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FOOD WASTAGE MONITORING SYSTEM USING GSM AND ARDUINO

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ABSTRACT

Wastage of food is an important problem in the society. The wastage occurs mostly at school's or institution's hostels. People who waste food are unaware of the amount of food they waste and the authorities in-charge also fail to notice the quantity of food wasted every day. This project is proposed to monitor and indicate the food wastage to them. In this project, a load cell measures the amount of wastage present in the food bin and it is displayed on a LCD screen present in the body of the bin using Arduino. This data is send to the registered mobile number of the authority using GSM module. The person in-charge shall make changes in the food menu based on the data and the people who waste food shall realize the amount of food they waste every meal session and reduce food wastage consequently.

KEYWORDS—*food waste monitoring, load cell, Arduino, GSM, no food wastage*

I. INTRODUCTION

The wastage of food is a serious threat to our living. While one part of the population is wasting food, other suffers in poverty. Hostels in the educational institutions are places where students waste more food, students dump a large amount of food as waste. Food wastage in our country is so high that Rs. 50,000 crore worth of food produced is wasted every year in the country [1]. One third of food produced globally is wasted, that is 1.3 billion tons of food is never eaten. While these numbers are huge, the number of people suffering in poverty is larger. 194 million people in India don't receive adequate amount of food and suffer in hunger. This consequently results in malnutrition, poor health and hygiene. This project aims to educate the students about their food wastage and creating a positive impact on the society [1]. The project would also notify the person in-charge of the food service about the session wise food wastage as a SMS alert, and this will help him to make changes in food menu etc. This data shall also be used to scale the amount of food waste and hence find an effective method to convert the food waste into useful forms like biogas, organic manure, etc.

II. ELECTRONIC LOAD MEASUREMENT SYSTEM

Load measurement is the important part of the system. The amount of food wastage in the food bin is measured using a load measurement system on which the bin is placed [2]. This system consists of a load cell to measure the weight, an ADC convertor to convert the analog value to digital and calibration unit to convert the digital value to usable form i.e. Kilograms. The amount of wastage weight is displayed in the LCD Display connected to the arduino. This data is send to the registered mobile number through GSM Module.

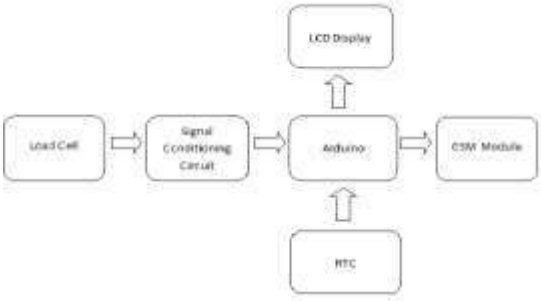

Fig.1.Block Diagram of Monitored Food Bin

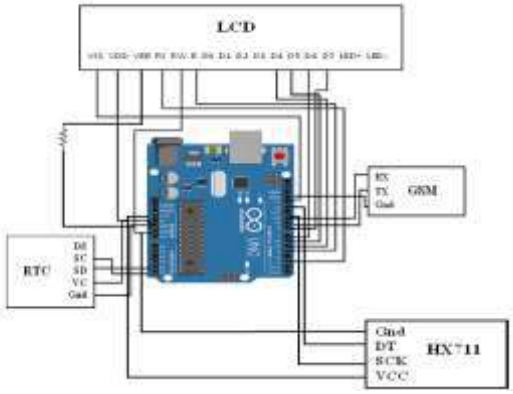

Fig.2.Circuit Diagram

A. Load Cell

Strain gauge converts the mechanical stress produced by the load into electrical signal. A strain gauge type load cell consists of a bridge circuit with 4 strain gauges each in place of the resistances in the circuit. When load is placed, the strain acts differently on each of the strain gauge and hence the resistances in the bridge circuit changes [2]. Two opposite strain gauge undergo compression and two undergo tension. The resistance in the strain gauge undergoing compression goes down and the resistance in the strain gauge undergoing tension goes high. This results in a current flowing through the bridge circuit.

B. HX711 Module

A power gain amplifier is used to convert the signal from the bridge circuit to readable digital value [3]. It consists of two main components- Programmable Gain Amplifier and Analog to digital convertor. The output of the load cell is very low and hence the PGA is used to amplify the analog signal. A 24 bit ADC is used to convert the analog signal into 24 bit digital output.

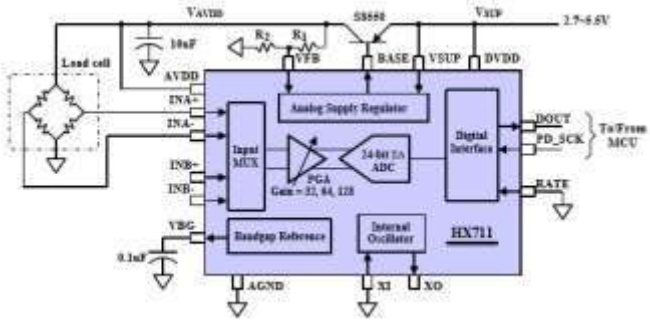

Fig. 3 Architecture of HX711

C. Calibration

The 24 bit binary data is obtained in a controller and is converted into its decimal equivalent. For each load varied, this decimal value varies. The data is plotted in a graph. The graph is a linear curve as in fig. 3 and hence can be established using the equation

$$y = mx+c \quad (1)$$

where y is the weight of the load, m is the calibration factor, x is the decimal value obtained and c is the weight at no load. By considering known values, the calibration factor can be calculated.

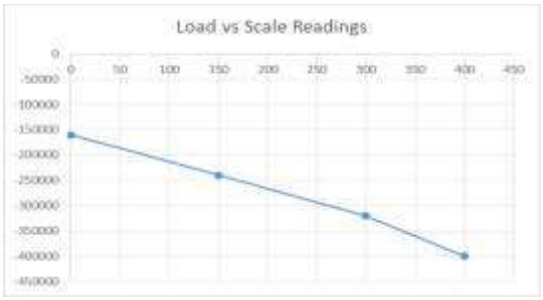

Fig. 4 Load in grams vs HX711 Readings without calibration

III. LCD, GSM AND RTC INTERFACING

For the system, three main interfacing is necessary. LCD is used to display the load measured in real time. RTC is used to monitor the time and use the GSM to send message of the food waste after every meal session.

A. LCD

A Liquid Crystal display is a matrix display. In the system we use a 16x2 display which can display 16 characters and in two lines. The data shall be sent in parallel communication. There are three control pins that need to be configured before sending the data for display [7]. The Register Select (RS) is used to select the mode of data send as character or instruction. Instructions are used to clear the LCD, set the cursor, selecting the line, etc. It is done by making RS=0. The character to be displayed shall be send by making the RS=1. The RW is used to either read or write data to the LCD. To display data, the RW is to be set in write mode, i.e. RW=1. For each data to pass, the enable (EN) has to be changed from 0 to 1. Further, a 5V supply is to be provided to the VCC.

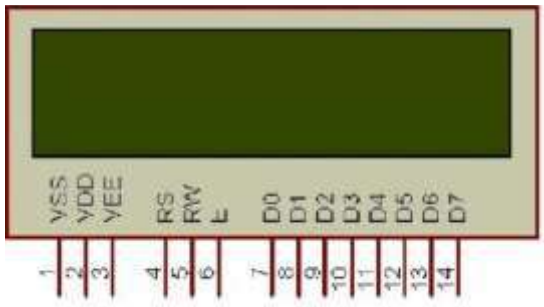

Fig. 5 Pin diagram of LCD display

B. GSM

A GSM Module is used to send or receive messages and call by using a SIM card. It works via serial communication. The frequency of both the devices is set and synchronism and the TX and RX of the devices are connected alternatively [5]. AT commands are used to select the GSM in message mode and send the data as message.

Fig. 6 GSM Module

C. RTC

RTC (Real Time Clock) is a device that can be loaded with time and it monitors this data without an external supply. This device monitors real time even in the absence of controller [6]. It used I^2C communication, where two pins, one to deliver and clock and another data is present. The real time can be obtained from this module and can be compared with preset values of time to send messages after the meal sessions.

Fig. 7 Tiny RTC Module

IV. FLOW CHART

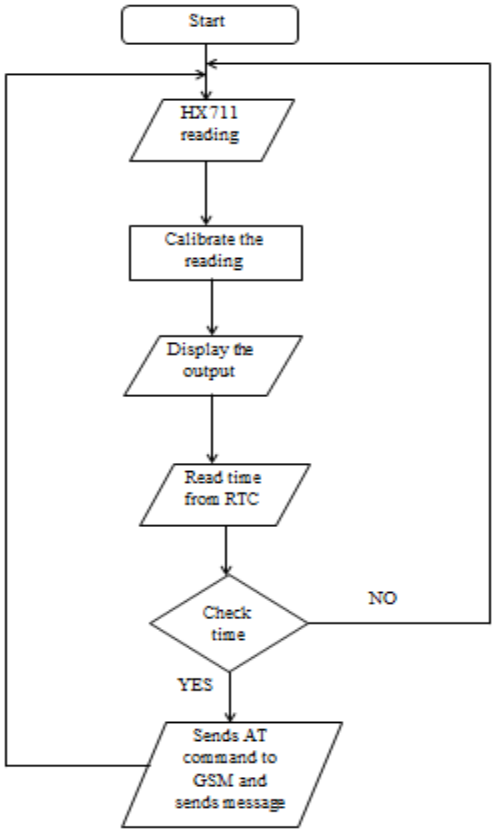

Fig. 8 Flow chart of Monitored Food Bin

V. RESULTS AND CONCLUSION

The system measures the amount of food waste and displays it on a display as in fig. 6. This helps people realize the amount of waste they produce and hence reduce the wastage they produce. This data is send after every meal session to a registered mobile number as in fig. 7. This helps the person in- charge to analyze the data and make decisions like change in food menu and hence reduce the food waste to a greater extent.

Fig. 8 Weight displayed on LCD

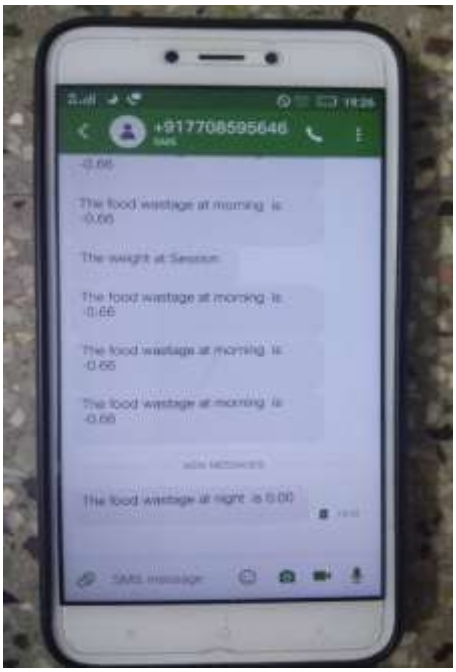

Fig. 9 Food waste value send as SMS

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