalla Naresh[*2], K. Vinaya Kumar[*3], Prof. B. Giri Raju[*4]

[*1,2,3]Student, Department Of Electronics And Communication Engineering, ACE Engineering College, Hyderabad, Telangana, India.

[*4]Professor, Department Of Electronics And Communication Engineering, ACE Engineering College, Hyderabad, Telangana, India.

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ABSTRACT

This paper is about building a smart container using Node-MCU and ultrasonic sensor to track the contents in the container dynamically from anywhere in the world with the help of internet. This smart container allows us to keep track of the stocks, and it is easily accessible from using the internet. The Container includes an ultrasonic sensor at the top of it and uses the ultrasonic reflected waves to figure out at what extent the Container is filled and how much space is left inside the container. Whenever the amount of content changes in the jar, it is sensed by the Node-MCU, and the same is updated on the web server. This can be helpful to track supplies and plan for restocking from anywhere in the world. The container is smart enough to send the level of container filled through email and warns when the container is empty or less than the threshold value set as per the requirement. It would be helpful for the user to track the details of contents in the container without their actual presence. The smart jar enables us to keep track of the medicines stocks with the help of an android app easily accessible anywhere with a simple internet connection. The jar contains an ultrasonic sound waves emitter and sensor which uses the reflected ultra-sonic waves to find out what level the jar is filled to and how much empty space remains in jar yet to be filled. This sensor is also connected to the internet and interfaced with the application so that as soon as the level of content in the jar changes the data is updated to us in the application without any delay. This helps us in monitoring the stocks and prepare for restocking from anywhere, additionally it also provides important data such as the expiry date and the manufactured data of the content in the jar.

Keywords: Node-MCU ESP8266 Wi-Fi Module, HC-05 Ultrasonic Sensor, Smart Container, Arduino IDE, IOT Architecture.

I. INTRODUCTION

Now days, In our day to day life, people became more busy such that they are much more immersed in their work schedule and are unable to concentrate or take care of their household things. Most of the time people find it difficult to track their kitchen items, because nowadays it has become a room of least visit. Ina scenario, where people find hard time to prepare their own food, it is even more difficult for them to track their grocery items in their room. They even waste most of their time in ordering and tracking the remaining items in kitchen room. In this project, I made an IOT based Smart jar using Node-MCU ESP8266 Module and ultrasonic sensor that tracks the exact percentage of the contents in the container. This helps the user to know the quantity of content in the jar and can access the information through the Internet from anywhere in the world. It takes the speed of the emitted waves and time taken to travel as the parameters and gives the actual content of the container. Node-MCU and ultrasonic sensor to track the contents in the jar dynamically from anywhere in the world with the help of internet. This smart Jar allows us to keep track of the stocks, and it is easily accessible from using the internet. The Jar includes an ultrasonic sensor at the top of it and uses the ultra- sonic reflected waves to figure out at what extent the Jar is filled and how much space is left inside the jar. Whenever the amount of content changes in the jar, it is sensed by the Node-MCU, and the same is updated on the web server. This can be helpful to track supplies and plan for restocking from anywhere in the world. The jar is smart enough to send the level of jar filled through email and warns when the jar is empty or less than the threshold value set as per the requirement .It would be helpful for the user to track the details of contents in the jar without their actual presence.

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II. METHODOLOGY

The project is developed on concept of Ultrasonic Sensor. We use major component for this project is Ultrasonic Sensor strategy, as it is used for calculation of distance of the object in front of the sensor. Based on this calculation the overall circuit function is takes place.LM35 is also used for taking care of temperature in container. Thus based on this, we used to get output result.

Components Used:

- Node MCU ESP8266
- Ultrasonic Sensor HC-05
- LM35 Temperature sensor
- 9V Battery
- Container (jar)
- Jumper wires
- Switch

Block Diagram of Smart Container

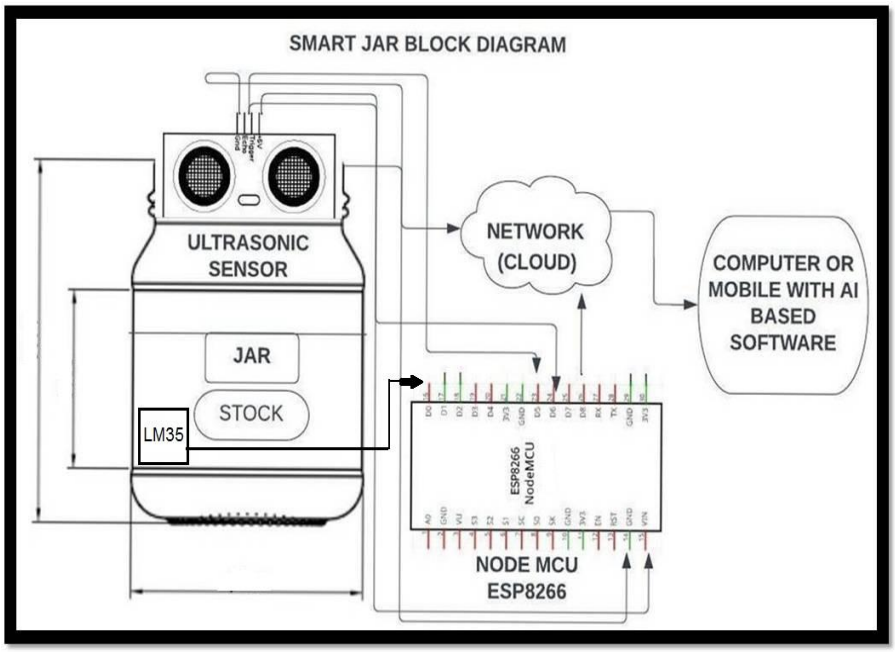

Figure 1: Block Diagram of Smart Container

Here is a block diagram of the project with basic input and output functions of each block. Complete set project measurements that are required, are mentioned in above figure .It illustrate the basic operation that takes place in project and also the hardware (components) are also mentioned in each block with ,that input and output supply pipe line.

III. WORKFLOW AND DATAFLOW

- It starts from collecting data from Ultrasonic sensor and LM35 sensor , That data is transfer to Node-MCU .Meanwhile the data collection task also happens in Node-MCU that conversion or any calculations needed to take place.
- All the Data transfers to Node-MCU then it connect to Wi-Fi router. As we mentioned that Wi-Fi name and password need to be given in code.
- Now there is internet connection to Node-MCU from Wi-Fi ,so the data will upload to Web Serve to a dynamical IP address.
- Every time the Ip address is changes as it is Dynamical .So you need to find it by Arduino IDE serial monitoring.

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- Continuously it uploads data to server for every 10 second of time. Whenever the given condition is satisfied the respected action takes place, that fallowed by program code
- Here is a decision maker by why which the output depends on level of the container filled i.e. Ultrasonic Sensor value.
- If the level is 0 % then it goes connect the IFTT server, from there we get a email Notification .That your container is empty. Please refill it.
- If the level is more than 10% the loop repeats again.
- Even you can see data in any web server as it is updated information in server

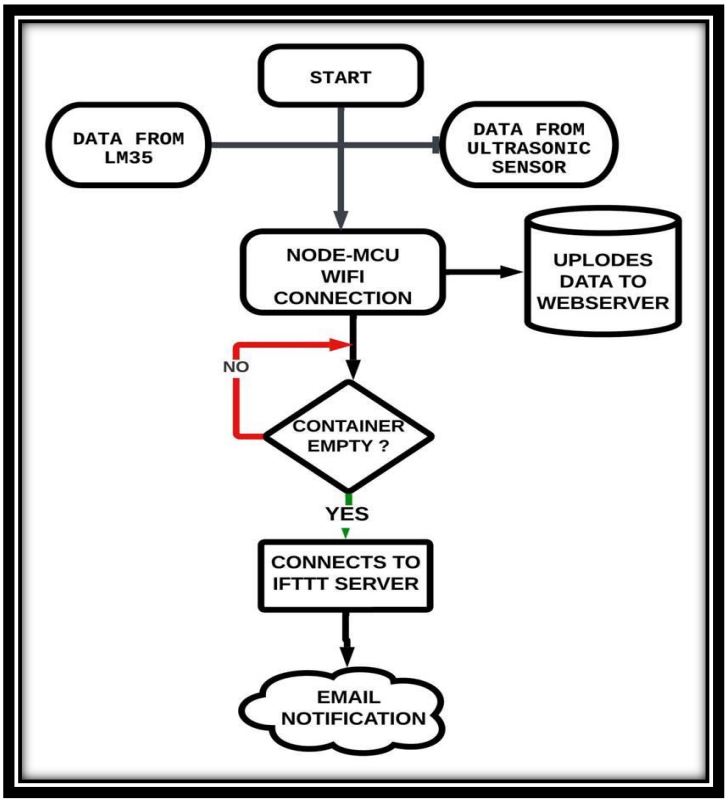

Figure 2: Dataflow of Smart Container

IV. IFTTT(IF THIS THEN THAT)

- IFTTT allows you to do more with over 700 different apps and services, including Twitter, Dropbox , Ever note, Fit bit, Amazon Alexa , and Google Assistant
- On IFTTT, we call these services. A list of all services on IFTTT can be found here
- We bring services together into Applets, automations that allow you to do things your apps and devices can't do on their own.
- IFTTT is short for 'If This Then That', and is pronounced like 'Gift' without the 'G'.
- We used to be called 'if this, then that' because Applets would have one trigger and one action. If this happens — then that happens.

Figure 3: IFTTT logo

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How does it works ?

IFTTT helps connect different apps and devices. When you sign up for a free account, you can enable your apps and devices to work together to do things they couldn't otherwise do. For example, you can back up your Instagram photos to Dropbox, have your lights turn on when you enter your home, or automatically remind a Slack channel about a meeting.

1. Here's how it works:
2. Create a free account.
3. Browse the IFTTT website or app to find something that interests you.
4. Connect the services that are involved in the Applet or connection.
5. Find more Applets and connections, and repeat!
6. Applets and connections can be built by services or users from the Developer Dashboard. You also have the power to create something custom for yourself! Go to ifttt.com/create to combine two services and make your own Applet!

V. SYSTEM CONFIGURATION

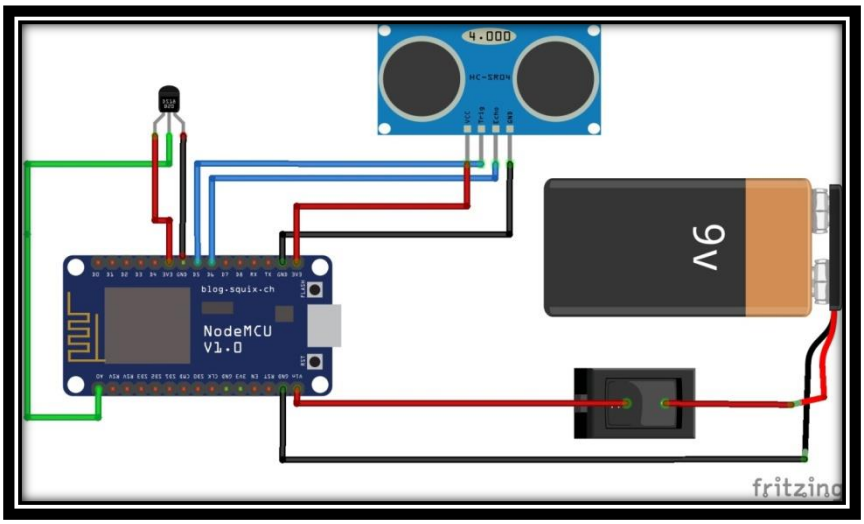

Figure 4: Circuit Diagram of Smart Container

Here is the interconnection configuration of the system. The Sensors, Power supply and Loads, are the above figure shows where to connect and how to connect. It is just the connections how are made on to the Board (NODE MCU), but reality is that this varies by container sizes and there zones. This all setup is fixed at back of container. So that the circuit connection can't visible and also occupies unwanted space of the container.

VI. RESULTS AND DISCUSSION

Case-1

The container is empty i.e. No content is present in container, so the output will be as shown in figure.

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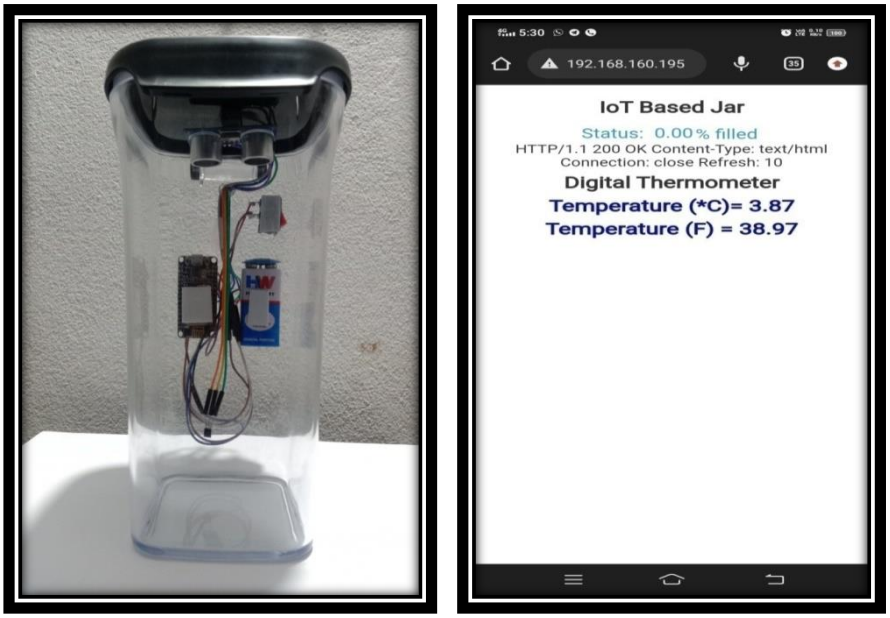


Figure 5: Smart Container with Empty and its Status

Here there is no objects present in container .The waves transmitted from ultrasonic sensor is reached at the end of container, So the percentage filled output should be 0 % in web server. Also the condition where we given that, if the container is empty or a given criteria is satisfied, then it should be connect to IFTTT server and Notifies to the mail that "**Container is Empty Please Refill It**".As it can be notified in the below shown figure.

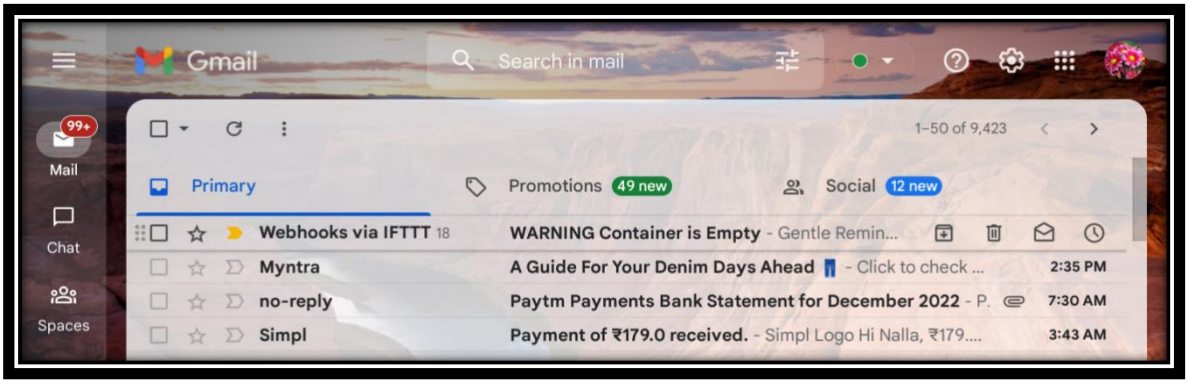
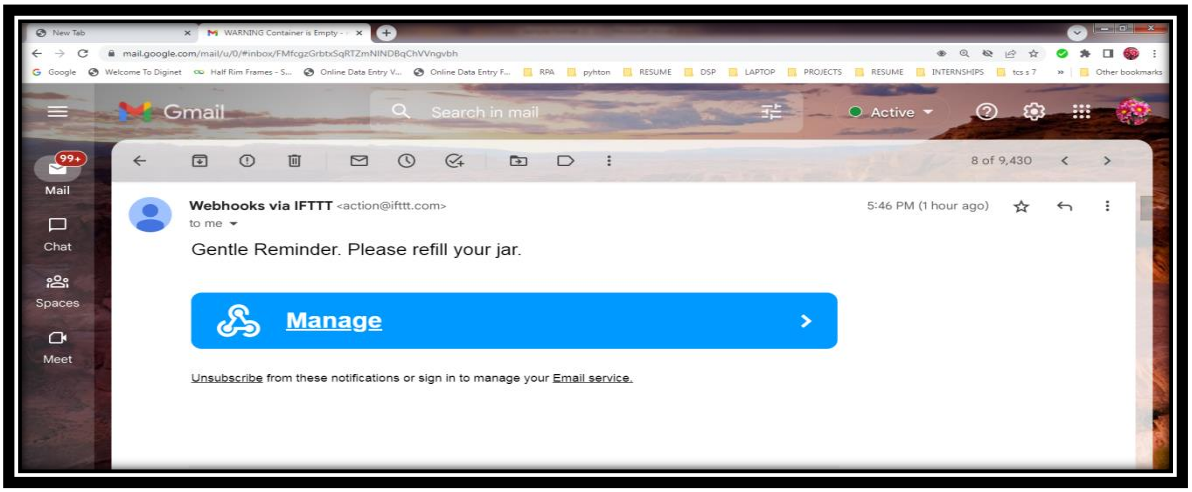


Figure 6: Notification of Email When a Container is Empty

Case-2

The container is partially filled with some amount of content. So the output will be as shown in figure.



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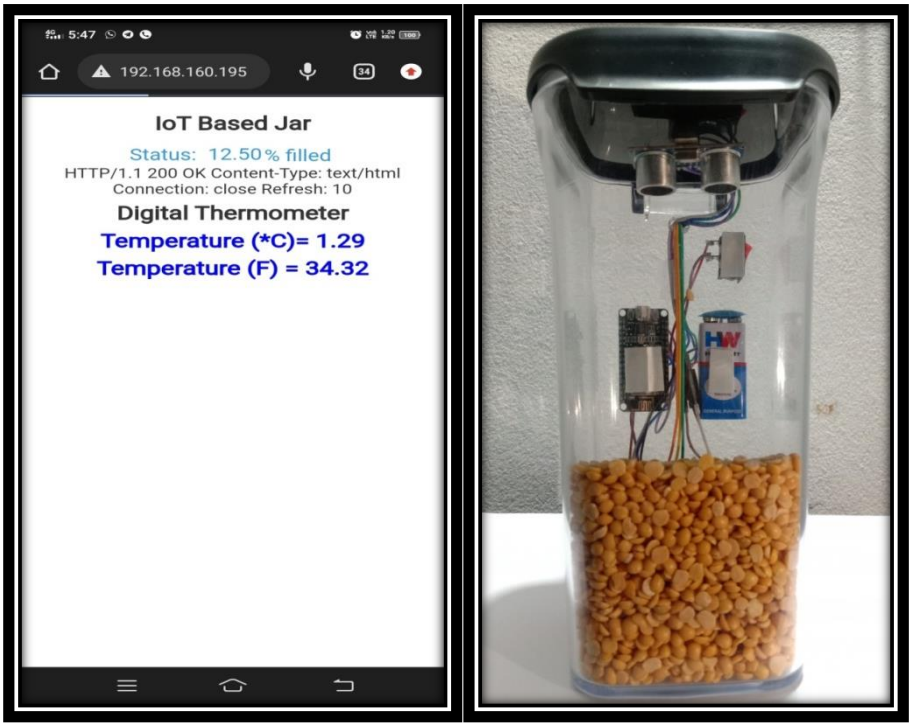

Figure 7: Smart Container with partially of filled and its Status

Here there is a objects present in container .The waves transmitted from ultrasonic sensor is reached at the top of content present in container, So the percentage filled in container will be output should be based on the calculation of ultrasonic sensor waves and that percentage value will be updated in web server. Also the condition where we given that, if the given criterion is satisfied, then it notifies to the mail .If the given criteria are not satisfied then the given loop repeated again and again.

In both cases, the smart container system leverages the capabilities of the ultrasonic sensor, Node-MCU, and web application to provide timely information and notifications. These features enable efficient stock management, ensuring that the container is refilled promptly and allowing users to monitor the fill level remotely.

VII. CONCLUSION

In conclusion, the development of a smart container using Node-MCU and an ultrasonic sensor offers numerous benefits for tracking and managing container contents dynamically. By integrating internet connectivity and a web-based application, the smart container enables users to monitor stock levels remotely and receive real-time updates on the container's fill level. The implementation of the smart container methodology outlined in this paper allows for easy access to stock information from anywhere in the world with an internet connection. The ultrasonic sensor accurately measures the container's fill level and sends the data to the Node-MCU, which in turn updates the web server. This information can be accessed through a user-friendly web or mobile application, providing users with essential details such as stock levels, expiry dates, and manufacturing dates. The smart container system also offers the advantage of proactive alerts. When the container reaches a threshold level or becomes empty, the system can send email notifications, ensuring that users are promptly informed and can plan for restocking accordingly. Overall, the smart container system presented in this paper enhances inventory management, improves efficiency, and provides convenience by enabling remote tracking and monitoring of container contents. It offers a practical solution for various applications, including tracking supplies, managing medicine stocks, and ensuring timely restocking. With further advancements and customization, this technology can be adapted to suit specific industry needs and contribute to smarter and more efficient supply chain management.

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VIII. FUTURE SCOPE

The jar can be developed for multi-purpose usage such as measuring the liquid quantity of some chemical solutions in a container. It can be made completely wireless with the availability of latest technology then. Synchronizing of one or more jars of similar kind would help the user optimally access various range of stock sand buy according to availability. This technology can also be used to track the quantity of medicine for patients who suffer from diseases like diabetes and who need to have regular medicine update. This jar saves them falling short of medicine and helps them keep their medicines in the jar updated. For merchants who own general store and who are away from their shop, this technology helps them to instantly order the amount of stock required for them to order by modifying the jar formula for bigger containers. The percentage of container filled would make their work easier.

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