OPEN ACCESS INTERNATIONAL JOURNAL OF SCIENCE & ENGINEERING

IOT BASED SMART REFRIGERATOR

[1]Rohit R. Mendhekar ,[2] Balaji P. Bhagat ,[3] Sachin J. Maindad , [4]Shilpa B. Rathod ,[5] Varsha B. Kadam , [6] Sachin D. Datey

Students, Department of Electrical Engineering, SKNSITS, Lonavala, India.
rohitmendhekar9988@gmail.com
Students, Department of Electrical Engineering, SKNSITS, Lonavala, India.
balajibhagat51@gmail.com
Students, Department of Electrical Engineering, SKNSITS, Lonavala, India.
sachinmaindad72@gmail.com
Students, Department of Electrical Engineering, SKNSITS, Lonavala, India.
rshilpa447@gmail.com
Students, Department of Electrical Engineering, SKNSITS, Lonavala, India.
varshakadam18121994@gmail.com
Students, Department of Electrical Engineering, SKNSITS, Lonavala, India.
sachin.datey.sknsits@sinhgad.edu

Abstract: ***Rapid improvement in technology tends to use smarter devices in day to day life, one such device is refrigerator. In the modular kitchen and shops refrigerator plays a major role in preserving food items. There is a need for more efficient way to monitor the amount of food materials left for the forth coming days and in case of shop it is necessary to avail the required quantity to improve the business. The proposed Internet of Things (IoT) system detects the shortage of food items, by transmitting the quantity of available food items to the users through mobile application. It gives an alert to the users to place an order if the weight falls below the threshold value. Classification and Regression (Prediction Algorithms) are used in the proposed system to prefer seasonal fruits and vegetables to users.***

Keywords: *IoT Things, Component, Raspberry pi, Load Sensor, Cameras, HX711, Android Application.*

----------∴ ∴ ∴----------

I INTRODUCTION

With tremendous improvement in technology, all devices are connected to the internet which forms the internet of things. The sensors are used to collect the data and send them to a host where it is intended to be processed over the internet. Improvement in the technologies, made our day-to- day life simpler. The technologies implemented using IoT in electrical appliances at homes made it smarter. One of those technologies is smart refrigerator which is used to store the food items. Refrigerators are used to prevent the spoilage of food and keep it fresh. It reduces illness and make our lifestyle healthier in the modern world. The proposed IOT based system uses Raspberry pi as the central server to make the fridge smarter. Load cell is used to find the weight of the available food in analog form which is then fed into HX711 (an A to D converter) to obtain the weight in digital form. Intelligent home automation system uses the mobile devices like tablet and smart phones to control the functioning of home appliances anywhere from the world through internet. Smart fridge is connected to the network via a protocol through which it can communicate with the user and make it interactive. Mobile application has been developed to monitor the quantity of things in the refrigerator. When the weight of the contents measured by the load cell falls below the threshold value then a message will be sent to the user through mobile application notifying that there is an urge to place an order. The order can be placed just by accepting or

||June 2021|| ISSN (Online) 2456-3293

rejecting the suggestion in the notification itself, which automatically places an order. The main focus is to develop a weight monitoring system and a mobile application to monitor and manage the smart fridge which makes the work done by the humans simpler.

II BASIC OBJECTIVE OF THE PROPOSED SYSTEM

The thesis is basically focused on the design of the hybrid solar system, which includes:

1. The main goal of this project is to check the status of vegetables and avoid wastage of vegetables.

2. The user can be alerted of the updates on his phone and can take place to avoid food wastage or can places orders to rests tock the food in the fridge

III METHODOLOGY

Components

We have used sensors like a Load cell sensor which helps us to track the weight of the food item. A Load cell sensor is a transducer and needs an analog to digital converter, here we have used HX711 (Load cell amplifier) to connect the sensor to Raspberry Pi. To know what food item, it is we have used a Pi camera which helps us to take a photo and save it. A push button is used to signal the camera to take a photo. These sensor inputs are then given to a microcontroller, here we have used a Raspberry Pi 3b because it is an all-in-one module which has inbuilt Wi-Fi module which helps us make the system wireless, it also has a user installable OS or GUI (Graphical User Interface). Fig. 1 shows the basic architecture of our proposed system. The data from the sensors is further processed by feeding it to a machine learning model which predicts the food item form the photo and compares it with an offline database (.csv file) and retrieves the relevant data and sends SMS messages to the users smartphone using an online SMS messaging API (Application Program Interface)II LITERATURE REVIEW

Whereabouts

The load cell sensor is fixed to a tray which can hold the food item inside the fridge. The Pi camera is fixed in such a way that the frame for every photo is fixed and can cover the whole tray in an image. The Raspberry is powered with the help of a portable battery.

The Pi Camera can be attached directly to the Raspberry Pi and is positioned such that the frame and the item have good lighting conditions (artificial lighting can be used).

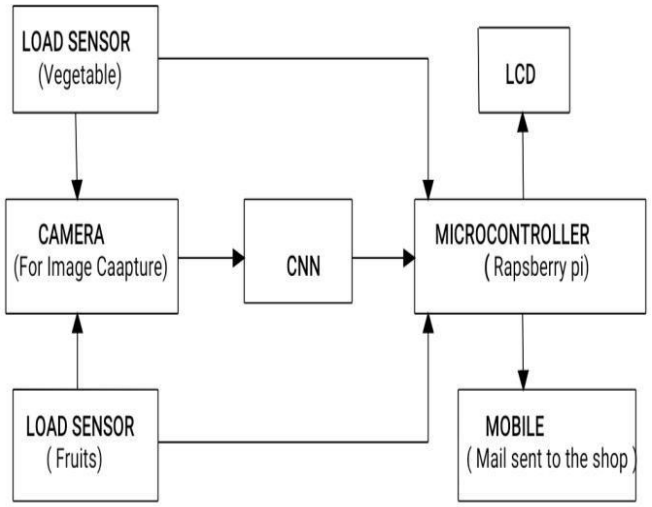

Fig1: Block diagram of a proposed system

The frame should get the photo of the whole item to gather the most information. The camera sends the image to the Raspberry Pi and the machine learning model predicts the item type. A push button is used to signal the Raspberry Pi to take a still using the camera.

1. Raspberry Pi :-

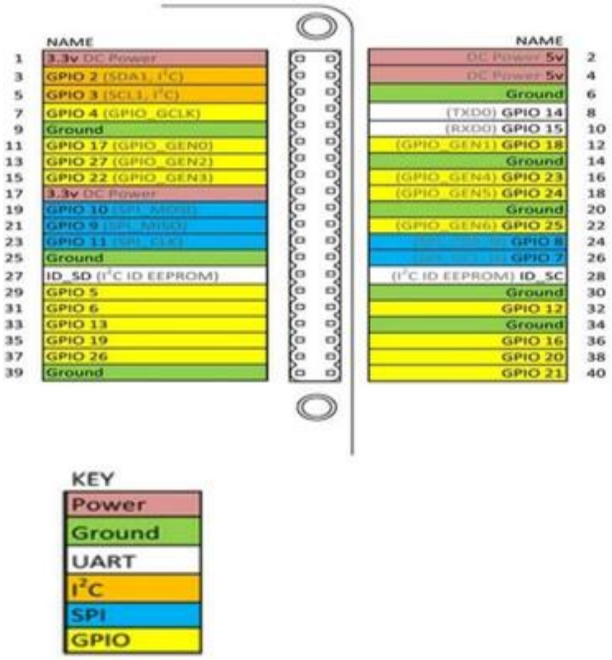

Fig 2:- Pin diagram of Raspberry Pi

2. HX711 :-

HX7ll Amplifier has five input wires such as RED, BLACK, WHITE, GREEN and YELLOW. Here

||June 2021|| ISSN (Online) 2456-3293

Yellow wire is an optional ground wire and other are come from the load cell. Sometimes yellow is replaced by a larger black wire, foil or loose wires.

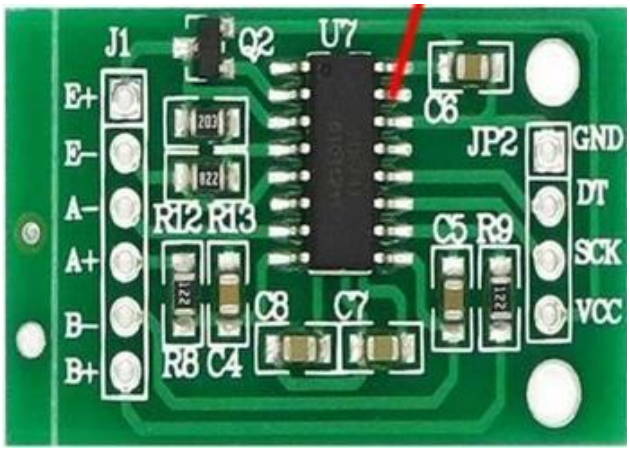

Fig 3:- HX711 Board

3.Load Cell:-

A Load cell measures and weight of the thing which is resting on it. It produces the output as analog signals which intern passed into the HX711 Board.We have used sensors like a Load cell sensor which helps us to track the weight of the food item. A Load cell sensor is a transducer and needs an analog to digital converter, here we have used HX711 (Load cell amplifier) to connect the sensor to Raspberry Pi.a visual interactive tool that will definitely sort the whole concept out for you.

- Step 3: Flattening This will be a brief breakdown of the flattening process and how we move from pooled to flattened layers when working with Convolutional Neural Networks.

- Step 4: Full Connection In this part, everything that we covered throughout the section will be merged together. By learning this, you'll get to envision a fuller picture of how Convolutional Neural Networks operate and how the "neurons" that are finally produced learn the classification of images.

4.Algorithm

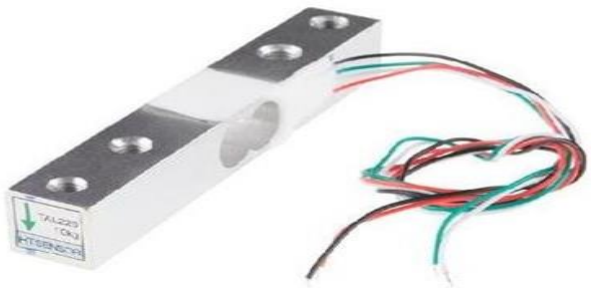

Fig 4:- Load Cell

The goal of the proposed architecture is to enhance the sustainability of IoT applications by exploiting smart and reliable (networks of) things and by being able to utilize a big number of heterogeneous device platforms. The proposed architecture enables the development of an environment for IoT applications through cross-platform channels that incorporate technologies for Data, Information, Things and Decentralized Management. As briefly described previously at a conceptual level, the proposed system's workflow is as follows. The Load cellThe Propose system uses following Algorithms:

CNN Algorithm

A Convolutional Neural Networks Introduction so to speak. Step 1: Convolution Operation

The first building block in our plan of attack is convolution operation. In this step, we will touch on feature detectors, which basically serve as the neural network's filters. We will also discuss feature maps, learning the parameters of such maps, how patterns are detected, the layers of detection, and how the findings are mapped out.

- **Step 1(b): ReLU Layer**

The second part of this step will involve the Rectified Linear Unit or ReLU. We will cover ReLU layers and explore how linearity functions in the context of Convolutional Neural Networks. Not necessary for understanding CNN's, but there's no harm in a quick lesson to improve your skills.

- **Step 2: Pooling**

In this part, we'll cover pooling and will get to understand exactly how it generally works. Our nexus here, however, will be a specific type of pooling; max pooling. We'll cover various approaches, though, including mean (or sum) pooling. This part will end with a demonstration made using sensor and camera module work in tandem to help find out what is the status of quantity of an item. And use the database to retrieve the data according to the output of the previous operation and send corresponding data to the user's smartphone using Twilio SMS API. We have achieved the desirable result from the image detection from the classifier. The Fig. 4 shows the result of the image detected and executes the command to send a message

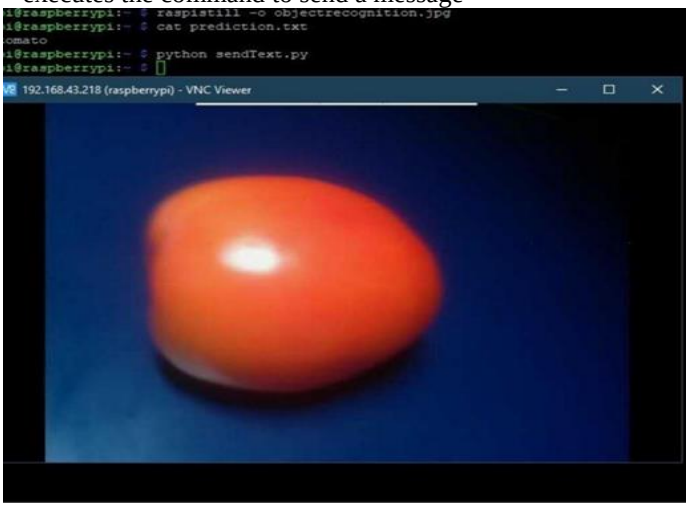

Fig 5:- Image Capture by Cam

Then the python program inputs the relative data onto the message which is eventually sent to the user's smartphone using Twilio API. The message received for a sample experiment is shown in Fig

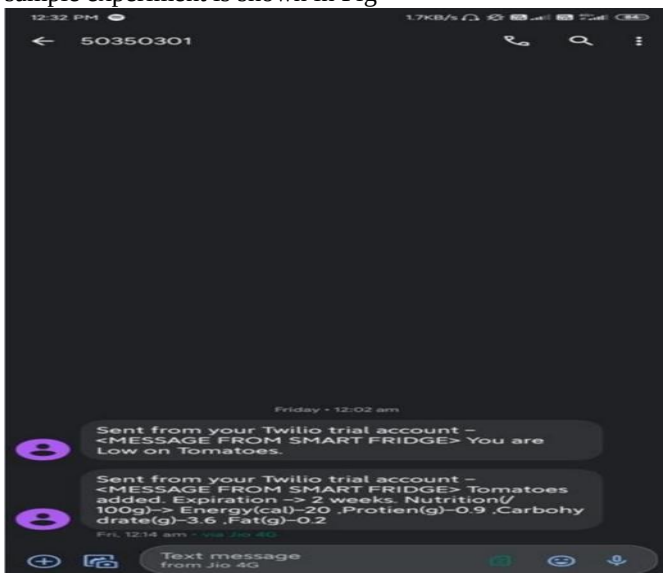

Fig 6:- Output Text Message

IV CONCLUSION

We have given a smart refrigerator application. The proposed smart refrigerator can enable prosperity. It is planned for regulating things set away in it. What's more, besides, through the intelligent refrigerator people can save some money with less effort. We are certain that such kind of smart refrigerator will be basic part in future smart homes. The possibility of the insightful fridge is obviously more coming to than educating the customer about the substance of the fridge. The smart refrigerator is conservative and easy to use.

V ACKNOWLEDGMENT

I would like to thank the publishers, researchers for making their resources material available. I am greatly thankful to Mr. Sachin D. Datey for their guidance. We also thank the college authorities, UG coordinator and Principal for providing the required infrastructure and support. Finally,we would like to extend a heartfelt gratitude to friends and family members.

VI REFERENCES

[1] Nikhil Kakade, Prof. (Dr.) S.D. Lokhande," IoT based Intelligent home using Smart Devices", International Journal of Innovative Research in Computer and Communication Engineering, vol. 4, Issue 6, June 2016.

[2] Deepti Singh, Preet Jain, "IoT Based Smart Refrigerator System", International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE), Volume 5, Issue 7, July 2016.

[3] Emily Moin, "Smart Refrigerator for Grocery Management", Technical Disclosure Commons, Defensive Publication Series, May 05, 2015.

[4] Folasade Osisanwo, Shade Kuyoro, and Oludele Awodele," Internet Refrigerator",3rd International Conference on Advances in Engineering Sciences & Applied Mathematics (ICAESM 2015) March 23-24, 2015.

[5] Shama Mubeena, N. Swati," The Design and Implementation of a Wi-Fi Based User- Machine -Interacted Refrigerator", ISSN 2319-8885, Vol.06, Issue.14, April-2017.

[6]B. Ramesh, J. Lingaiah," Raspberry Pi Based Interactive Home Automation System through E-Mail", International journal of Innovative Technologies ISSN 2321-8665, Vol.04, Issue.15, October-2016.

[7] Jessica Tran, Jordan Gilles, Ryan Mann, and Vishnu Murthy, "Automated Demand Response Refrigerator Project", CE 186, OCTOBER 2015.

[8] Soundhar Ganesh S, Venkatesh S, Vidhyasagar P, Maragatha Raj S, "Raspberry Pi Based Interactive Home Automation System through Internet of Things", International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 3 Issue III, March 2015.

[9] Carson Kai-Sang Leung, Richard Kyle MacKinnon and Yang Wang, "A Machine Learning Approach for Stock Price Prediction", University of Manitoba, Winnipeg, MB, Canada.Vol 2, Issue II, July 2016

[10]Prapulla S B, Dr. Shobha G and Dr. Thanuja T C, "Smart Refrigerator Using Internet Of Things" Journal of Multidisciplinary Engineering Science and Technology (JMEST) ISSN: 3159-0040 Vol.2 Issue 7, July – 2015.

****

e- National Conference

On

Advances in Modern Technologies of Multidisciplinary Research in Engineering Field (AIMTMREF)

[20th -21st May, 2021]

In association with ISTE , IETE and CSI

Address for Correspondence SKN Sinhgad Institute of Technology and Science Lonavala, Pune. 410 401, MS, India.

Website: www.sinhgad.edu

****