Grain Warehouse Monitoring Using "IoT"

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Abstract: The work presented here attempts a better vision for a warehouse monitoring system, in order to improve the life span of the grain. This paper includes monitoring for rice, wheat, jowar, etc grains which can be stored in a particular warehouse for a longer duration without being decayed and also provides protection against rodents within the warehouse. To overcome the problems in the current warehouse system is due to lack of hygienic manner of storing food in our country. By means of automation, we can reduce the workload of the administrator and provide a better storage facility. This paper also shows the technologically advanced way we can implement "IoT" within a warehouse in order to increase the life of the grain stored within the warehouse. Technology includes implementation of rodent detection and maintaining the warehouse temperature to the grain required standards.

Keywords **– Automation, Object-Detection, AWS, Warehouse, Grain-decay, Temperature, Humidity.**

1. INTRODUCTION

This "IoT" framework for facilitating grain monitoring for protection, so that it would not get contaminated due to surrounding conditions during storage. In present scenario, the temperature and humidity calculated in terms of the sensed values have been recorded and a detailed analysis has been performed but automated control alternatives are not present. Efficient monitoring of temperature, humidity other conditions without being present physically at the location helps us to get a better outcome. Here, the main purpose is to observe, control and monitor the storage atmosphere, thus making the admin to manage the data in real time. Here the central node which is a web application is responsible for passing information to management mode using computer. Proposed system monitors the warehouse which stores the grain. It also provides the benefit over the existing system by monitoring the warehouse temperature, humidity as well as Object-detection. The system also maintains the warehouse condition such that the decay rate is reduced.

2. PROBLEM STATEMENT

Current system will provide user a hazel-free experience and will maintain the warehouse temperature and humidity, if any rodent is detected, corresponding action will be taken and making the warehouse completely automated as technology advancement needs everything being monitoring and controlling.

2.1. LIMITATION OF EXISTING SYSTEM

Manually compiling reports, onboarding and offboarding processes are complex. File transfers are something almost every enterprise deal with, and larger warehouse often transfer thousands of data every day. Existing system doesn't provide automation which makes the system hefty.

2.2. PROPOSED SYSTEM

The system detects the temperature and depending on which if the temperature is above or below the threshold value the cooling fans are turned on and bring back the warehouse temperature as needed. Following set of algorithms used in order to maintain the temperature within the warehouse.

```
if(temperature > 26)
{
        set GPIO "pin-number" high;
}
        else
        {
                set GPIO "pin-number" low;
        }
```

Fig no :- 2.1 Temperature value evaluation

```
if( humidity  >30)
{
        set GPIO "pin-number" high;
}
        else
        {
                set GPIO "pin-number" low;
        }
```

Fig no :- 2.2 Humidity value evaluation

The system included with the temperature and humidity graph with the help of graph user can easily interact with the data, which provides administrator hazel free experience by elimination of long analysis. System will collect the data from temperature and humidity sensor also camera will be placed which will send the captured image to the AWS Rekognition. the Amazon Rekognition provides two API sets. They are Amazon Rekognition Image, for analyzing images, and Amazon Rekognition Video, for analyzing videos.

Sensors of different type are used to collect the information of warehouse conditions in information is transmitted through network to the Administrator or devices that initiates corrective action. Some disadvantages in communication must be overcome by advancing the technology to consume less energy and also by making user interface ease to use. Sensor networks are used for monitoring the atmospheric condition and microcontrollers are used to control and automate the farm processes. IO technology can reduce the cost and enhance the productivity. The camera used for object detection is 1.3MP with built-in microphone depending upon the video been captured the video will be divided into frames and then those frames will be labeled and action can be taken either ultrasonic sound can be activated and by this the rodents will move out of the warehouse.

In AWS Rekognition API perform detection and recognition analysis of images and videos to provide insights you can use in your applications. For example, you could use Amazon Rekognition Image to enhance the customer experience for a photo management application. When a customer uploads a photo, your application can use Amazon Rekognition Image to detect real-world objects or faces in the image. After your application stores the information returned from Amazon Rekognition Image, the user could then query their photo collection for photos with a specific object or face.

3. LITERATURE SURVEY

Agriculture enabling the farmers with the wide range of techniques. IOT technology helps in collecting information about conditions like weather, moisture, temperature and fertility of soil, Crop online monitoring enables detection of weed, level of water, pest detection, animal intrusion in to the field, crop growth, agriculture.Wireless sensor networks are used for monitoring the farm conditions and micro controllers are used to control and automate the farm processes.[4]

Searchable image and video libraries Amazon Rekognition makes images and stored videos searchable so you can discover objects and scenes that appear within them. [1].

The objective of ODK Tables is to lower barriers experienced by entrepreneurs or other information providers in the developing world to field their own information services. This paper describes ODK Tables' capabilities, user interface, performance characteristics, and some example use cases.

Air temperature monitoring systems and devices should be installed in all temperature-controlled rooms, cold rooms, freezer rooms, refrigerators and freezers used to store TTSPPs. Electronic sensors should be accurate to ± 0.5°C or better4. Sensors should be located in areas where the greatest variability in temperature is expected to occur within the qualified storage volume and they should be positioned so as to be minimally affected by transient events such as door opening. Humidity monitoring systems and devices should be used in temperature-controlled rooms that are used to store TTSPPs that require a humidity-controlled environment. Monitoring sensors should be accurate to ± 5% RH and located to monitor worst-case humidity levels within the qualified storage volume and they should be positioned so as to be minimally affected by transient events such as door opening.[4] Temperature, and where necessary, humidity alarm systems should be linked to the monitoring system(s) with high and low alarm set points. There should be a visual alarm and also preferably an audible alarm to key personnel such as administrator.

4. IMPLEMENTATION AND RESULTS

The flip side, warehouses may also get very cold in the winter. That's where the likes of ceiling fans as a ventilation solution come into play. Hot air rises, so ceiling fans work to push the hot air down to the work floor in the winter, thereby helping the temperature rise. And in the summer, they help with the circulation of air to cool the environment. It's why ceiling fan are among the most simple, and best, solutions for ventilation.

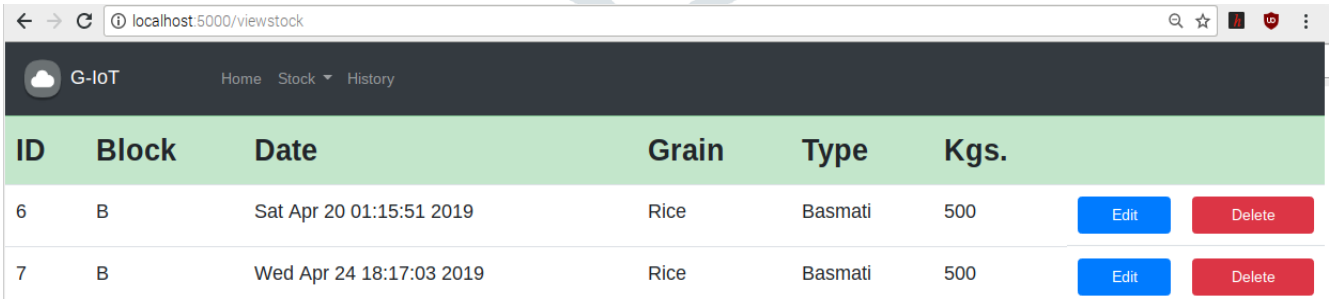

Fig 4.1 : Live Stock Recording

The AWS Rekognition will then return a JSON file which will be taken as an input for analysis and based on which r rectification can be performed and hence the analysis can be done and necessary action can be taken if necessary.

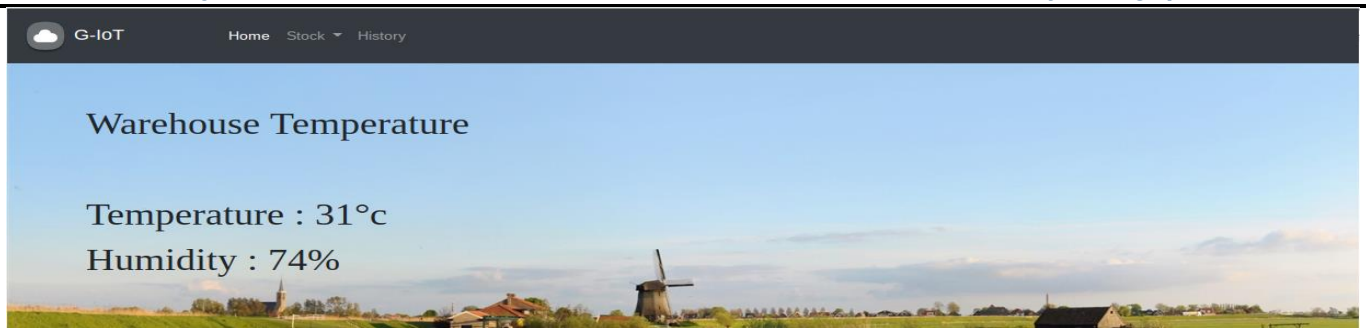

Fig 4.2: Display the actual Temperature and Humidity of Warehouse.

The warehouse database also contains the amount of grain stored within the warehouse the type of grain been stored it also contains the quantity of grain that can be added or removed depending on the warehouse current volume that are currently within the warehouse. This will make the task of the warehouse administrator easy and can perform task hazel-free.

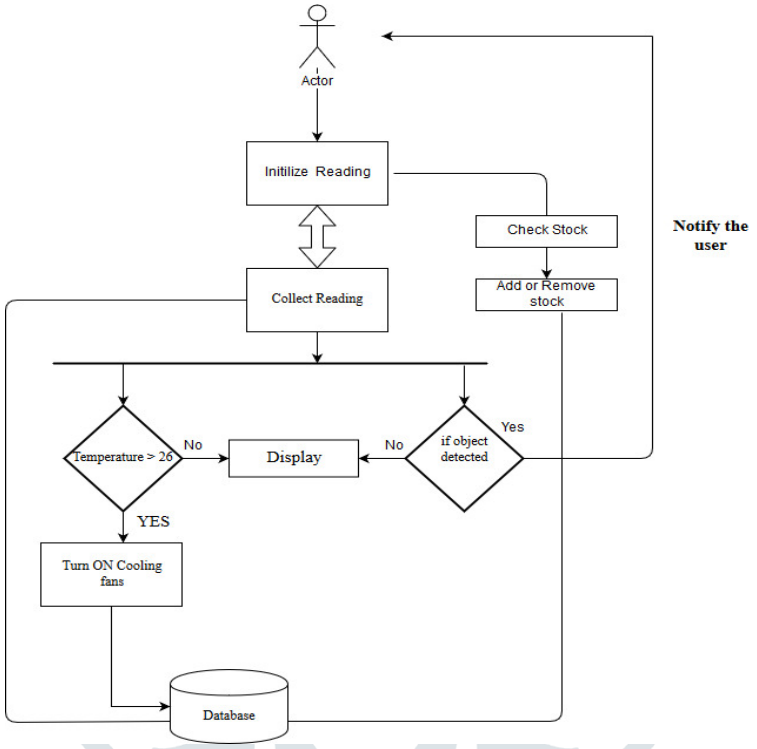

Fig 4.3: Detail flow chart

Maintenance of data is also taken into practice as the data which is added and is to be deleted when grains are removed out of the warehouse it needs to be updated in database when the stock is added in the warehouse the administrator can update in the database and when the product is sold it can be deleted from the database but when a particular quantity is deleted it will be maintained in a excel sheet which can be later used for verification. The excel sheet will contain the following labels within excel sheet: “Id”, ”Block”, ”Added-Time”, ”Grain”, ”Type”, ”Weight”, ”Deleted”, ”Time”.

Id	Block	Added Time	Grain	Type	Weight	Deleted Time
71	'F'	'Sat Mar 23 14:24:01 2019'	'Wheat'	'Basmati'	80	Sat Mar 23 14:28:33 2019
72	'C'	'Sat Mar 23 14:28:42 2019'	'Maze'	'Maze'	150	Sat Mar 23 14:29:48 2019
76	'G'	'Sat Mar 23 14:29:10 2019'	'Maze'	'Wheat'	60	Sat Mar 23 14:29:50 2019
79	'G'	'Sat Mar 23 14:29:44 2019'	'Wheat'	'wheat'	50	Sat Mar 23 14:29:51 2019
73	'A'	'Sat Mar 23 14:28:50 2019'	'Rice'	'Basmati'	49	Sat Mar 23 14:30:30 2019
80	'D'	'Sat Mar 23 14:30:41 2019'	'Maze'	'Maze'	600	Sat Mar 23 14:31:54 2019
74	'D'	'Sat Mar 23 14:40:37 2019'	'Maze'	'kASTURI'	50	Sat Mar 23 14:40:48 2019

Fig 4.4: Detail of actual record.

5. CONCLUSION

The proposed system provides farmers best Grain storage areas and preserve grains for longer time by usage of the IOT in agriculture in certain condition the temperature might go above the threshold level during that duration the fan will be turned on which will be placed within the warehouse which will reduce the temperature and henceforth will maintain the warehouse condition. This will give the farmers best productivity and provide grain long lasting storage. Instead of selling their produce cheap, immediately on harvesting, they warehoused yields and waited for grain prices to appreciate in the off-season.

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