RFID BASED INVENTORY MANAGEMENT USING IOT

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Abstract:

Improper maintenance of agricultural products during storage is one of the major causes for the loss of food. Many godowns and warehouses that store agricultural products do not take proper measures for their storage which results in the loss of food, time and money. This paper is one of our ideas to reduce the wastage of agricultural products during their storage by using RFID and a temperature sensor. This involves two stages one is stock management which is useful to sell or buy the stock as per the requirement and can easily get notified about the old stock which is going to be spoiled soon. The other one is temperature control which gives alert about the temperature changes which spoil the products.

Keywords **- RFID, DHT11 sensor, Load cell, Load cell amplifier, NodeMCU**

INTRODUCTION:

Supply channel bottlenecks and lack of proper marketing channels are serious issues for farmers who face problems in marketing and production. An improper marketing and storage channel also lead to storage problems. Even if there is a good progress in the production, there would be problems pertaining to maintenance quality leading to degradation in agricultural exports and in many cases, it leads to gross wastage of valuable food grains and other farm output.

At present India has a total agriculture warehousing capacity of 90 MMT to store and conserve large quantities of produce with state agencies owning 41% of the capacity and the balance being distributed among private entrepreneurs, co-operative societies, farmers, etc. Though the storage capacity has increased at a rate of 6.7% CAGR during the last decade, 20-30% of the total food grain harvest is wasted due to lack of availability of regional imbalance in warehouses.

Generally, at the time of harvesting, the price of agricultural commodities tends to be lower because of positive supply situation and farmers often do not get adequate price for their produce. By depositing their produce in a registered warehouse and obtaining NWR, farmers can use it as collateral for obtaining short-term borrowing in their working capital requirement for the current sowing season from banks. Further, when the prices become favorable, the farmer can sell the same, repay the loan and get a better income.

EXISTING SYSTEM:

The records of the products in the godown are maintained manually by the owner of the godown. By this system, the owners of the godown does not have complete idea about the stock which is getting old. This causes the old stock get spoiled after a span of time.

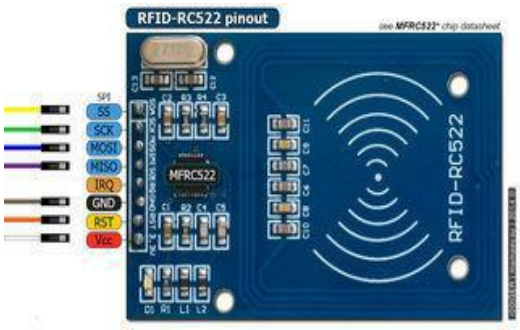
PROPOSED SYSTEM:

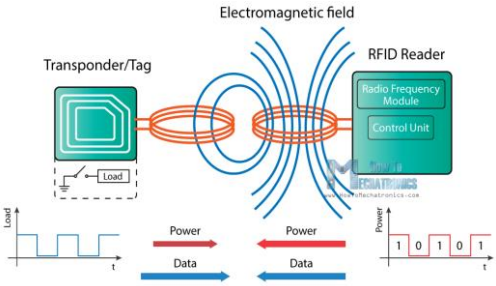
In this project, the records maintained manually will be replaced by an RFID reader and tag. The tag given to each storage unit carries the details of the stock. An RFID reader placed at the entry of the godown reads the tag. An additional feature in this project is DHT11 sensor. This sensor monitors the temperature and humidity inside the godown which in turn reduces the spoilage of stock in the godown. A load cell placed at the bottom of the rack in godown is used to get notified about the loss of stock. The data collected by these sensors will be transferred to the NODEMCU which displays the data in a website and this data will be stored in database.

COMPONENTS:

MFRC522 (RFID):

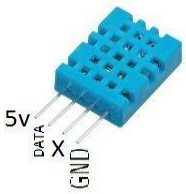
The MFRC522 is a highly integrated reader/writer IC for contactless communication at 13.56MHz. It is easy to use, low cost and suitable for equipment development such as the development of advanced applications, the need for RF card terminal design / production users. This module can be directly loaded into the variety of reader modules. Module uses voltage of 3.3V, simple few lines through the SPI interface directly with any user CPU board is connected to the communication module can guarantee stable and reliable work, reader distance.



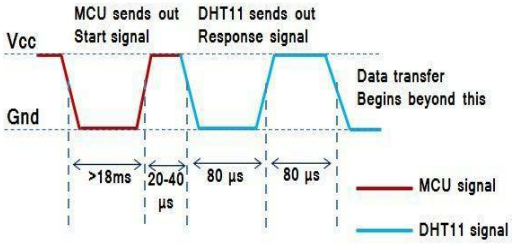


DHT11:

The DHT11 is a basic, ultra-low-cost digital temperature and humidity sensor. They consist of a humidity sensing component, an NTC temperature sensor (or thermistor) and an IC on the back side of the sensor. A thermistor is actually a variable resistor that changes its resistance with change of the temperature. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). It's fairly simple to use, but requires careful timing to grab data. This sensor measures a temperature in the range of 0 to 50 degrees with an accuracy of +/-1 degree and humidity in the range of 20% to 90% with an accuracy of +/-1%.



DHT11
0 - 50°C / ± 2°C
20 - 80% / ± 5%
1Hz (one reading every second)
15.5mm x 12mm x 5.5mm
3 - 5V
2.5mA



NODEMCU:

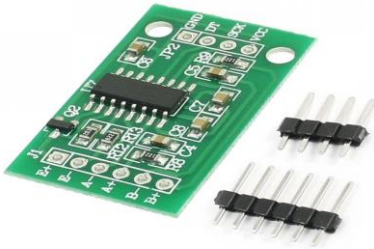
It is open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project and built on the Espressif NON-OS SDK for ESP8266.

LOAD CELL:

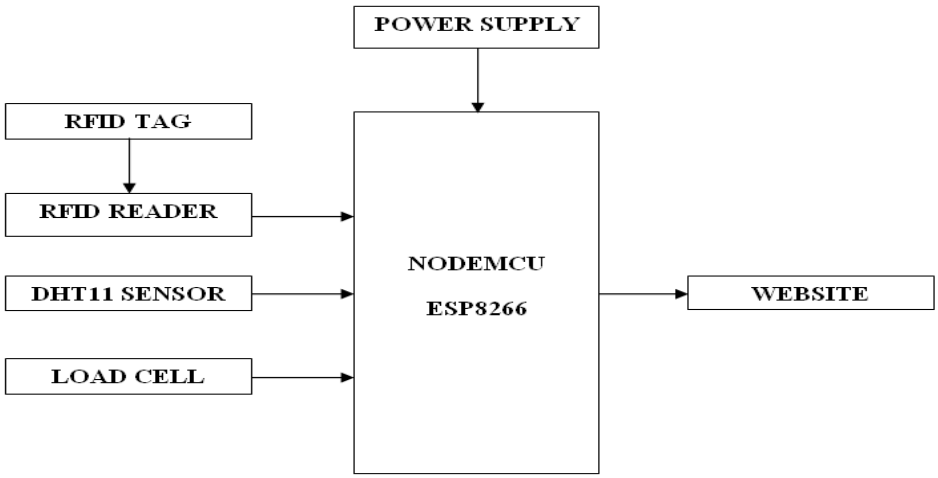
A load cell is a transducer that measures force and outputs this force as an electrical signal. Most load cells use strain gauge to detect the measurements. A load cell usually consists of four strain gauges in a Wheatstone bridge configuration. The electrical signal output is typically in the order of a few millivolts (mV).

LOAD CELL AMPLIFIER:

The load cell amplifier is a small break out board for the HX711 IC that allows you to easily read load cells to measure weight. The HX711 uses a two-wire interface (clock and data) for communication. Load cells use a four wire Wheatstone bridge configuration to connect to the HX711. These are commonly colored RED, BLACK, WHITE, GREEN and YELLOW. Each color corresponds to the conventional color coding of load cells. By connecting the amplifier to your Arduino, you will be able to read the changes in the resistance of the load cell.



BLOCK DIAGRAM:



PROCEDURE:

To reduce the wastage of the stock we are using three mechanisms.

1. Stock management
2. Temperature control
3. Weight management

STOCK MANAGEMENT:

The requirements from the owner of the godown is to create backup inventory within limited time and in high accuracy makes us to come up with automation solution by using desktop. Each storage unit in the godown is given an RFID tag. This RFID tag contains the details of the stock like date and time of entry, weight of the stock. An RFID reader is placed at the entry of the godown. This RFID reader reads the data of the tag and sends the data to the NODEMCU. NODEMCU acts as a gateway

between RFID and cloud and sends the data to the website. The owner of the godown can verify the details of the stock in the godown from any place at any time.

TEMPERATURE CONTROL:

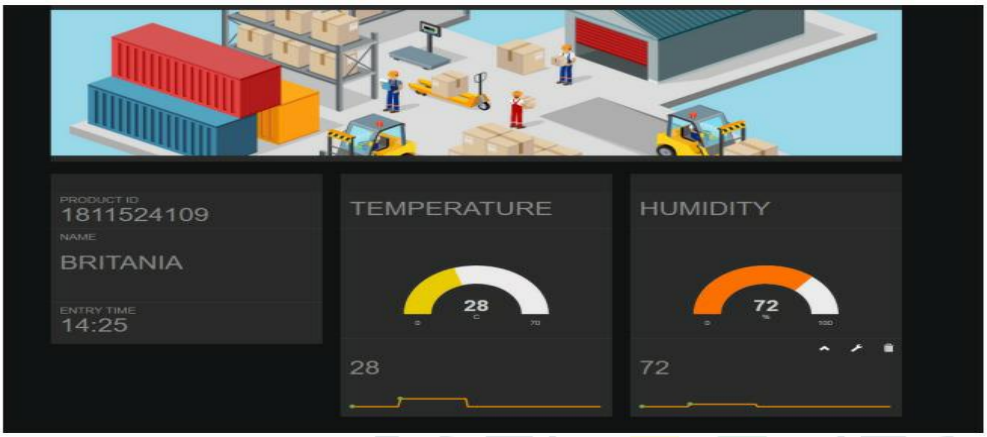
To maintain the stock for a long time, the temperature and humidity in the godown should be maintained as per the requirement of the product. Some products get damaged at high temperatures. DHT11 sensor used in this project takes the temperature and humidity of the godown continuously and sends the data to the NODEMCU. This NODEMCU sends the data to the website by which the user can know the temperature and humidity. Another advantage of using this sensor is in case of fire accidents, the temperature in the godown suddenly raises. In such cases, the owner of the godown will get notified about that and he can reduce some damage.

WEIGHT MANAGEMENT:

A load cell is placed on the bottom of the rack which has a perforated base preventing any loss of crops. The grains that are leaked get collected at the bottom. The load cell is used to constantly monitor the weight of the crops. It also has a rack load capacity indicator which indicates if the weight exceeds the maximum capacity of the rack. The load cell is used to maintain the weight of the load to check the loss of grains. This load cell continuously collects and transfers the data to the NODEMCU which acts as a gateway between sensor and cloud. This data will be displayed in the website.

RESULT:

This system is used to continuously monitor the stock in the godown and transfers the data to the website. Whenever the stock is getting old, the owner of the godown will be notified about that and he gets an idea that the old stock should be sold out otherwise it will be spoiled.



The figure displays the details of the particular product, the temperature and the humidity of the godown where the goods are stored.

CONCLUSION:

Considering the problems faced by many godown owners, we came with a solution to alert the owner of the godown constantly about the stock in the godown.

ADVANTAGES:

1. This project is easy to use as it replaced maintaining the written records which may be lost.
2. The owner of the godown can see the data anywhere at any time.
3. Fire accidents can be prevented.
4. The owner of the godown can have a brief idea about the stock such as the amount of stock in the godown and how much he has to buy.

APPLICATIONS:

1. Godowns
2. Warehouses
3. Big basket

FUTURE SCOPE:

RFID can be replaced with AI (Artificial Intelligence) which reduces the usage of tags given to each storage unit. A camera can be fixed at the door of the godown. Through AI, this camera sends the information directly to the website where the owner of the godown can monitor the products in the godown.

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