IJCSE International Journal of Computer Sciences and Engineering Open Access
Research Paper Volume-6, Issue-1 E-ISSN: 2347-2693

IOT based Smart weighing system for Crate in Agriculture

P.M. Sonsare

Dept. of Computer Science and Engineering, Shri Ramdeobaba College of Engineering and Management, Nagpur, India

**Corresponding Author: sonsarep@rknec.edu Tel:+91-9422731370*

Available online at: www.ijcseonline.org

Received: 24/Dec/2017, Revised: 04/Jan/2018, Accepted: 19/Jan/2018, Published: 31/Jan/2018

Abstract-As people are getting smarter so are the things. The Internet of Things (IoT) is a system of connecting mechanical and digital machines, animals or people with interrelated computing devices to provide an ability to collect process and transfer data over a network without requiring human interaction. While the thought comes up for smart cities there is a requirement for smart agriculture. As an example, this project presents a Smart weighing system which can be used for agriculture automation. The idea of Smart weighing system is for the farmer where they can weight their goods by placing it in crate. The Smart weighing system thus thought is an improvement of normal weighing machine by elevating it to be smart using sensors and logics. Smart weighing machine is a new idea of implementation which makes a normal weighing machine smart using sensors for weighing goods and sending message to keep track of the container using GSM modem.

Keywords-IoT, Smart Agriculture, Weighing System, Cloud Computing

I. Introduction

We have seen weight machines at many shops, where machine displays the weight just by placing any item on the weighing platform. So here we are building the Weighing machine to weight goods in crate itself by using Arduino and Load cell**s**, having capacity of measuring upto 40kg. This limit can be further increased by using the Load cell of higher capacity.

The Internet of Things (IOT) is the network of physical objects—devices, vehicles, buildings and other items which are embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data. The Internet of Things allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit.[1]

A home IoT system essentially integrates sensors into a network so that functionality that is required on a daily basis can be completed without human intervention. The design criteria will mainly have the following parameters:

1. The sensors that we choose for specific functionality, such as mechanical/electrical sensors for signal acquisition.
2. The networks and protocols that we choose, such as UDP, TCP/IP or even local networks such as Bluetooth, Zigbee or 6LowPAN.
3. The processing capability requirements for the specific functionality. This criterion is to check on how well data processing can be done by choosing a specific MCU/processor.
4. The power criteria for the system. The system power consumption should be minimal – hence a power efficient system is to be designed.
5. Additional interfaces for control mechanisms such as manual overrides, calibration or security modes.

An example, IoT system is the Smart weighing system. This system will perform the following functionalities[2]:

1. Goods weight is monitored automatically and if the crate is about to full (thresholds can be set based on capacity of crate), then automatically a beep is alarmed and data will be send on cloud.
2. The system is flexible enough to bring it to the notice of a user using a Mobile App and via this Mobile App the user can check the status of goods.
3. The system can also be used for communication.

Section I contains introduction of work, Section II contains objective and significance of work, Section III contains project impact, social benefits and expected

outcomes, Section IV contains system architecture, Section V contains expected result.

II. Objective - Project Significance

1. Implementation of mobile applications

The first objective is to implement mobile applications for farming that enable simple and efficient input of data during the execution of farmer's daily activities. Based on existing prototypes we will implement a scenario-oriented user interface which will enable farmers to have a sequenced order of activities. To enable this we will enhance existing system with a recommended plan for next day activities. Recommended plan will be created through special function in decision support system and based on data.[4]

Above objective may have following benefits:

- Significant increase in the efficiency of farming as they will enable the concept which call input data as you go *(farmer)*.
- More efficient use of resources on the farm due to access to timely information *(farmer)*
- Saving a lot of administration work *(farmer)*
- Better possibilities to demand additional data to be electronically reported and this is a basis for better data analysis to define strategies and directives for farming *(government institutions)*

2. The integration of services and application to enable extensive data collection

The second objective is to integrate monitoring systems, which will enable the collection of data from sensors and other devices through wireless communication technologies. We will also integrate various devices through their monitoring systems into the platform. [3]

Above objective may have following benefits:

- Data collected from sensors brings new possibilities for analyses and decision support *(farmer)*.
- Better possibilities to demand additional data to be electronically reported and this is a basis for better data analysis to define strategies and directives for farming *(government institutions)*

3. Implementation of advanced decision support for farming

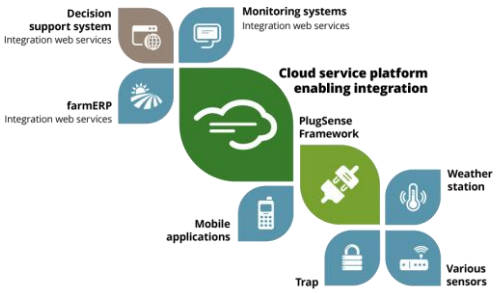
The third objective is to enable advanced decision support for farming.[4]

Above objective may have following benefits:

- Availability of timely and specific consulting service on the spot *(farmer)*.
- More efficient use of resources on the farm due to timely information and integrated data *(farmer)*
- Saving a lot of administration work *(farmer)*
- Possibility to collect more data from farmers than currently authority has *(government institutions)*
- Possibility to offer application for consulting service in the cloud for farming: consulting in general or for areas with high expertise needed *(companies, advisory services)*

4. Integration and creating of open standards for integration

The fourth objective is to integrate individual elements into platform as a whole and to create open standards for integration. Standards will be published under public domain or creative-commons license to allow collaboration, large support within the industries and communities.



[4]Figure1: Cloud Service Platform

III. Project Impact /Social Benefits- Expected outcome

Accuracy Measurements: Farmer can be assured of getting absolutely accurate measurements of the load due to the precise technology.

Cost Efficient: The traditional way of weighing the product involved a number of people loading and unloading, while others read the weight and some would tally the total. This means you had to pay every single person involved in the process, which increased the costs. On the other hand, you just need one to two people to weigh using on-board scales, thus helping you save money.

Saves Time: When you have on-site weighing scales, you don't have to repeatedly weigh the load. You can

just weigh it once, either at the warehouse or the farm from where it is collected. This helps you save time by eliminating the need to constantly load and unload the produce to weigh at the site and then again at the collection point.

Flexible Solutions: On-site scales are quite versatile, which can be used on different surfaces and a variety of vehicles of different sizes.

Data Management: Easily collect and manage the explosion of data from sensors, cloud services , connected equipment and existing systems. Enable farmers to easily visualize data and take action on insights and recommendations.

IV. System Architecture and Description

An overview of the system architecture for Smart weighing system is as shown in following figure.

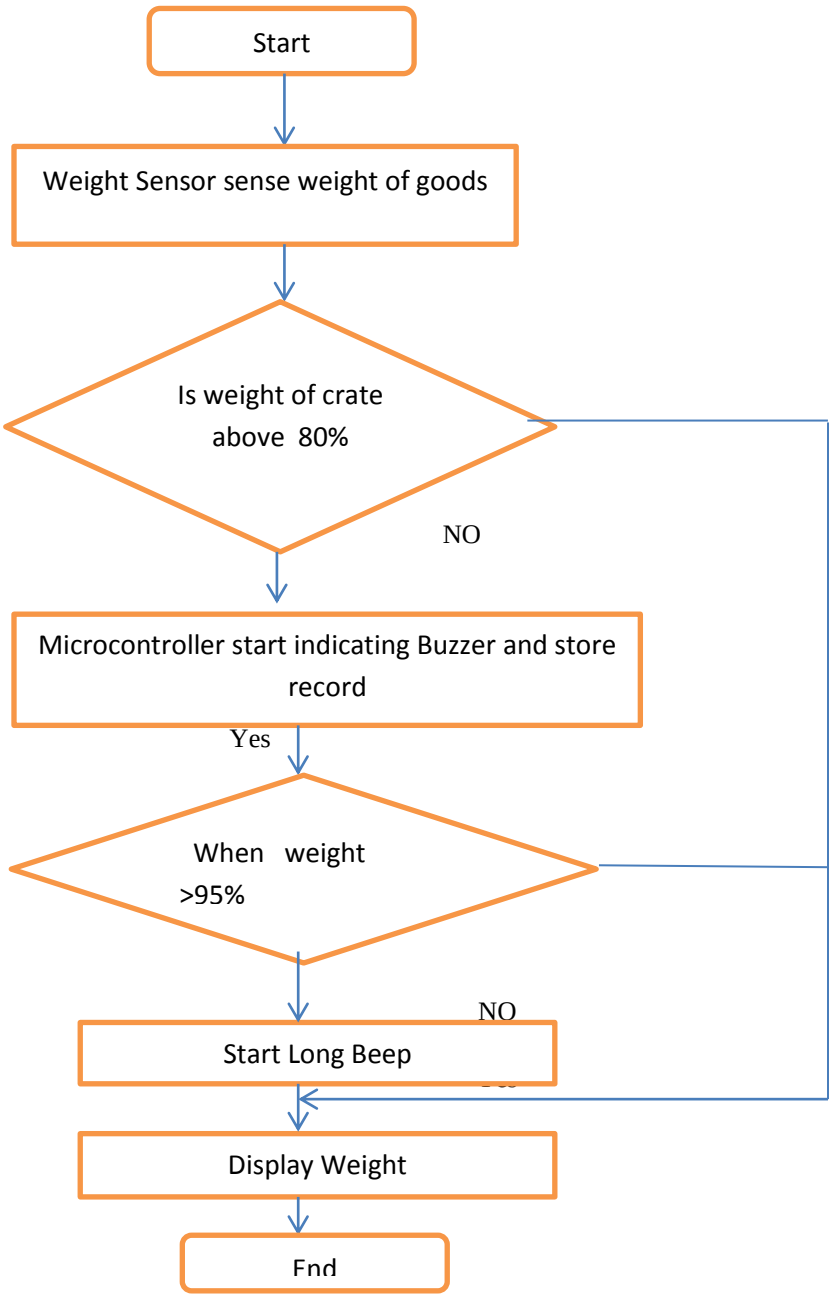


Figure 2: System Flowchart

The System architecture is divided into two parts.

Analog part: This includes the sensor and the amplifier sections.

Digital part: This consists of the Micro-controller along with network connectivity.

This proposed system consists of Weight sensor, Arduino UNO, GSM Module, LCD display. The arduino needs the power supply of 5v. The main platform we are using to build the project is Arduino which provides us the flexibility to write code effectively in convenient way and also it will provides us features like inexpensive, cross platform, open source and extensible software, easy for beginners. The Arduino is a microcontroller based on UNO.

Goods on crate are measured on crate itself. If weight is above 80% of maximum capacity of crate, it will start buzzer to indicate crate is about to full. So that responsible person will be attentive. Once crate is filled more than 95% long beep will be given by buzzer. The weight of goods will be stored on cloud and appropriate message will be communicated to concern person.

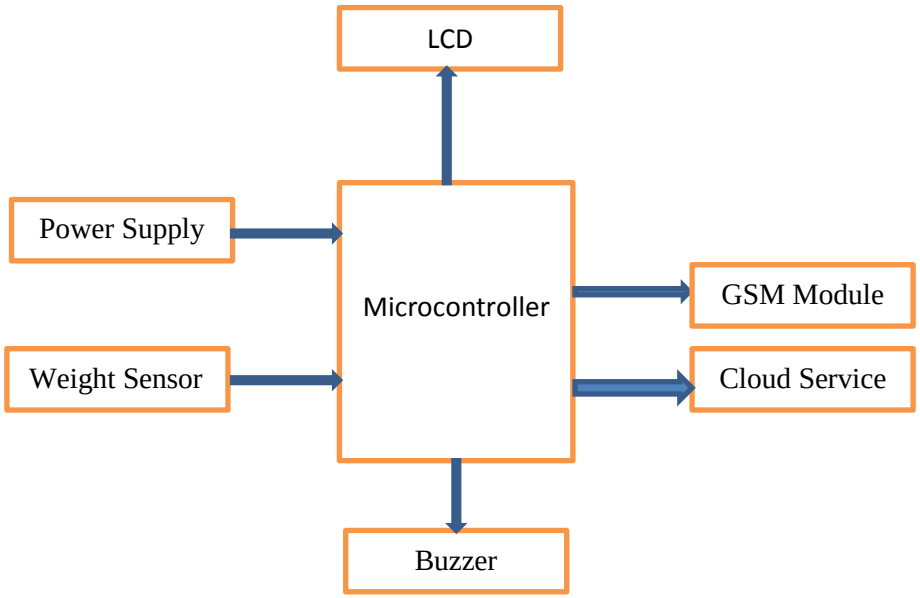


Figure 3:Hardware

LCD Display

LCD stands for Liquid crystal display. They have become very common with industry by clearly replacing the use of cathode ray tubes (CRT).CRT consumes more power than LCD and also bigger and heavier.

Load Cell

As per dictionary, a load cell described as "weight measurement device necessary for electronic scale that displays weight in digits". However, load cell is not restricted to weight measurement in electronic scale. Load cell is passive transducer or sensor which converts applied force into electrical signals. They are also referred to as "Load Transducers".

Load cells use different operating principles:

- Load cells based on fluid pressure
- Load cells based on elasticity
- Load cell based on magnetostriction or piezoelectric effect

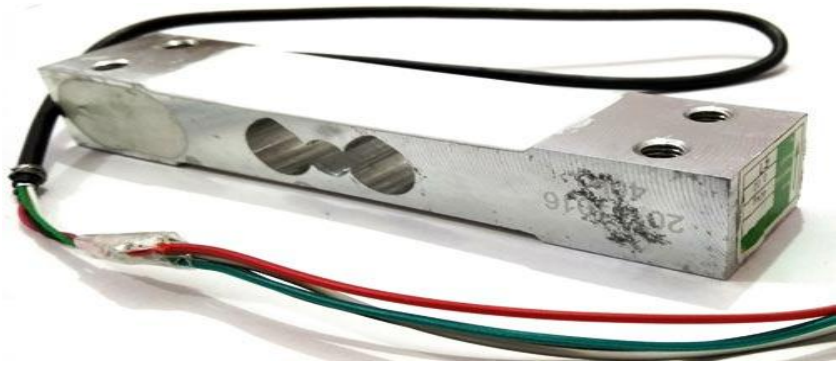


Figure 3:Load Cell

Now the electrical signals generated by Load cell is in few millivolts, so they need to be further amplify by some amplifier and hence HX711 Weighing Sensor comes into picture. HX711 Weighing Sensor Module has HX711 chip, which is a 24 high precision A/D converter (Analog to digital converter).HX711 has two analog input channels and we can get gain up to128 by programming these channels. So HX711 module amplifies the low electric output of Load cells and then this amplified & digitally converted signal is fed into the Arduino to derive the weight.

Arduino UNO:

Arduino Uno is a microcontroller board based on the ATmega328P. (It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

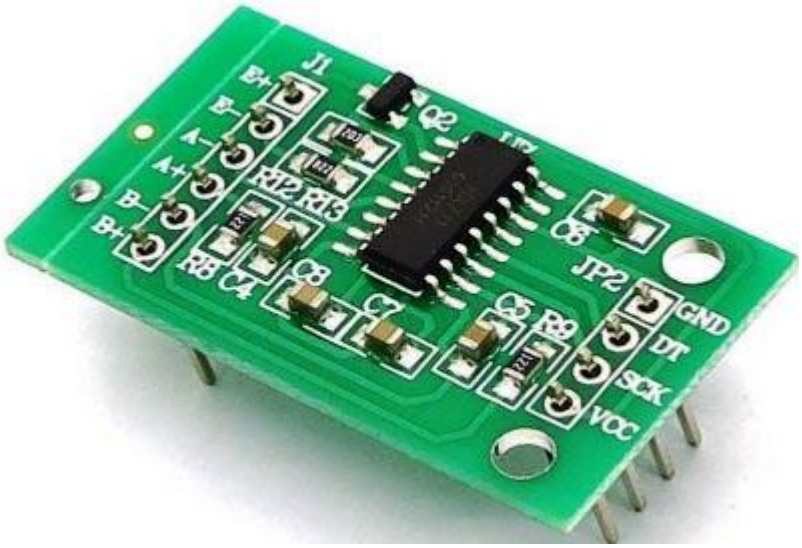


Figure 4: Arduino UNO

Cloud Service:

Automatic weighing system produces a lot of data that must be recorded and processed, which is why the system you use to collect is just as important as the scale you choose.

For example: Packaging and shipping companies must weigh containers to ensure that shipments and the associated costs are accurate to control costs and maintain consistency and customer satisfaction. The ideal connection would allow the operator to print complex labels quickly by enabling communication directly between the scale and printer.

One of the latest advancements in data technology, cloud computing allows you to process massive amounts of data through a secure connection that requires no hard drive or dedicated server. Data is simply stored "in the cloud" and can be accessed from any authorized location throughout

the world. This option is ideal for operations that need to compile data from a variety of remote locations.

V. Result

In arduino based Goods weighing system with alert system 40kg load cell as input device an buzzer, LCD display, GSM module and cloud service used as output devices.

Figure 5:Digital Display

The article proposes a cost effective and user friendly Smart Crate weighing system using GSM Module and cloud service. The significant advantage of the method is that the weighing system in agriculture is centralized and monitored using the cloud service. It saves the time to measure crop production. This concept avoids delay in analysis of crop production and to make decision about price. The proposed system is robust, reliable and requires less maintenance. The idea proposed in this article can be used by farmers from remote as well as urban area.

REFERENCES

[1] Ruhin Mary Saji, Drishya Gopakumar, Harish Kumar, K N Mohammed sayed, Lakshmi S (2016) "A Survey on Garbage Management in cities using IOT", International Journal of Engineering and Computer Science, Vol.5, Issue.11, ISSN:2319-7242, pp.18749-18754,

[2] Kanchan Mahajan, Prof.J.S.Chitode (2014), "Waste Bin monitoring system using Integrated Technologies" International Journal of Innovative Research in Science, Engineering and Technology, Vol.3, Issue.7, ISSN: 2319-8753,pp.14953-14957.

[3] Prakash, Prabhu V (2016) "IOT based waste management for smart city", International Journal of Innovative Research in Computer and Communication Engineering, Vol.4, Issue.2, DOI: 10.15680/2016.0402029,pp.1267-1274.

[4] Shyamala S C, Kunjan Sindhe, Viswanth Muddy, Chitra C N (2016), "Smart waste management system", International Journal of Scientific evelopment and Research, Vol.1, Issue.9, ISSN:2455-2631,pp.224-230.

AUTHOR PROFILE:

Pravin Sonsare: He is M.E. in computer science and engineering and working as as Assistant professor in
Shri Ramdeobba college of engineering and management ,Nagpur. His research interests are IOT,Biometric and Machine learning.
Email:sonsarep@rknec.edu

