

Microwave Sensing of Quality Attributes of Agriculture and Food Products

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ABSTRACT

Highly automated and computerized processes in agricultural and food industries require the development of sensors for continuous measurement and monitoring of quality attributes for agricultural and food products. Recent advances in calibration methods and availability of reliable and inexpensive microwave components offer an opportunity for the development of a new generation of low-cost microwave sensors for process monitoring and control.

This paper discusses both the development of calibration methods for indirect determination of bulk density and moisture content from measurement of the dielectric properties at a single microwave frequency and development of inexpensive microwave meters for routine characterization of grain, seed and in-shell peanuts in static and dynamic situations. Accuracy and savings associated with the use of such devices are also covered.

Keywords: temperature sensor; humidity sensor; ultrasonic device; Toggle Switch; GPS

I. INTRODUCTION

A lot of new inventions are there for saving agriculture mainly they are concentrated in planting and to grow the plants in a good manner, when we are giving new ideas to cultivations most of them are not bother about the seeds or grains and some technology is available and that are expensive for normal farmers.

Here we are giving a new idea for storing food products (grains, seeds, etc) and we are implementing an automatic system for saving the seeds and grains from Indian climate change and also we adding the anti- theft system and producing ultrasonic echo for thefting of food products also from small animals like rat, squirrels, birds etc

II. LITERATURE REVIEW

Sensing moisture content in grain is needed to protect the seeds by getting damaged using the advance moisture sensors available. A microwave method for on-line determination of bulk density and moisture content of particulate materials is very important with respect to preserve the grains without getting harmed by insects from paper by S. Trabelsi, A. Kraszewski, and S. O. Nelson [1].

Quality control in seeds is very important using Machine vision inspection of crumb grain by continuously monitoring the grain in storage room & checking the condition of the grains by Application of machine vision in agricultural product by Sapirstein, H.D[2] Evaluation of the functional properties of grains using a computer

vision method need to be implemented so as to have continuous surveillance on the seeds from Application of machine vision in agricultural product by Wang, H., and Sun, D[3]. , J., Navarro, F., and Molto, E[6]. New density independent calibration function for microwave sensing of moisture content in particulate materials need to be monitored to keep the seeds healthy and can be stored for longer duration of time from paper by S. Trabelsi, A. Kraszewski, and S. O. Nelson[5].

Multispectral inspection of seeds in real-time using machine vision and digital signal processors are to be done in order to ensure that the seeds are preserved from Application of machine vision in agricultural product by Aleixos, N., Blasco By this it is easy to find out the volume humidity and temperature of the seeds and grains by continuously monitoring using GSM technology. A practical model for estimation of agricultural products volume using machine vision”, 2008, In Proc. 5th National Congress on Agricultural Machinery Engineering and Mechanization is done to take care of the agricultural products from Application of machine vision in agricultural product by Amiriparian J,M.H.Khoshtaghaza, and E.Kabir[7]

These components are connected with ARM micro controller board and the results are displayed in LCD display. In this method, temperature and humidity is measured and the results are stored in the registers in the PIC board. It will ensure the present temperature and humidity conditions in the room where the seeds are kept. The sensor will monitor the temperature and microcontroller for the lower machine control unit. The grain environment information such as temperature, humidity data is collected and stored by Multi-sensor. If the humidity and temperature sensor value increases, the further action is done by ARM microcontroller. If the inner room and outer room temperature is up, normal or not equal, ARM microcontroller automatically generates the signal to run the motor for opening the window. When the temperature is normal, it closes automatically. If the humidity level is high, fan will rotate automatically. At the same time corresponding in charge will get the information through GSM. Toggle switch is used to activate or deactivate the Theft security process. Ultrasonic sensor is used to produce the echo signal for stop the reproduction for animals (like cat, rat, etc) and lizard (like Central bearded dragon. Ground agama, etc). And it also detects if any person enters the store system it automatically sends information to the corresponding in charge humidity condition within the room and the status is sent to the person who is in charge of the room.

This is done because when temperature increases the grain will burn and if the humidity increase the grain may grow, to avoid those conditions this method is used. This system will continuously monitor the interior conditions and notifies the in-charge when there is any change in those conditions. This system is based on embedded ARM

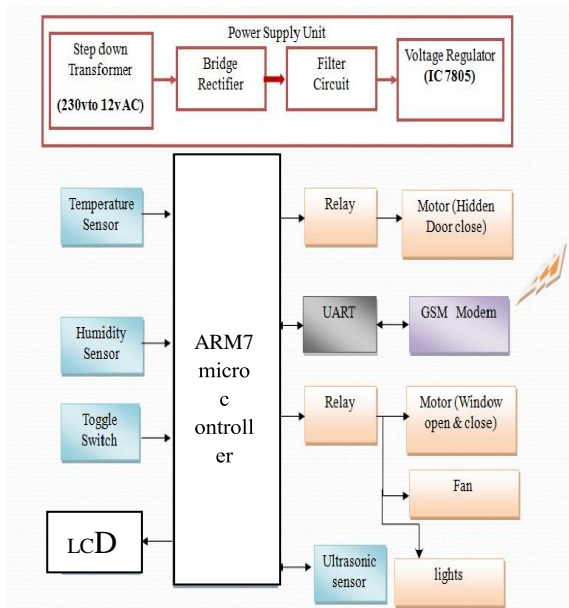


Fig 1. Intelligent food grain system

III. FLOWCHART

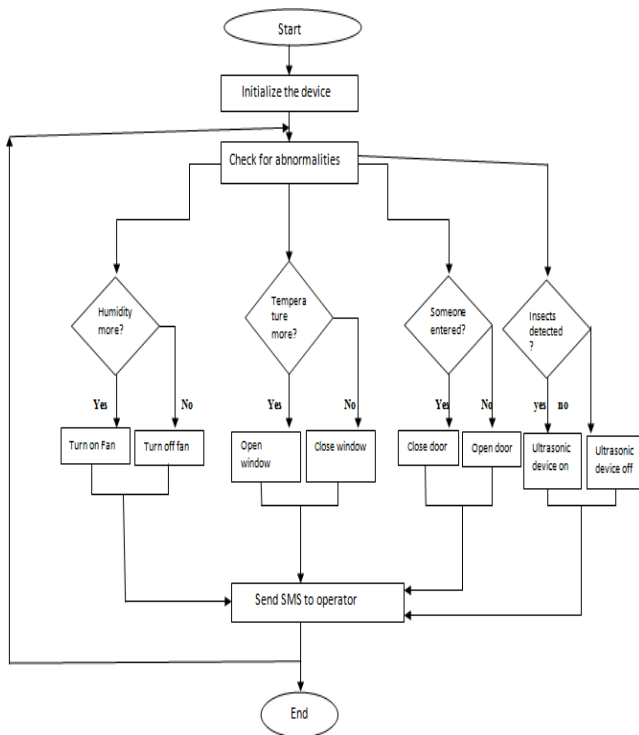


Fig 2: Flow Chart Of The System

This system is based on embedded ARM7 Microcontroller for the lower machine control unit. The grain environment information such as temperature, humidity data is collected and stored by Multi-sensor. If the humidity and temperature sensor value increases, the further action is done by ARM7 microcontroller. If the inner room and outer room temperature is up, normal or not equal, ARM7 microcontroller automatically generates the fan will rotate automatically. At the same time corresponding in charge will get the information through GSM signal to run the motor for opening the window. When the temperature is normal, it closes automatically. If the humidity level is high, fan will rotate automatically. At the same time corresponding in charge will get the information through GSM. Toggle switch is used to activate or deactivate the Theft security process. Ultrasonic sensor is used to produce the echo signal for stop the reproduction for animals (like cat, rat, etc) and lizard (like Central bearded drago, Ground ag a, etc). And it also detects if any person enters the store. Here we have designed

one hidden door for security purpose. If person enters the store; it automatically sends information to the corresponding in charge. The in charge can activate the door by using the GSM.

IV. CONCLUSION

This method is a cost effective method and it is very useful be present status of the seed/grain contained in the room. The grain condition is monitored continuously and it will prevent the seed from damage or any other side effects. Increase in temperature or increase in humidity will definitely have side effects on the seed. This is also prevented by taking necessary actions before they are damaged. This method will help the farmers from a heavy loss and also to increase their grain within a short period of time.

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