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Automated Kitchen Shelf

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Abstract: ***This paper presents the design and development of an "Automated kitchen shelf" which measures the quantity of the grocery items in the kitchen containers. The container is augmented with the sensor to measure the level of the grocery items which is updated to a database whenever the quantity level goes below the threshold. The containers in the kitchen shelf are fixed with the ultrasonic sensor at the top for measuring the distance and tracking the quantity of the grocery items. The system also generates a message to the user when the item reaches below the threshold level and directs the user to the automated shopping list in the mobile phone.***

Keywords: Automated kitchen shelf, Internet of things(IOT), Wireless Sensing Network(WSN)

I. INTRODUCTION

The Kitchen is a very important place of our home in our day to day life. Now a day we are facing difficulties in kitchen to find the food item's quantities whether it is there or not.In today's world, people find it difficult to check the kitchen for quantity of each and every food product and to buy them when it is emptied .Mobile has become a common mode of communication for all, so it would be very much useful and helpful for working people. Even people who don't know to use internet, they are using mobile application easily The growing popularity of the automated things to be smart and to support us in our day to day activities, we are introducing home automated technique using Internet of Things(IOT).Managing kitchen shelves and checking the grocery items with the help of internet has a lot of scopes in future generations .In order to make it feasible for people and to reduce time consumption, this invention will work behalf of humans. The present invention generally relates to remote measurement, telemetry and more particularly, to rapid and automated measurement of food product levels in the containers and reporting the results to the user.It is an embedded system which consists of Ultrasonic Sensor, Arduino Nano, Wireless Sensing Network(WSN),IoTboard, Wifi-module. It is often that people working feel difficult to track the food items in the container. To overcome this problem we are introducing this system.

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I. RELATED WORK

Nilesh Kordeetal. [1] has the given concept of IOT based smart infrastructure management system which saves a lot of time of the user. "Smart Shelve Management System using IOT-A Novel Approach[1]is implemented using level and weight sensor which measure the level of the food in the container.J.Chen et al. [2] "A Smart Kitchen for Nutrition-Aware Cooking" has given the concept of upgrading the nutrition values of each food items. The sensor monitors the cooking activities of the user and is helpful in intimating the nutrition information's for the user.Mattihias Kranz et al. [3] "Context Aware Kitchen Utilities" is implemented using sensor enriched- knife on a cutting board. The cutting board is made up of various augmented sensors like load and acceleration sensors which is used to find the type is used. Here microphone and camera is also used to recognize the cutting sound and to identify the object.Michael Schneider el al. [4] "The Semantic Cookbook: sharing cooking experience in the smart kitchen", is implemented to capture, share and exploit cooking experience. The cooking information is observed from the user actions during the preparation of food. These processes are noted in stepwise manner.Pal Amutha Karuppiahetal.[5]"Smart kitchen cabinet for aware home" is implemented using augmented load sensors in the sides of the jars. It measures the weight of the grocery item which is updated in the database. RFID tag is used for identifying and tracking the location. The system delivers automated shopping list when the grocery item reaches the specified threshold level which is based on the requirement of the user .It is used for item identification and balanced diet cooking..K.Jayalakshmi et al.[6] "Waste to Wealth –A Novel approach for food waste management "invented a disposal machine which measures the amount of food waste. It measures the quantity of food, displays and tells how to be recycled.

II. OVERVIEW AND ARCHITECTURE

A .System design

This section comprises the complete description of the Embedded System. The main improvisation of our work is that the use of a hub is being replaced by Wireless Sensing Network (WSN) module. The main use of this module is to connect up to 65532 devices at a time. The other improvisation is that usage of two sensors is replaced with a single sensor called ultrasonic sensor. Ultrasonic sensor is used to measure the distance of the grocery items present in the container.

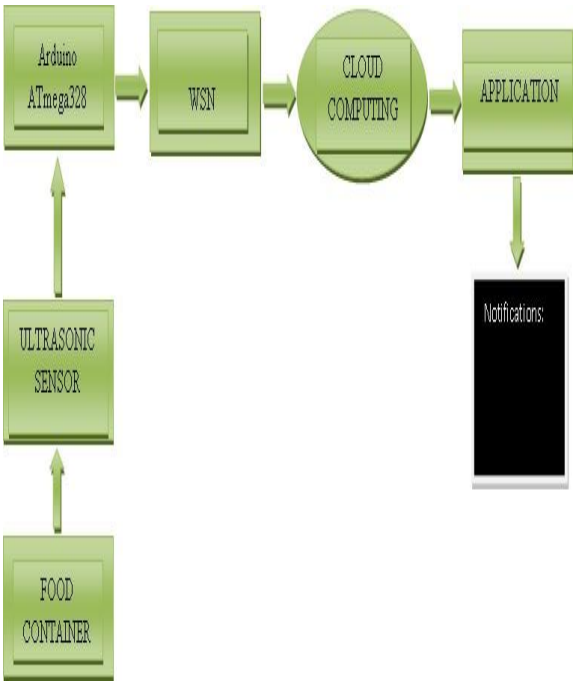

Figure 1: System Overview

Mini microcontroller (Arduino) is use to reduce the cost and to make it compact. Iot board is used to activate internet connection with dedicated webpage. Also to process all input UART data to Wi-Fi based online data. Wi-Fi module allows microcontroller to connect network and make TCP/IP.The entire system is designed into an embedded system. The functional representation of the system is shown in Figure 1. The sensor measures the values and sends the data to the application. The application checks the data and intimates the user whether necessary action to be taken when the level goes below the threshold level. The user can check the data in mobile application and can interact with the system using the touch screen ad keypads. User has to set all the necessary details like container name, settings, and alarms when it reaches below threshold level. Once initial settings are given, the design can be fixed in the kitchen shelves.

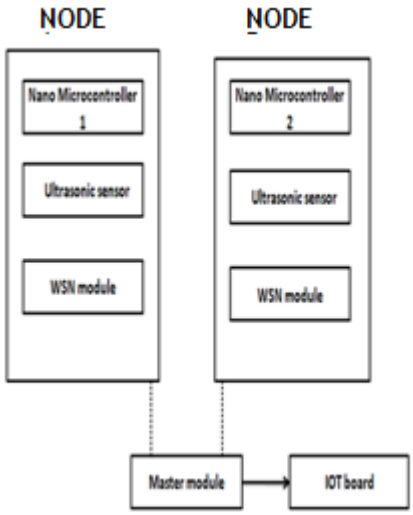

Figure 2: Block Diagram

B. Block Diagram:

In this system we are using Wireless Sensing Network which can have many numbers of nodes for connecting into containers. Figure 2 contains two nodes A and B. Each node contains Nano Microntroller (Nano Arduino), Ultrasonic sensor and a WSN node. Each node acts as a slave node, which words for the master module to collect the information's. Then these slave nodes are connected to the master module. Master Module gathers information from the slave nodes for every second,and then it sends the data to the IOT Board. In IOT board Wi-Fi module is fixed, to send the information to the mobile application.

C. Key challenges:

- Giving proper connections to sensors for each container's.
- Connecting the Ultrasonic sensor and Arduino to Wireless Sensing Module.
- Proper coding should be done to run the software for measuring the values from the ultrasonic sensors.

D. Novel Architecture Design:

Our proposed system is mainly focused on having a automated kitchen containers to measure the food level and this is affordable, convenient and easy to use by all people.

Design Objective of Automated System:

- Making user stress less and free from worrying about tracking the grocery items in the container.
- Alerting the user aware about the items in a kitchen for every time when it is going to be emptied.
- Making a convenient infrastructure for the women.
- Time can be consumed for checking the grocery items each time.
- Work load can be reduced by ordering the items in the webpage.

E. Components Of Proposed System:

1. Ultrasonic Sensor:

The HC-SR04 Ultrasonic sensor uses sonar waves to determine the distance of the grocery items because it is the best way to sense proximity and level of the food. An Ultrasonic Sensor uses a transducer to send and receive ultrasonic pulses in the container that relay back the information to the user. It offers non- contact range detection with high reliability and accuracy. It detects from 2cm to 400cm. It detects any type of grocery items like oil, water, and grains. It is not affected by external factors like sun light and heat.

2. Nano Arduino:

Arduino Nano (Microchip ATmega 328) is compact in size and it can be fit in any type of containers easily. It is a surface mount breadboard used in various embedded system due to less cost and friendly board. It has Integrated USB pin for programming and serial monitoring. The Nano Arduino automatically sense and switch to high potential source of power. For this controller coding is to be done in the Arduino programming language. It has manual reuse switch and it automatically resets during the program download. It also has ICSP header for direct program download.

3. Wireless Sensing Network:

A Wireless Sensing Network is a network of devices that can communicate with the user by collecting the information from a monitored field through wireless links. The data can be forwarded through multiple nodes and the data connected to another network like Wireless Ethernet. WSN is used to monitor the sensors and to gather information wirelessly and combining the data at a central location. It can be connected into several hundred or thousands. Each such sensor network node contains radio receiver, internal antenna connection to external antenna and it is connected via Arduino board.

4. IoTboard:

IoT boards are used most commonly in embedded platforms which are commonly used to build prototypes of manufacturer's ideas. For example , the prototype designs can be implemented thro ugh single board computers or any systems on module like Snapdragon 410E processor. It supports various programming environments and it collects sensor data using firmware and transfer these data"s to a cloud server. Energy efficiency is one of the good performance characteristics.

5. Wi-Fi Module:

ESP8266-01 is a low-cost Wi-Fi module enabling Wi-Fi network connection for microcontrollers. ESP8266 has a self-contained SOC (system on a chip), so it can function independently without a controller. It is possible to connect Arduino via serial communication which gives potential for more GPIOs (General Purpose Input Output). New components can be connected any time and it can be fixed to any board.

6. Master Module:

Master module is used to connect various slave nodes and connecting all the nodes and collecting information together. This information is transferred to IoT board.

III. FLOWCHART

The step to step design of our proposed Automated Kitchen Shelf system is explained in Figure 3

A. Flowchart of slave node

- Fix threshold up to 1 feet to measure the distance using Ultrasonic sensor
- Gather the values from Ultrasonic sensor when the threshold reaches.

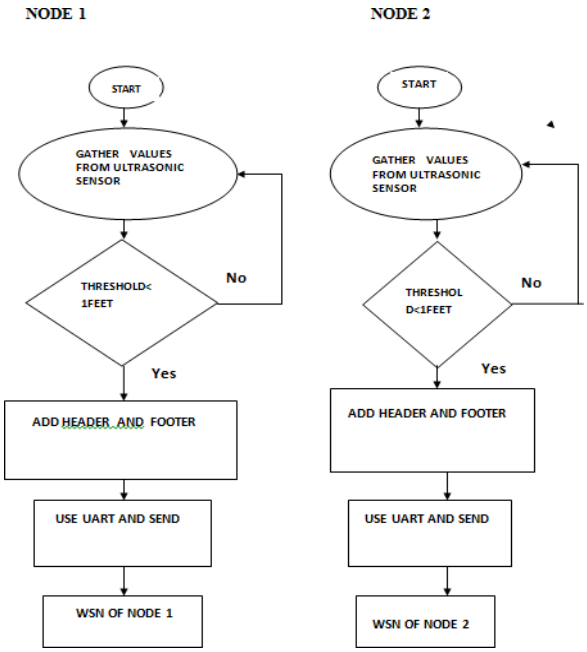

Figure 3: Slave node for A and B

- Check whether the value goes below the threshold level.
- If it goes below the set value, then add Header and Footer to both the nodes.

- For each node give separate Header and Footer.
- By using UART, serial computing is done.
- Each node values are sent to Wireless Sensing Network (WSN) using UART.
- If the value remains the same, the above process is repeated until the threshold reaches.
- For every node same process is repeated.

B. Flowchart of Master node

- The first step is to get the values from the Wireless Sensing Network(WSN).
- Now the data from both nodes are got.
- The values in both the nodes are thus separated.
- After splitting them they need to be separated for the user identification.
- The separated data is now sent to UART.

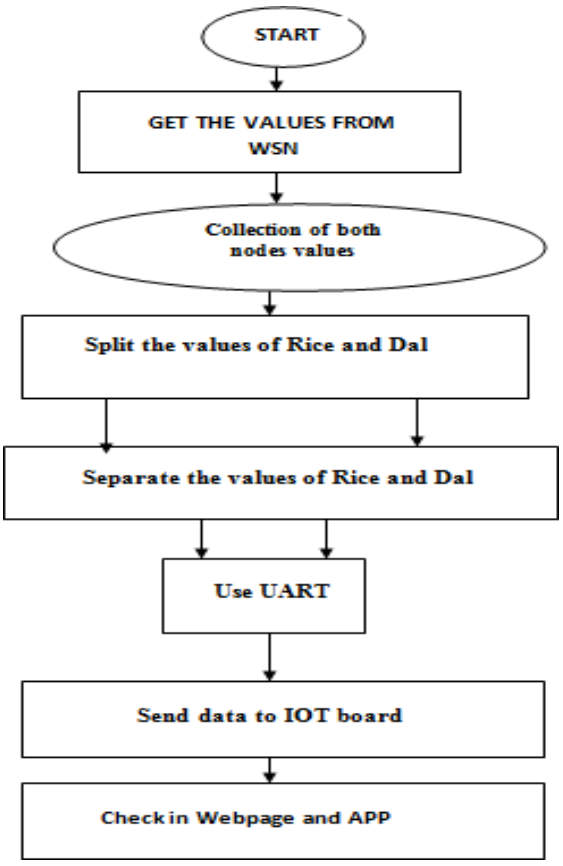

Figure 4: Master Node

- From the UART, through serial communication the data is sent to IoT board.
- Now we can check the result in both Web page and an Application.

IV. RESULT

Different values are collected from the ultrasonic sensor form the kitchen shelves. These data‟s are stored in the webpage whenever the grocery items are emptied. Figure 5,6,7,8 represents estimated results. If the value of the level goes below the threshold level then it indicates emptied. For exampledal1_empty‟, Rice2_empty‟ is shown in the webpage and mobile application. If the grocery items are refilled then it again alerts the user that the item is full. For example, itindicatesdal1_full‟, Rice2_full‟islistedtotheuser. If the food is emptied, he can buy the grocery items by clicking the URL. It directs the user to Online page where different vendors are present.

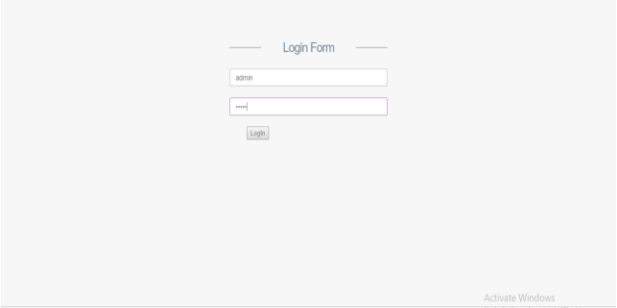

Figure 5: Login page of website

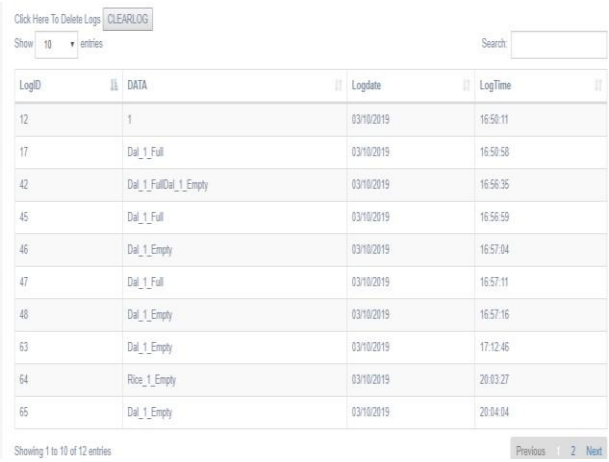

Figure 6: Webpage of last 50 entries can be viewed

Figure 7: Output in Mobile application

V. CONCLUSION

This system is an initiative towards a Smart Kitchen where we have used an Ultrasonic sensor, to measure the distance. In the existing work they have used both level sensor and load sensor. The calculation of weight using the load sensor is not needed. The main aim is to find whether the item in the container is full or emptied. So we have used a single sensor instead of two different sensors , to meet the same purpose. In the existing network they used Ethernet hub, which can connect 6 to 8 devices.

To overcome this problem we have used Wireless Sensing Network which can connect 65532 devices at a time. The system saves the user time for searching the items and helps to work in kitchen. It is cost effective and consumes more time.

REFERENCES

1. K. Nilesh and T.Abhijeet " Smart Shelve Management System using IOT-A Novel Approach". In 2018 International Conference for convergence in Technology, The Gateway Hotel, XION Complex, Wakad Road, Pune, India, Apr06-08-2018.
2. J. Chen, P.Chi and H.Chu. "A Smart Kitchen for Nutrition-Aware Cooking". In Pervasive Computing, pages 58-65, 2010.
3. M .Kranz, A. Schmidt, A. M Maldonado, R. B. Rusu, M . Beetz, B. Hornler, and G. Rigoll, "Context-aware kitchen utilities". In Proceedings of the 1st International conference onTangibleandembeddedinteraction–TEI'07,page 213- 214, New York, USA,2007.
4. M ichael Schneider " The Semantic Cook NOOK". 2007 3rd IET International conference on Intelligent environment 24-25 September2007.
5. Pal Amutha Karuppiah. " Smart Kitchen Cabinet for Aware Home" Conference paper-M ay2012.
6. K.Jayalakshmi, S. Pavithra and C.Aarthi. "Waste to Wealth-A Novel Approach for Food Management". 2017 International Conference on Electrical Instrumentation and Communication Engineering, pages1-5, 2017.

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