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Smart Refrigerator using IoT

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Abstract -*Refrigerator is the most frequently used domiciliary/kitchen electrical appliance all over the world for food storage.kitchen is one of the most prominent zones of intelligent appliances, one of those devices is refrigerator. The Internet of Things (IoT) refers to the set of devices and systems that interconnect real world sensors and actuators to Internet. Principally this appliance is used for various tenacities like storing vegetables, fruits etc. Smart refrigeration module is designed to transfigure any existing refrigerator into a smart cost-effective machine using sensors. Smart refrigerator compares the status of the food for e.g. Weight, quantity etc. Significance of this work will be removable of food spoilage, reduce illness and make healthier lifestyle of modern age human being. It will be smart enough to notify the current status of food items through an android app on our mobile phone.*

Key Words **- Android, HX711(Load Cell Amplifier)sensor, ESP32 Camera, DHT11, Water Sensor , Internet of Things (IoT), Smart Home refrigerator**

1. INTRODUCTION

In this modern human being is used to deal with technology or we can say it as IOT. The IOT define a use of intelligent connected devices and systems to leverage data gathered by embedding sensors and actuators in machines and other physical objects. Recently, smart kitchen always comes to mind whenever we talk about the Internet of Things or also known as Cloud of Things. The reason is the kitchen is the largest producer of waste and second largest user of energy in the home. As we look around ourselves technology, like cell phones, kitchen, appliances and many more. Here we study about smart refrigerator, because people are very busy in day to day life style. Usally they do not really have time to look after their healthy habits and diet; since we are capable to deal with the technology we can design a smart refrigerator system that helps us to maintain a healthier lifestyle without putting any extra effort and time. In this paper we had propose smart refrigerator which leads to healthier lifestyle.

1.1 OBJECTIVES

Amount of food is detected inside the fridge.

Automatic ordering of food when food becomes out of stock.

Send images of food inside the fridge.

Manually orders the food through the app.

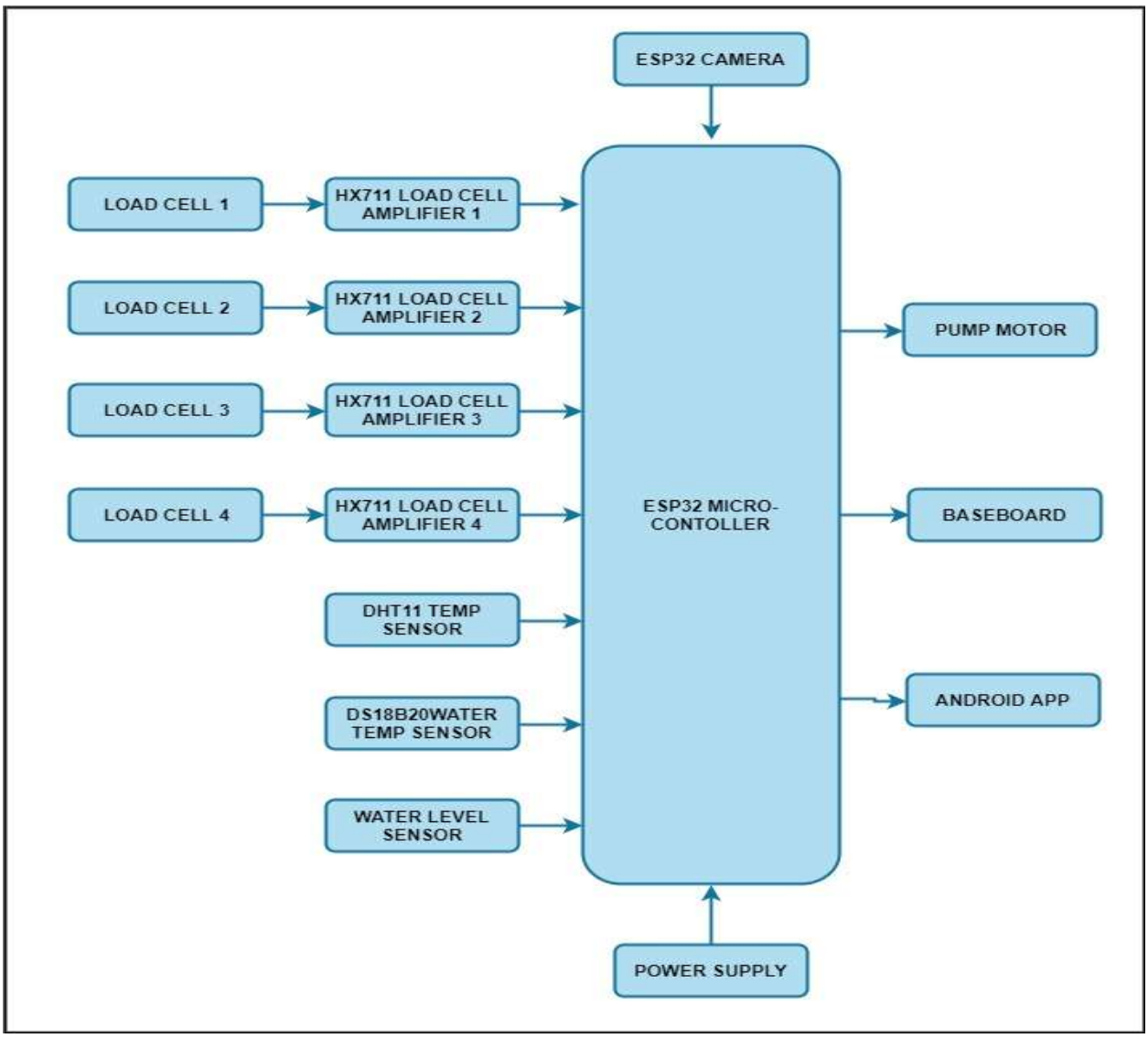
Checks Level indication of water.

Sensing temperature and water inside the fridge and water temperature.

1.2 PROPOSEDSYSTEM AND METHODOLOGY

This project uses ESP32 as the microcontroller. The project has two modes Auto Replenish Mode and Normal Mode. It uses Load Cell along with Load Cell Amplifiers HX711 for measuring the amount of food in the fridge. This data is then sent to the android app. When the food is found to be scarce it is automatically (Auto Replenish Mode) ordered by app. The user can set the food ordering to manual (Normal Mode) /automatic (Auto Replenish Mode) mode. It has a DHT11 sensor for measuring temperature inside the fridge, a water sensor for measuring the water level inside the water container and a water temperature sensor for measuring the temperature of water inside the water container. The device also has a water pump for dispensing. The android app will be developed on MIT App Inventor 2. It contains all the sensor values as well as the image of the containers. These images are sent by the ESP32 camera to Android App. It also has settings for providing links for automatic/manual food ordering.

2. SYSTEM ARCHITECTURE



3. ALGORITHM (MATHEMATICAL MODEL)

Inputs: w1, w2, w3, w4, ftemp, wtemp, wlvl, btn.

Outputs: aw1, aw2, aw3, aw4, awlvl.

Notations:

w1 = Load Cell 1 Value

w2 = Load Cell 2 Value

w3 = Load Cell 3 Value

w4 = Load Cell 4 Value

ftemp = Temperature inside the fridge

wtemp = Water Temperature

wlvl = Level of Water

btn = Status of button (On/Off)

aw1 = Alert for Load Cell 1

aw2 = Alert for Load Cell 2

aw3 = Alert for Load Cell 3

aw4 = Alert for Load Cell 4

awlvl = Alert for Water Level

Mathematics:

if (w1<= 0.1kg) then generate alert aw1.

if (w2<= 0.1kg) then generate alert aw2.

if (w3<= 0.1kg) then generate alert aw3.

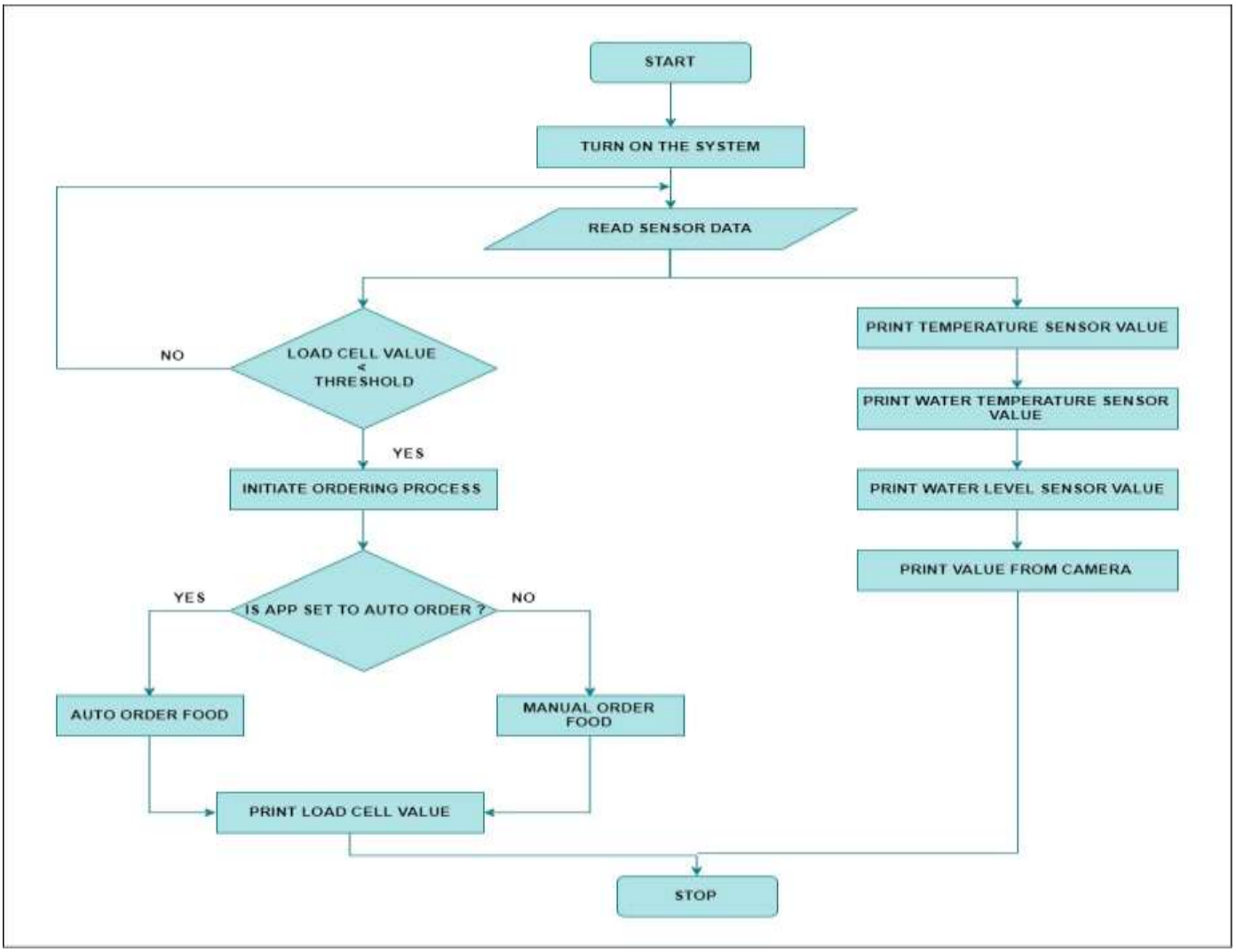
if (w4<= 0.1kg) then generate alert aw4.

if (wlvl <= 1L) then generate alert wlvl.

if (btn == 1(pressed)) then make water pump pin high.

Display ftemp and wtemp directly for temperature indication.

4. FLOWCHART



5. SOFTWARE USED

5.1ARDUINO IDE

The Arduino IDE is a cross-platform. It is a application for Windows, macOS, Linux that is written in the programming language Java. It is specially used for writing and uploading programs to Arduino board. The code for the IDE is released under the GNU General Public License, version. The Arduino IDE used C and C++ language. The Arduino IDE provide a software library from the Wiring project, which provides many common input and output procedures.

5.2MIT APP INVENTOR 2

Google provide an app inventor web application IDE. App inventor is maintained by the Massachusetts Institute of Technology (MIT). It allows newcomers to computer programming to create application software for two operating systems : Android, and iOS, which, as of 8 July 2019, is in final beta testing, scheduled to be released publicly in summer 2019. It is free. IT is open-source software released under dual licensing: a Creative Commons Attribution ShareAlike 3.0 Unported license, and an Apache License 2.0 for the source code.

6. WORKING

1. This project uses ESP32 as a microcontroller. The project has two modes Auto Replenish Mode and Normal Mode.

2. It uses Load Cell along with Load Cell Amplifiers HX711 for measuring the amount of food in the fridge. This data is then sent to the android app.

3. When the food is found to be scarce it is automatically (Auto Replenish Mode) ordered by app. The user can set the food ordering to manual (Normal Mode) /automatic (Auto Replenish Mode) mode.

4. It has a DHT11 sensor for measuring temperature inside the fridge, a water sensor for measuring the water level inside the water container and a water temperature sensor for measuring the temperature of water inside the water container.

5. The device also has a water pump for dispensing water when a push button is pressed.

6. The android app will be developed on MIT App Inventor 2.

7. It contains all the sensor values as well as the image of the containers. These images are sent by the ESP32 camera to Android App. It also has settings for providing links for automatic/manual food ordering.

7. FUTURE SCOPE

The feature in Smart Refrigerator can be upgraded by replacing the normal camera by a camera capable of image processing. The camera will perform image processing based on which the contents present inside the refrigerator can be easily identified. The camera will perform its task when the food is being kept inside the refrigerator. Along with this we can add a Recipe Creator which can suggest various recipes based on the food available inside the fridge to promote timely use of food before it gets wasted.More area can be converted using more sensors. Device size can be reduced effectively.

8. CONCLUSION

The Smart Refrigerator module is able to remotely notify the user and control the functions inside the refrigerator. It also facilitates purchase of the scarce food items from an online vendor. The notifications and information inside the application that is sent to the user via android application. This module allows the user to indicate a placed order and the other users to acknowledge the placed order.

Smart refrigerator application with intelligent multimedia capability. The proposed smart refrigerator can enable health.

We are sure that this type of smart working refrigerator will be important component in future smart homes.The concept of smart refrigerator is far more reaching than notifying the user about the contents of the refrigerator. Smart refrigerator is economically cost effective, and user friendly.

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