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Detection of Duplicate using eNose and Sensor

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Abstract—**Here in this topic, I am basically concerned about the problems and worries which occur during any function or parties relating to the number of plates used by the guests. This idea tries to minimize the amount of manpower or technologies used to check this habit at the event. Here in this project, I am using a pre-designed PIR Sensor with Electronic Nose and on-field Heartbeat Sensor. The PIR Sensor used here will sense the presence or arrival of a person near or in front of it through the change in temperature. The Electronic Nose attached with it will detect the odor or smell of the person coming near to it. It will be followed by a memory which will be linked to the gadget that keeps a record of all the odors sensed by it. If there will be any duplicate, then a buzzer will ring which will be the first indication for the user operating that this person is going to use the plate more than once. Then in the next level, on the plate's desk, there will be a sensor attached which keeps the track of the Heart Beat of the person touching it. If the heartbeat is unusual, then the second and final indicator buzzer will ring which will assure that the person is intentionally using the plate multiple number of times. By this way, the organizer can efficiently use this technology in detecting such problem with minimum resources. This project can also be extended to several other detection strategies which involve human intervention.**

Keywords—PIR Sensor, Heartbeat Sensor, Electronic Nose, Microcontroller

I. INTRODUCTION

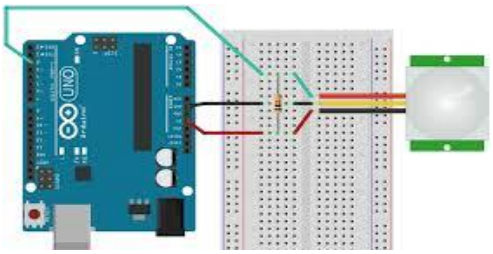
Now-a-days, the maximum proportions of problems arising in any parties or functions are due to the shortage or multiple intentional uses of plates by the guests attending the party. Despite several efforts taken by the organizers, this problem has not yet found any solution. So in order to give respite to them, I have designed a model which can automatically detect multiple uses. By the use of this, not only the extra amount will be saved but also the tension will be relieved.

II. EXPERIMENTAL SETUP

For this we need a PIR Sensor, a Heartbeat Sensor, an Electronic Nose, memory, controller unit and some logic gates to have a 3 level detection.

A. PIR Sensors

The PIR sensor is used to sense the temperature transmutation of the environment when discovers an arrival of a human. It is called as Passive Infrared Sensor. Basically, the average distance upto which it can sense is approximately 10m. There are 3 pins of the PIR Sensor i.e. Ground, Signal and Power at side or bottom. Power is upto 5V. We can see two types of output i.e. HIGH or LOW depending on Human Interference. Physically, it has Fresnel Lens which are bifurcated to detect Infrared Radiation[1].



B. Electronic Nose

It is an instrument intended to identify odors or flavors. Electronic Sensing refers to the potentiality of reproducing Human Senses using Sensor Arrays and Pattern Recognition Systems. The stages of the recognition Processes are identical to Human Olfaction and are accomplished for identification and quantification. It includes three major parts i.e. Sample Delivery System, Detection System and a Computing System. Some commonly used sensors for Electronic Nose include MOSFET, Polymer Composites, Quartz Crystal Microbalance, Surface Acoustic Wave, etc.[2]

C. Heartbeat Measurement Sensor

Heartbeat is basically the sound of the heart valve during contraction or expansion as they force blood from one region to another. The heartbeat sensor is based on the principle of Photo Plethysmography. It measures the change in volume of blood through any organ of the body which causes a variation

in the light intensity through that specific organ. These processes are done through 2 types of Photo Plethysmography i.e. Transmission and Reflection.[3]

III. Problem Statement

Firstly, the infrared radiation nosed out by the sensor in the form of temperature variation generates an electric signal that can be used to trigger an alert system or buzzer or alarm sound depending on the need of detection purpose. PIR sensor is internally bifurcated into two halves out of which one half is positive and another half is considered as negative. Therefore one half produces one signal by discovering the motion of a hot body and other half generates another signal. Output signal is destined as the difference between these two signals. If the sensor gets heated up once, then the output remains low until it detects motion. If once it detects the motion, then the output goes high for a handful of seconds and then returns to a normal state or low. This sensor needs settling time which is anticipated to be in the range of 10 to 60 seconds. It is then connected to the microcontroller kit for additional connection circuit.[5]

Electronic Nose comprises of a sensor array of eight commercially available sensors, a Data Acquisition Interface PCB and a Microcontroller embedded with a K-nearest neighbor (KNN) algorithm for odor classification and verification programme. Sensor responses pass through a Data Acquisition Card to a Laptop/PC with a user oriented LAB View programme for the purpose of verifying the function of portable Electronic Nose System. Basically Human Body has a wide variety of mixture of gases and odors. Within the range of this assortment, the sensor array produces a definite pattern taken as an odor signature that can be casted off for odor identification. As the array consists of 8 sensors, the interface PCB includes 8 interface processing units, an 8:1 Multiplexer and a 8 bit ADC. The ADC transfigures sensory data into a digital form for data processing. After conferring the signal from ADC, the microcontroller processes the sensor data. Before gas enters the system, the Microcontroller reads the sensor resistance as its baseline resistance. When the gas flows into the chamber, the microcontroller determines the steady state value of sensor resistance and calculates the percentage change in resistance. The collective resistance change ratios of 8 sensors form a pattern according to odor and the microcontroller identifies the odor pattern in training mode with the help of KNN algorithm. Then comes three data processing interfaces i.e. DAQ interface, Training interface and Classification interface to operate eNose system. DAQ interface records changes in sensor resistance and plots the change ratio. The training interface used data stored by DAQ interface to build a classification model used to recognize odors in classification interface. Users can read and stratify odors through classification interface.[2]

Finally, in the last level detection, a Heartbeat Sensor is used. Heartbeat is measured based on optical power variation as light is scattered or absorbed during its path through the blood as the heartbeat changes. Basically it consists of a Light Emitting Diode and a Light dependent Resistor. The heartbeat pulse causes a variation in the flow of blood to different regions of the body. When a tissue is illuminated with the light source, it either reflects or transmits the light. Some of the light is assimilated by the blood and the transmitted or reflected light is collected by the Light Detector. Amount of light absorbed depends on the blood volume in that tissue. Detector output is in form of electric signal and is correlative to heartbeat rate. The output from the detector is first percolated using a 2 stage HP-LP circuit and is then connected to digital pulses using a comparator circuit or using simple ADC.[4] The digital pulses are given to a microcontroller for calculating the heartbeat rate given by the formula;

BPM (Beats per Minute) = 60 X frequency

IV. Problem Formulation

After considering the working principle of all the components used, let's have a look on how all these work together to form a complete package in determining the duplicate. First of all, a guest is made to pass in front of the PIR Sensor and the sensor will detect the person coming. Then it will pass upon the information to the electronic nose with a head number. Then the electronic nose will sense the smell and odor of the person coming near to it and keeps its track in a memory. Whenever the same person with the same odor comes near the Electronic Nose again, then an indicator with or without buzzer will be present which will tell the operator that the same person is coming near again. In the third level of detection, there is a Heartbeat Sensor which detects the heartbeat of the person when that person touches the table on which the plates are kept. The person coming to take the plate is made to touch the table which has sensor connected to it. When the thumb will come in contact with the sensor, through some sensory actions the heartbeat of the person will be measured and will be recorded in a memory for analysis of the operator. If there will

be any unusual reading caused by the nervousness, then the second indicator with or without buzzer will ring confirming that the person is surely using it twice. Here I am using three logic gates, out of which two are AND gate and another one is OR gate. The output of PIR Sensor and the output of the Electronic Nose shall be connected with AND gate basically because if any one of the output will be high then the detection principle will be valid. Same will be case for the output of electronic nose and heartbeat sensor where I have connected another AND gate which will confirm the validity of the detection action if any one output will be high. I have also given a direct high output from the heartbeat sensor so as to detect any outside uninvited guest who has come to take the plate for the first time having a guaranteed unusual heartbeat. The outputs from the two AND gates will be connected to another AND gate. The output from this AND gate and from the direct high output from the Heartbeat Sensor will be again connected to an OR gate. If this final output is high or 1, then the person is either a duplicate or an uninvited guest and hence will be dealt by the operator accordingly.

Conclusion

So from this idea, I concluded that the working of some sensors like PIR and Heartbeat along with Electronic Nose and some working procedures and methodologies can do a world of good for the people who are suffering from problems like plate shortage in parties. Probably to me, it is one of the most affluent and emerging ideas in the field of converging technology in Electronic Science. The efficacy of the model can also be enhanced by using advanced controllable principles but due to confined scope of ideas, following dummy idea has been described.

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