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A Survey on Electronic Nose for Detection of Diseased Onions

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ABSTRACT: Now a days there is large demand for onions, onions are stored and kept for future use. Most of farmers sell their onion without any sorting. Onion sorting by human is inefficient, labour intensive and error prone. When onions are stored many times there is chance of getting vitiate due to infection. There is no system designed to product the onion from all these causes. So the aim is to design the system that will protect the onions from getting infected, rotten and many more diseases.

The automated sorting system not only time saving but also minimizes error. The complete system will composed of the gas array. The Gas sensor array which will detect the gases coming out from the defected onions so that mechanical assembly will remove the rotten onion and healthy onion will be sent to storage .The study is carried out for the design of a machine which can be used to sort multiple onions by making adjustment with the sensors. Machine design is so simple that it can be operated by any unskilled person also so that farmers can also use it.

KEYWORDS: automation, disease, gas sensors, onion, gas array, grading, processing, post harvest.

I. INTRODUCTION

In the economic development of India, agriculture sector plays a key role. For the proper price of any agriculture product, sorting according to size is necessary. And it is also value adding technique to the product. To makes the onion product more attractive and improve its processing qualities uniformity in size is important.

Farmers market their onion without any sorting. Persons engaging in post-harvest crop handling such as collectors, whole sellers, retail sellers, and farmers cannot use high technical and costly sorting technique. And also, by the local market survey it is found that retail market price of the onion is significantly varied according to its size. Onion sorting by human is inefficient, labor intensive and error prone. The automated sorting system not only time saving but also minimizes error. Improvement of quality and value addition of agricultural produces has gained higher concern in recent times. There is a great demand for onions in both local and foreign markets. The study is carried out for the design of a machine which can be used to grade and sort multiple onions by making adjustments with the sensors.

II. LITERATURE SURVEY

According to ICAR - Directorate of Onion and Garlic Research, the cultivation in India is growing day-by-day [1]. Onion contributes a wide impact on national economy and financial status of growers/consumers [2], DR.P C. Tripathi stated that the year wise production pattern is observed about 60-65% in Rabi (Mar-Jun) seasons [3]. The post-harvest treatment involves selection, grading and curing of the bulbs [4]. J Food Sci Technol. in Jun 2012 given a view on onions that The Indian onion bulbs have higher water content [5] making them more susceptible to rotting. In India, there is no such electronic system available yet, that will help us in a way to reduce/prohibit these losses. On this scenario a need based electronic circuitry has been designed, developed and tested.

Also,we found many problems faced in onion farming, in that we marked major problems, one of this is to differentiate between the healthy and diseased onion. According to Krishi sutra [6]the majority onion sorting is done manually. But in existing process farmer's faced certain problems like sorting, tedious work, decrease selling cost, changeability and low productivity and this process doesn't remove the complete rotten onion in that lot. Thus, sorting and sorting efficiency is decreased. Some of the above problems are faced by farmer and exporters are lessened in our automated process. As India is a country where agriculture-based economy is there but due to environmental uncertainties the quality of food produced is lowered and hence farmer gets the lowered cost of product. So, the aim is fulfil the market demand and also improve the quality of onions. Problems facing by the onion grower while marketing

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|| Volume 8, Issue 4, April 2020 ||

onion they do not get proper remuneration for the product. In order to get proper post-harvest processing the farmer is not capable to do it.

III. PROPOSED SYSTEM

Our system has the main purpose to detect the diseased and damaged onions and separate it from the healthy onions. Basically our system is divided in three units: First is the loading of onions and the passing it on conveyer belt. Second is to pass it through the gas sensor array to differentiate the unhealthy onions.

Gas array circuit is designed as it consisting of different gas sensors, temperature and humidity sensor. Also pump, exhaust, valve are present for complete mechanism. Microcontroller is used to control this whole mechanism. When the onion gets damaged or diseased it expels different types of odors. Once the sample gases are inserted through the valve in the array there will also be the flow of clean air, the sensors work on the principle of air. In clean air their conductivity is less whereas when the gas is detected the conductivity increases and hence we can detect the diseased onion .When this onions are detected and conductivity is reached at the specified level, the audio-visual alarms will be buzzed and they are separated out using the actuators and hence the healthy onions are separated.

IV. NEED OF SYSTEM

1. The Electronic Nose For Detection of Diseased Onions scheme should benefitted to collectors, whole sellers, retail sellers, and farmers.
2. Farmers will be help with storage losses reducing from 25%-30% as in traditional storage to 5% in case of scientific storage.
3. Consumers have benefitted from less volatility in the price of onions to even arrival in the market.
4. Onion storage has also facilitated promotion of onion exports from India.
5. There is a need in the onion industry for a sensitive and inexpensive gas sensing device that can differentiate between healthy and diseased onions.

V. DETAIL SPECIFICATION OF ICS/MODULES

MQ Sensors: The MQ series of gas sensors utilizes a small heater inside with an electro chemical sensor these sensors are sensitive to a range of gasses are used at room temperature.

A. MQ 8 SENSOR

This is a simple-to-use hydrogen gas sensor, suitable for sensing hydrogen concentrations in the air. The MQ-8 can detect hydrogen gas concentrations anywhere from 100-10000ppm. This sensor has a high sensitivity and fast response time. The sensor's output is an analogresistance.High sensitivity to Hydrogen (H2),Less sensitivity to alcohol. It is a Stable and have long life. They are used in gas leakage detecting equipments in family and industry, are suitable for detecting of Hydrogen (H2).

B. MQ 6 SENSOR

This is a simple-to-use liquefied petroleum gas (LPG) sensor, suitable for sensing LPG (composed of MQtly propane and butane) concentrations in the air. The MQ-6 can detect gas concentrations anywhere from 200 to 10000ppm. This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple; all you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC.This sensor comes in a package similar to our MQ-3 alcohol sensor, and can be used with the breakout board below.High Sensitivity to LPG, iso-butane, propane Small sensitivity to alcohol, smoke Detection Range: 100 - 10,000 ppm iso-butane propane Fast Response Time: <10s

C. MQ 135 SENSOR

MQ135 alcohol sensor is a Sno2 with a lower conductivity of clean air. When the target explosive gas exists, then the sensor's conductivity increases more increasing more along with the gas concentration rising levels.The MQ135 gas sensor has high sensitivity in ammonia, sulfide, benze steam, smoke and in other harm full gas. It is low cost and suitable for different applications. The operating voltage of this gas sensor is from 2.5V to 5.0V The air quality sensor is also a MQ-135 sensor for detecting venomous gases. The gas sensor layer of the sensor unit is made up of tin dioxide (SnO2). The air quality sensor detects ammonia, nitrogen oxide, smoke, CO2 and other harmful gases. The air quality sensor has a small potentiometer that permits the adjustment of the load resistance of the sensor circuit.

D. IR SENSOR

An infrared sensor is an electronic instrument that is used to sense certain characteristics of its surroundings. It does this by either emitting or detecting infrared radiation. Infrared sensors are also capable of measuring the heat being emitted by an object and detecting motion. that emits in order to sense some aspects of the surroundings. An IR sensor

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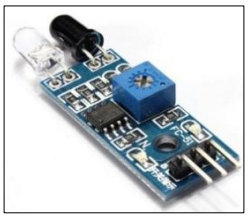

can measure the heat of an object as well as detects the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called a passive IR sensor.

Fig1: MQ-6 **Fig2: MQ-8** **Fig3: MQ-135** **Fig4: IR Sensor**

E. PROTEUS 8.8

The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards.The Proteus Design Suite is a Windows application for schematic capture, simulation, and PCB (Printed Circuit Board) layout design. It can be purchased in many configurations, depending on the size of designs being produced and the requirements for microcontroller simulation. All PCB Design products include an autorouter and basic mixed mode SPICE simulation capabilities.Schematic capture in the Proteus Design Suite is used for both the simulation of designs and as the design phase of a PCB layout project. It is therefore a core component and is included with all product configurations..The micro-controller simulation in Proteus works by applying either a hex file or a debug file to the microcontroller part on the schematic.The PCB Layout module is automatically given connectivity information in the form of a netlist from the schematic capture module. It applies this information, together with the user specified design rules and various design automation tools, to assist with error free board design. PCB's of up to 16 copper layers can be produced with design size limited by product configuration.The 3D Viewer module allows the board under development to be viewed in 3D together with a semi-transparent height plane that represents the boards enclosure.

F. MICROCONTROLLER

An Electronic Controller uses electrical signals and digital algorithms to perform its receptive, comparative and corrective functions. A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. A typical microcontroller includes a processor, memory and input/output (I/O) peripherals on a single chip. Sometimes referred to as an embedded controller or microcontroller unit (MCU), microcontrollers are found in vehicles, robots, office machines, medical devices, mobile radio transceivers, vending machines and home appliances, among other devices. They are essentially simple miniature personal computers (PCs) designed to control small features of a larger component, without a complex front-end operating system (OS).Common MCUs include the Intel MCS-51, often referred to as an 8051 microcontroller, which was first developed in 1985; the AVR microcontroller developed by Atmel in 1996; the programmable interface controller (PIC) from Microchip Technology; and various licensed Advanced RISC Machines (ARM) microcontrollers.

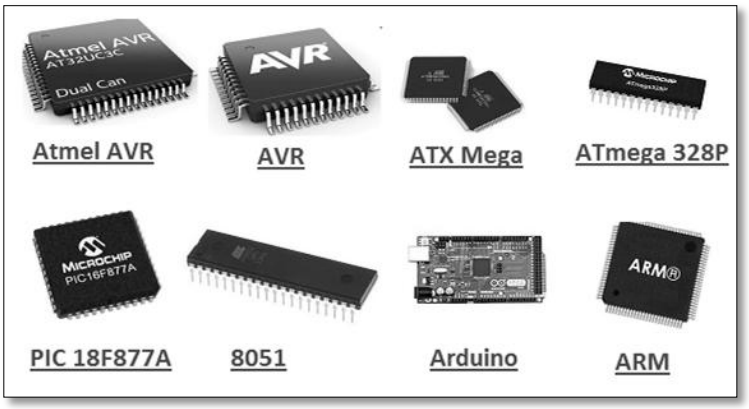

Fig 5. Various Microcontrollers used in embedded system

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VI. CIRCUIT DESIGN

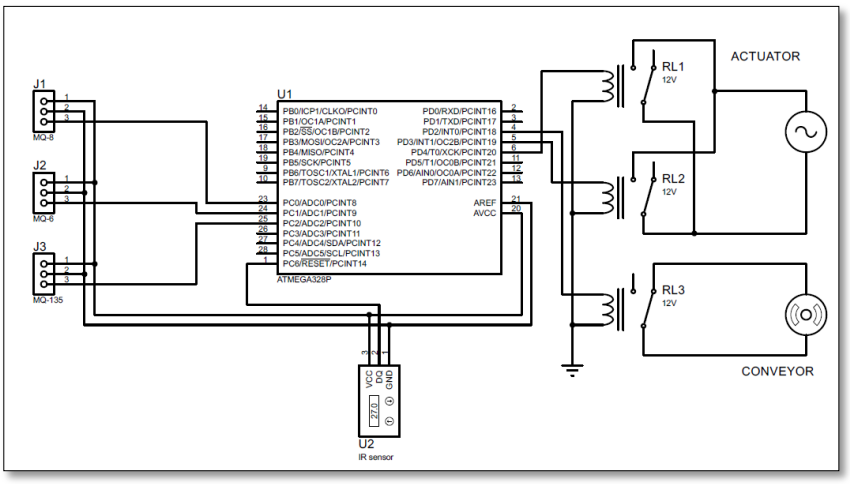

Fig 6. Circuit Diagram

VII. ALGORITHM

1. Initialize sensors to sense emitted gases by onions. Sensors used in this system are A. Hydrogen B. Sulferdioxid C. Nitrous oxide. D. Carbon dioxide &/or ammonia E. Temperature
2. Convert analog input into digital (used inbuilt ADC) using microcontroller.
3. Check whether sensed level of gases emitted by onions are less/greater than previously defined levels.
4. If it is less, then display the level and repeat step 2.
5. If it is greater, then switch for the actuator and repeat step 2.

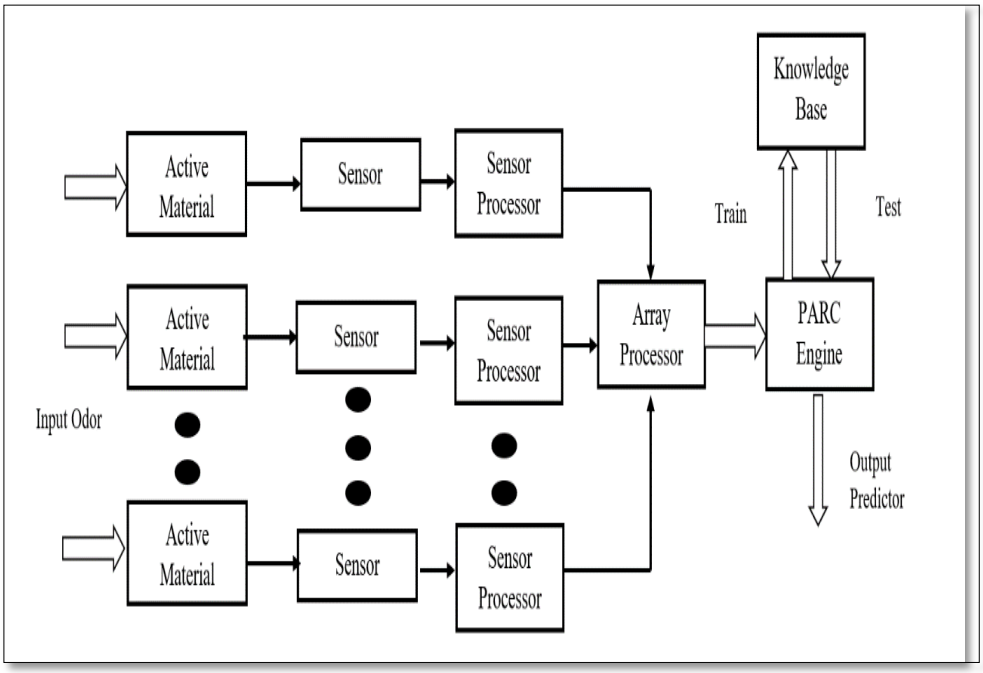

Fig 7. Flow of Execution

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VIII. FLOWCHART

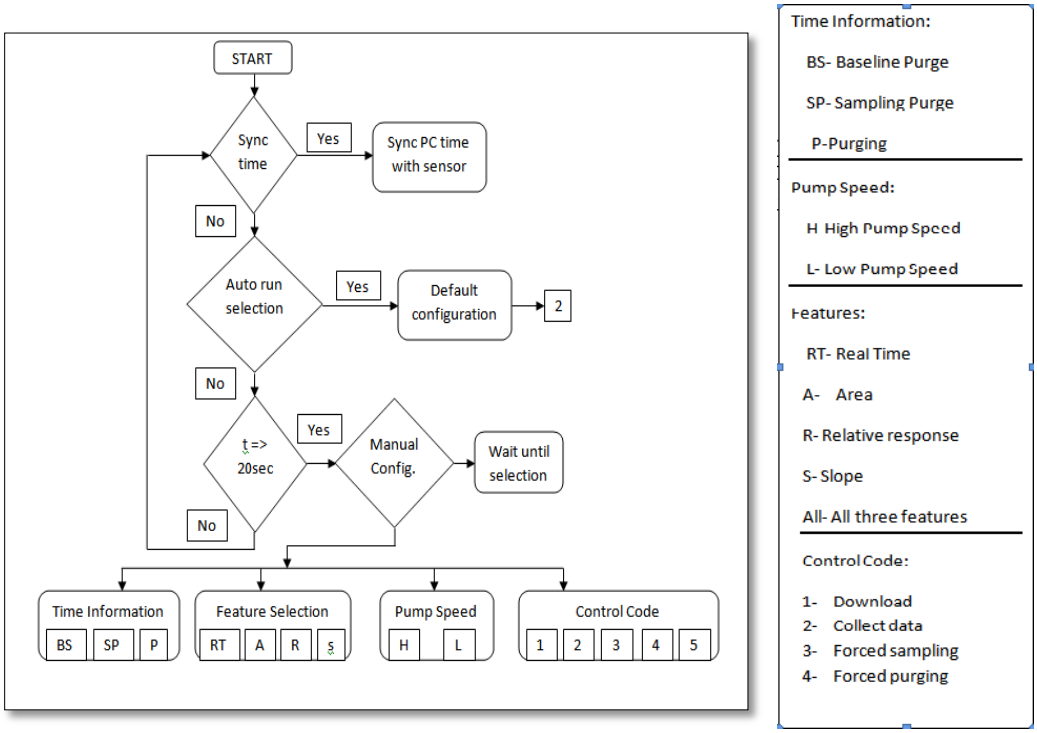

Fig 8. Flowchart

IX. CONCLUSION AND FUTURE WORK

The main system outcome of this project is to develop a low-cost customized gas sensor array with an automated gas delivery and data acquisition system to detect volatile compounds emitted by onions. The sensor studyhas proven the efficacy of the device for sour skin infected and internally damaged onion detection. The customized low-cost gas sensor array could be a useful tool to detect onion postharvest diseases in storage. It will surely increase the yield(Production Rate).This system will increase throughput (the amount of material or item passing through a system or process). Also it will give Consistent quality in working.Thus, the goal has been satisfied that, this Electronic Nose For Detection of Diseased Onions will cut the economic losses and reduce labor costs for onion growers and packers, and to provide quality products to consumers.

This system can be further modified for bulk sorting. Also the capacity can be increased by improving all working the parameters. As the Production and maintenance cost is high future work can resolve it.

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