Monitoring of Machinery Access by Restricting the Unauthorized and Drug Consumed Person with Embedded System

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Abstract:
This system aimed to protect the factory worker and machine. This system is implemented using Arduino. It propose the detection of alcohol using alcohol detector connected to Arduino such that monitors the workers condition rapidly to know his state; if he is drunk or normal. If he is in intoxicated condition, then also checks the sloshed value; if it is above the lefull range, then shutdown the machine automatically and Bluetooth module will pass the information to the higher officials via message for preclude any accident that may occur as a result of his implementation on the machine.

Keywords: Alcohol detection system, automatic machine shutdown, Bluetooth, Arduino.

I. INTRODUCTION
In India 85% of people consumes alcohol. Alcohol consumption is associated with accidents primarily due to its effect on the nervous system, which leads to impairment of thinking skills, increased reaction time and reduced muscle control. These effects have obvious implications for safety and become increasingly pronounced as more alcohol enters the bloodstream. ABV (Alcohol by Volume) is a standard measure of how much ethanol contained in the alcoholic beverage. Alcohol can be particularly serious within workplace as it has an impact on human performing that can affect productivity, accident rates, working relationships and absenteeism. The workplaces have recently been highlighted by research and its health campaigns through the hypothesized contribution of alcohol consumption to a number of high profile industrial accidents. This system detects the consumption of alcohol by the worker and immediately the machine will shut down. At the same time, message will be sent to the higher officials in the factory. Hence this system reduce the huge accidents and fatalities of the factory workers in future.

II. OBJECTIVE
To prevent human losses by the machineries in the factory. To improve the production and maintain a good working condition. Investigation of Alcohol Consumption and Employee Monitoring System can be used in various manufacturing industries to detect if the person at work has consumed any kind of alcohol or not.MQ-3 Sensor based alcohol detector systems can be used at hospitals, school as well as college campuses. This project can also be used as an alcohol detection system in cars to reduce road accidents.

III. METHODOLOGY
"Investigation of alcohol consumption and employee monitoring by using embedded system" use Arduino Uno based circuit that consists of alcohol detector interfaced with it. Also we have Bluetooth module and LCD display. The entire system is powered by a 12V supply. The alcohol detector is constantly running to check if worker consumed alcohol. The alcohol detector can sense the alcohol level and outputs a voltage according to the alcohol sensed. The Arduino interfaced to it reads the value and if it is found to be above the permissible range it goes into alerting mode. Once it enters alerting mode the Arduino stops machine operated by the worker and displays the status of alcohol alert on LCD display. Also it sounds a buzzer to indicate the same. It now shuts down the motor used to demonstrate as the machine. Now the mishap was avoided, the system now needs to send a report to the responsible dignitary of the industry informing about the incident. It then automatically sends an SMS message through Bluetooth module to the authorized device informing about the situation so that required action can be taken about it. The productivity module is used to check and measure the outcome and quantity of the product manufactured per day in machine by the operator.

IV. HARDWARE MODULE
The entire system is manipulated by Arduino Mega Board, the principle of the hardware module as shown in figure 1. The hardware function modules are Arduino Mega, Alcohol Sensor module(MQ-3), Bluetooth, Productivity Module, Audio Module, Fingerprint Scanner, LCD, DC motor, Speaker, Keypad.figure.1 shows the whole hardware module of monitoring system.
A. ARDUINO MICROCONTROLLER BOARD

Figure. 2. Arduino Board Description

Figure.2 shows the Arduino Board. Arduino is an open source and programmable microcontroller for prototyping electronic and mechanical devices. The microcontroller board is based on an ATmega328. The Arduino Uno board uses the IC ATmega328 as the microcontroller processor. The Arduino Uno board comes with 14 digital input/output pins (which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header and a reset button. The Arduino Uno can be powered via either a USB connection or by an AC-to-DC adapter.

Highlighted Features:
- Microcontroller: ATmega328
- Operating Voltage: 5V
- Input Voltage (limits): 6-20V
- Digital I/O Pins: 14 (of which 6 provide PWM output)
- Analog Input Pins: 6
- DC Current per I/O Pin: 40 mA
- Clock Speed: 16 MHz

B. ALCOHOL SENSOR (MQ-3)

Figure. 3. Alcohol Sensor

Figure.3 shows the alcohol sensor. The Gas Sensor MQ-3 (Figure II-2) is a gas leakage detector used for indoors (e.g. home) or outdoors (e.g. industry). It is suitable for detecting few types of gases namely, Alcohol, Benzene, CH4, Hexane, LPG and CO. The sensor is characterized by its high sensitivity and fast response time [4], thus, enabling an almost immediate data retrieval of the measured gases. The sensor outputs its values in term of varying voltage (Analog output); therefore, the data can be obtained via the microcontroller using its built-in Analog-to-Digital converter. The sensor has several specifications; Table I lists some of it.

<table>
<thead>
<tr>
<th>Item</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vcc</td>
<td>Working voltage</td>
<td>4.9</td>
<td>5.1</td>
<td>Volts</td>
</tr>
<tr>
<td>Rs</td>
<td>Sensing resistance</td>
<td>1</td>
<td>8</td>
<td>MΩ</td>
</tr>
<tr>
<td>Rs</td>
<td>Operating temperature</td>
<td>-10</td>
<td>70</td>
<td>MΩ</td>
</tr>
<tr>
<td>Rs</td>
<td>Detecting concentration</td>
<td>0.05</td>
<td>10</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

Sensitivity Adjustment:
Resistance value of MQ-3 is difference to various kinds and various concentration gases. So, when using these components, sensitivity adjustment is very necessary. It is recommended to calibrate the detector for 0.4mg/L (approximately 200ppm) of Alcohol concentration in air and use value of Load resistance that (RL) about 200 KΩ (100KΩ to 470 KΩ). When accurately measuring, the proper alarm point for the gas detector has to be determined after considering the temperature and humidity influence.

C. DC MOTOR SHIELD

To extend the functionality and ease the integration with microcontrollers, a specifically designed shield manufactured by one of the companies hosting the chip L293D (Motor Driver) and other supporting modules for better integration and consistent performance.

Figure. 4. DC motor conveyor

The motor rotation direction is given by Fleming’s left hand rule. It states if the index finger, middle finger and thumb of your left hand are extended perpendicularly to each other and if the index finger represents the direction of magnetic field, middle finger indicates the direction of current, and then the thumb represents the direction in which force is experienced by the shaft of the dc motor. DC motor connected with Arduino rotates the conveyor. This conveyor carry the products.

D. LCD MODULE

Figure. 5. Liquid Crystal Display

Figure.4 shows the Liquid Crystal Display. A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals combined with polarizer. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed.
images with low information content, which can be displayed or hidden, such as preset words, digits, and seven-segment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are made from a matrix of small pixels, while other displays have larger elements. LCDs can either be normally on (positive) or off (negative), depending on the polarizer arrangement. LCDs are used in a wide range of applications, including LCD televisions, computer monitors, instrument panels, aircraft cockpit displays, and indoor and outdoor signage.

E. BLUETOOTH MODULE

![Figure 6. Bluetooth module](image)

Bluetooth is a wireless technology standard used for exchanging data between fixed and mobile devices over short distances using short-wavelength UHF radio waves in the industrial, scientific and medical radio bands, from 2.400 to 2.485 GHz, and building personal area networks (PANs). Figure 5 shows the Bluetooth module. It was originally conceived as a wireless alternative to RS-232 data cables. Bluetooth is managed by the Bluetooth Special Interest Group (SIG), which has more than 35,000 member companies in the areas of telecommunication, computing, networking, and consumer electronics.

F. FINGERPRINT SCANNER

![Figure 7. Fingerprint Scanner](image)

Finger Print Sensor (R305) -TTL UART is a finger print sensor module with TTL UART interface. Figure 6 shows the fingerprint module. The user can store the fingerprint data in the module and can configure it in 1:1 or 1: N mode for identifying the person. The fingerprint module can directly interface with 3v3 or 5v Microcontroller. A level converter (like MAX232) is required for interfacing with PC.

V. PROPOSED SYSTEM

The Proposed system is for alcohol detection. In alcohol detection we use MQ3 sensor. Using this alcohol detector, we can detect whether the employee consumes alcohol or not in industries. If the person consumed alcohol the message will pass on to the higher authorities to prevent the unfortunate problem occurring in machines. It leads to reduce the wages of that person as a warning for his disciplinary actions. Machine continuously checks the presents of employee by requiring fingerprint for each 30 minutes, when the person who operating the machine is not available to ensure the presents of his on that time, the system will automatically turn off the machine. It also monitors and measures the productivity status of that employee by proximity sensor.

VI. RESULT

Resistance value of MQ-3 is difference to various kinds and various concentration gases. So, when using this components, sensitivity adjustment is very necessary. We recommend that you calibrate the detector for 0.4mg/L (approximately 200ppm) of Alcohol concentration in air and use value of Load resistance that(RL) about 200 KΩ (100KΩ to 470 KΩ).

<table>
<thead>
<tr>
<th>Samples</th>
<th>Rs/Ro values of different samples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Concentration in mg/L</td>
</tr>
<tr>
<td></td>
<td>0.1</td>
</tr>
<tr>
<td>Air</td>
<td>60</td>
</tr>
<tr>
<td>CH4</td>
<td>50</td>
</tr>
<tr>
<td>CO</td>
<td>50</td>
</tr>
<tr>
<td>LPG</td>
<td>50</td>
</tr>
<tr>
<td>Hexane</td>
<td>50</td>
</tr>
<tr>
<td>Benzin</td>
<td>4</td>
</tr>
<tr>
<td>Alcohol</td>
<td>2.2</td>
</tr>
</tbody>
</table>

When accurately measuring, the proper alarm point for the gas detector should be determined after considering the temperature and humidity influence. Figure 8 shows the typical sensitivity characteristics of the MQ-3 for several gases. In their: Temp: 20℃, Humidity: 65%, O2 concentration 21%, RL=200KΩ.

Ro: sensor resistance at 0.4mg/L of Alcohol in the clean air.
Rs: sensor resistance at various concentrations of gases.

![Figure 8. Sensitivity characteristics of the MQ-3](image)
VII. CONCLUSION

Our paper presented to prevent human losses by the machineries in the factory, and improve the production and maintain a good working condition. Investigation of alcohol Consumption and Employee Monitoring System can be used in various manufacturing industries to detect if the person at work has consumed any kind of alcohol or not. MQ-3 Sensor based alcohol detector systems can be used at hospitals, school as well as college campuses. This project can also be used as an alcohol detection system in cars to reduce road accidents.

VIII. REFERENCES


