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IOT BASED GAS PIPE LEAKAGE DETECTOR USING INSECT ROBOT

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Abstract

Gas pipes play very important roles for cities, industries and thus in growing economies.So gas leakages lead to losses as well as are a threat because they can also lead to fireaccidents. Placing sensors at each section of pipe is very costly. So here we propose aninnovative robot that clings on to the outer surface of the gas pipe and moves with the pipeto check for leakages. The robot consists of gas sensor that is used to detect gas leakages.As the robot keeps moving along the metal pipe it keeps monitoring for any gas leakage,On detection it uses an interface gas sensor to transmit location of the leakage detected over to the IOT login system, Here we use IOTgecko to receive and display the gasleakage alert and location over IOT. Thus we have a fully automated insect like robot thatmoves with the gas pipe and detects gas leakages instantly at a low budget.

Introduction:

Few years ago, the emergence of the Internet of Things (IOT) was stillconsidered with a certain degree of scepticism. These days are gone. A series of announcements, from the acquisition of Nest Labs by Google for $3.2 billion to SamsungGear and health-related wearables to the development of Smart Home features into Apple's iOS, have made IOT an increasingly tangible business opportunity. Predictions have been consistently on the high side in terms of potential. For instance, Cisco estimates that theInternet of Things has a potential value of $14 trillion. Looking at the buzz in the US as wellas in Asia, one may wonder whether it means that Europe has once more missed the technology train and that IOT will be developed by the likes of Apple, Google and Samsung.Or whether public research is still relevant given the fast moving market developments. Fromthe European Commission's point of view, it would be a serious mistake to believe that it isgame over for IOT. In fact, the hope has been building for some years and we are only at thevery beginning. The EU has already for some time invested in supporting Research and Innovation in the field of IOT, notably in the areas of embedded systems and cyber-physical systems, network technologies, semantic inter-operability, operating platforms and security, and generic enablers. Just like RFID did not quite manage to become pervasive yet, there are still a number of challenges before the IoT can expand and reach maturity. Research resultsare now feeding into innovation, and a series of components are now available, which coulusefully be exploited and enhanced by the market. But there are still a number of issues asregards how Internet of Things applications will develop and be deployed on the back ofResearch and Innovation. These issues may be of a technical nature, not least in terms of security, reliability, complex integration, discoverability and interoperability. Standard-isation will certainly play a

role there. the issues may be related to the acceptability of IoT applications by users and by citizens. Others may relate to business models and generally to marketpartitioning and coordination problems, which could seriously hamper the deployment of IoT applications. In that context, the Commission is considering how to best support IoT Research and Innovation further. One opportunity could be around pilot projects testing the deployment oflarge amounts of sensors in relation with Big Data applications. Another could be to launchlarge scale pilots to test in real life the possibility for integrated IoT solutions to be delivered.End-to-end security is another clear challenge that will need to be addressed to convince usersto adopt the IoT.

LITERATURE REVIEW

LITERATURE SURVEY

AUTHOR: Hinaruqsar, Chandana, Nandhini, Dr.TP Surekha,

TITLE: "INTERNET OF THINGS (IOT) BASED REAL TIME GASLEAKAGE MONITORING AND CONTROLLING"

ABSTRACT:

This proposed paper is aimed at developing that constantly monitors that gas leakwith the help of the electronic sensors.

AUTHOR: D.VishnuVarathana Reddy, N.Pushpalatha, I.Suneetha

TITLE: "RFID AND SENSORS IMPLEMENTATION IN SMARTSECURITY ROBOT NAVIGATION SYSTEM"

ABSTRACT:

This paper proposes an implementation of RFID and sensors in the smart security robot navigation system. Robot movement is generally controlled by a human by using a remote or mobile. The system uses Radio Frequency Identification (RFID) tags as landmarks to estimate the robot position within the topological map.

System Modeling and Design

BLOCK DIAGRAM

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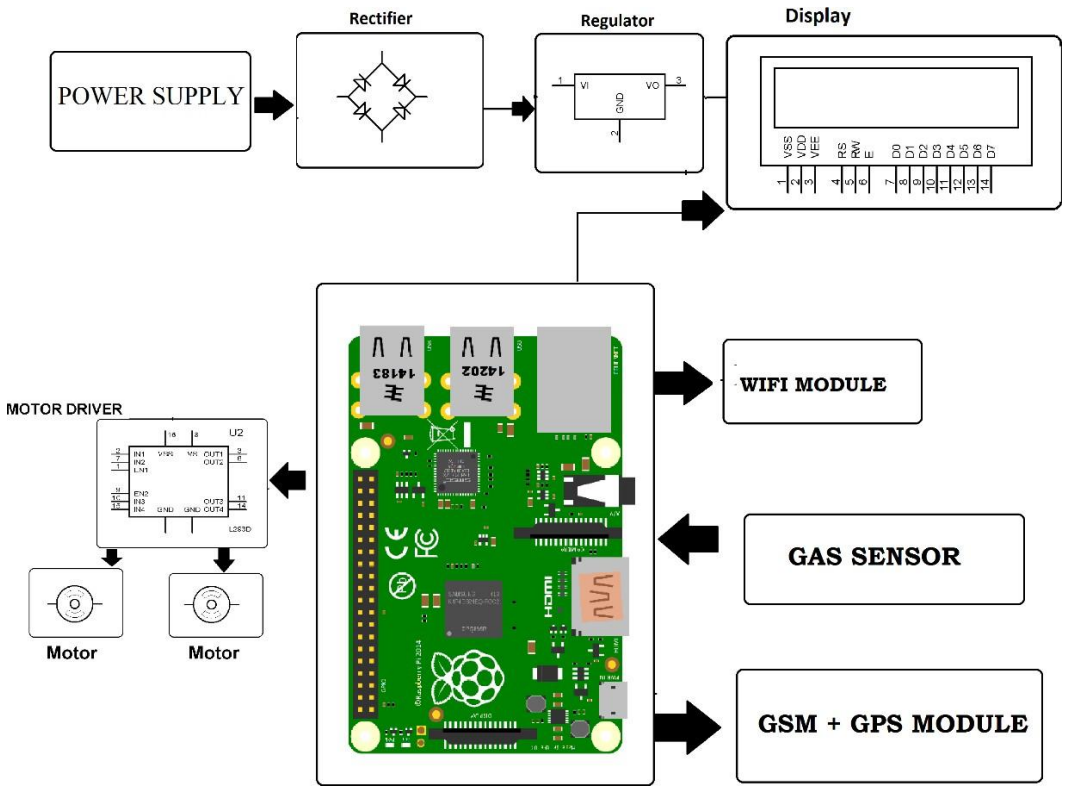

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ROBOT DETAILS

DIMENSION OF INSECT ROBOT

- Diameter of the wheels – 7 cm
- Length of th.e moving frame – 27 cm
- Width of the moving frame– 22cm
- Height of the moving frame -17.7 cm

WORKING PRINCIPLE

A motor is an electrical machine which converts electrical energy into mechanical energy. The principle of working of a DC motor is that "whenever a current carrying conductor is placed in a magnetic field, it experiences a mechanical force". The direction of this force is given by Fleming's left hand rule and it's magnitude is given by F = BIL. Where, B = magnetic flux density, I = current and L = length ofthe conductor within the magnetic field.

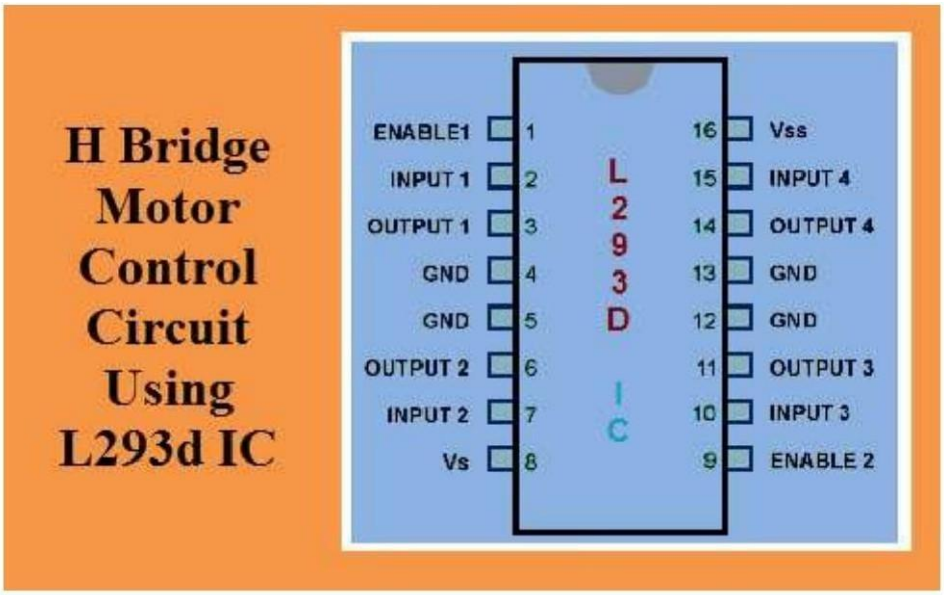
Fleming's left hand rule: If we stretch the first finger, second finger and thumb of our left hand to be perpendicular to each other AND direction of magnetic field is represented by the first finger, direction of the current is represented by second finger then the thumb represents the direction of the force experienced by the current carrying conductor.

When armature windings are connected to a DC supply, current sets up in the winding. Magnetic field may be provided by field winding (electromagnetism) or by using permanent magnets. In this case, current carrying armature conductors experience force due to the magnetic field, according to the principle stated above. Commutator is made segmented to achieve unidirectional torque. Otherwise, the direction of force would have reversed every time when the direction of movementof conductor is reversed the magnetic field.

LM 293D MOTOR DRIVER

Common DC gear head motors need current above 250mA. There are many integrated circuits like ATmega16 Microcontroller, 555 timer IC. But, IC 74 series cannot supply this amount of current. When the motor is directly connected to the o/pof the above ICs then, they might damaged. To overcome this problem, a motor control circuit is required, which can act as a bridge between the above motors and ICs (integrated circuits). There are various ways of making H-bridge motor control circuit such as

using transistor, relays and using L293D/L298



H Bridge Motor Control Circuit Using L293d IC

A H bridge is an electronic circuit that allows a voltage to be applied across a load inany direction. H-bridge circuits are frequently used in robotics and many other

ications to allow DC motors to run forward & backward. These motor control circuits are mostly used in different converters like DC-DC, DC-AC, AC-AC converters and many other types of power electronic converters. In specific, a bipolarstepper motor is always driven by a motor controller having two H-bridges.

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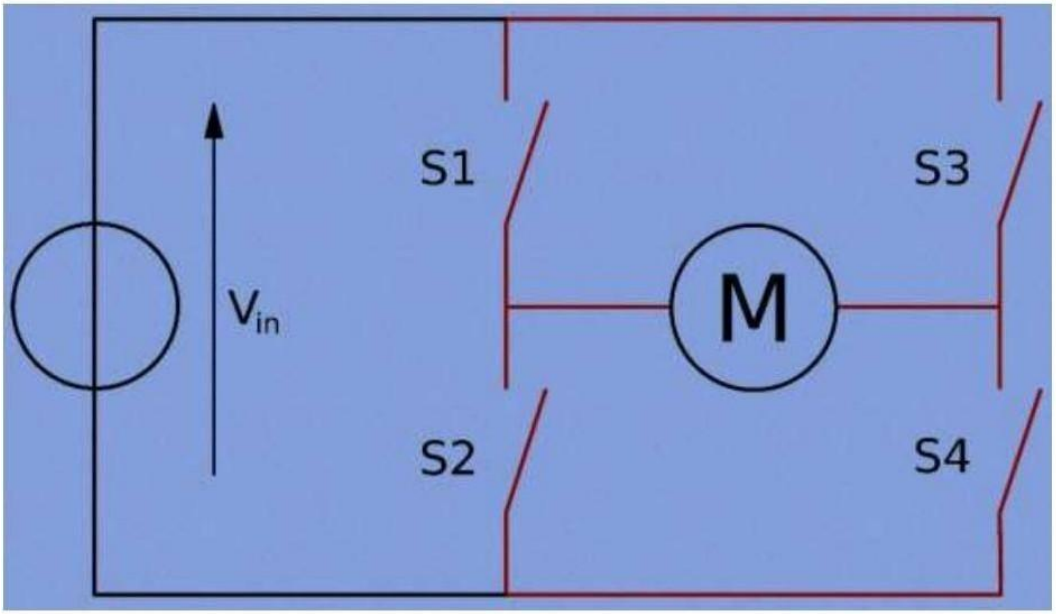

H bridge circuit

Generally, the H-bridge motor driver circuit is used to reverse the direction of the motor and also to break the motor. When the motor comes to a sudden stop, as the terminals of the motor are shorted. Or let the motor run free to a stop, when the motoris detached from the circuit. The table below gives the different operations with the four switches corresponding to the above circuit.

S1	S2	S3	S4	Operation
1	0	0	1	Motor moves right
0	1	1	0	Motor moves left
0	0	0	0	Motor free runs
0	1	0	1	Motor brakes
1	0	1	0	Motor brakes
1	1	0	0	Short Power Supply
0	0	1	1	Short Power Supply
1	1	1	1	Short Power Supply

Operation of H bridge circuit

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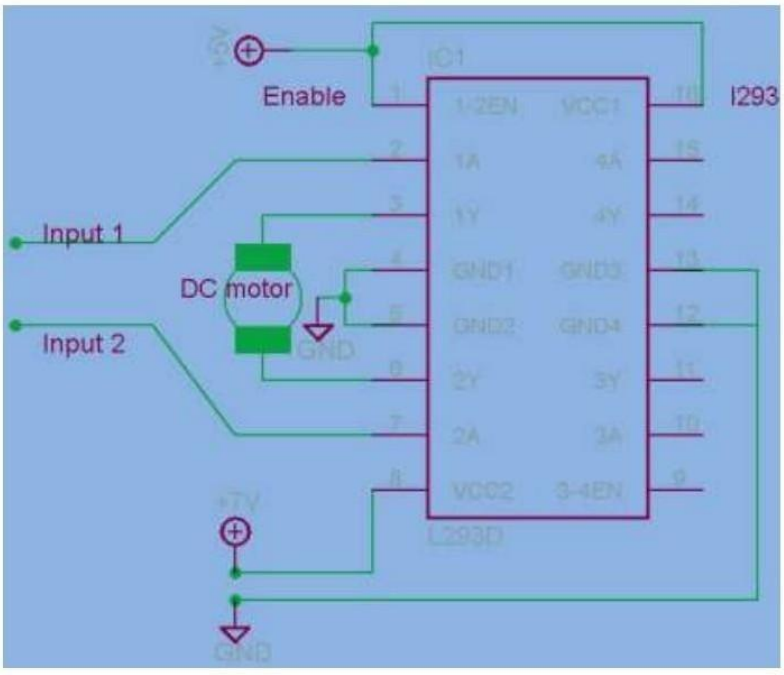
L293D Motor Driver IC

L293D IC is a typical Motor Driver IC which allows the DC motor to drive on any direction. This IC consists of 16-pins which are used to control a set of two DC motorsinstantaneously in any direction. It means, by using a L293D IC we can control two DC motors. As well, this IC can drive small and quiet big motors.

This L293D IC works on the basic principle of H-bridge, this motor control circuit allows the voltage to be flowing in any direction. As we know that the voltage must be change the direction of being able to rotate the DC motor in both the directions. Hence, H-bridge circuit using L293D ICs are perfect for driving a motor. Single L293D IC consists of two H-bridge circuits inside which can rotate two DC motors separately. Generally, these circuits are used in robotics due to its size for controllingDC motors.

H Bridge Motor Control Circuit Using L293d IC

The IC LM293D consists of 4-i/p pins where, pin2 and 7 on the left side of the IC and Pin 10 and 15 on the right side of the IC. Left input pins on the IC will control the rotation of a motor. Here, the motor is connected across side and right i/p for themotor on the right hand side. This motor rotates based on the



i/ps we provided acrossthe input pins as Logic 0 and Logic 1.

Let's consider, when a motor is connected to the o/p pins 3 and 6 on the left side of the IC. For rotating of the motor in clockwise direction, then the i/p pins have to be provided with Logic 0 and Logic 1.
When Pin-2= logic 1 & pin-7 = logic 0, then it rotates in clockwise direction.Pin-2=logic 0 & Pin7=logic 1, then it rotates in anti clock direction
Pin-2= logic 0 & Pin7=logic 0, then it is idle (high impedance state)Pin-2= logic 1 & Pin7=logic 1, then it is idle
In a similar way the motor can also operate across input pin-15 and pin-10 for the motor on the right hand side.
The L4293D motor driver IC deals with huge currents, due to this reason, this circuituses a heat sink to decrease the heat. Therefore, there are 4-ground pins the L293D IC. When we solder these pins on the PCB (printed circuit board), then we can get huge metallic area between the ground pins where the heat can be produced.

MQ6 GAS SENSOR

This is a simple-to-use liquefied petroleum gas (LPG) sensor, suitable for sensing LPG (composed of mostly 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. he sensor's output is an analog resistance. Thedrive 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.
Sensitive material of MQ-6 gas sensor is SnO2, which with lower conductivity in clean air. When the target flammable gas exist, the sensor's conductivity gets higheralong with the gas concentration rising.

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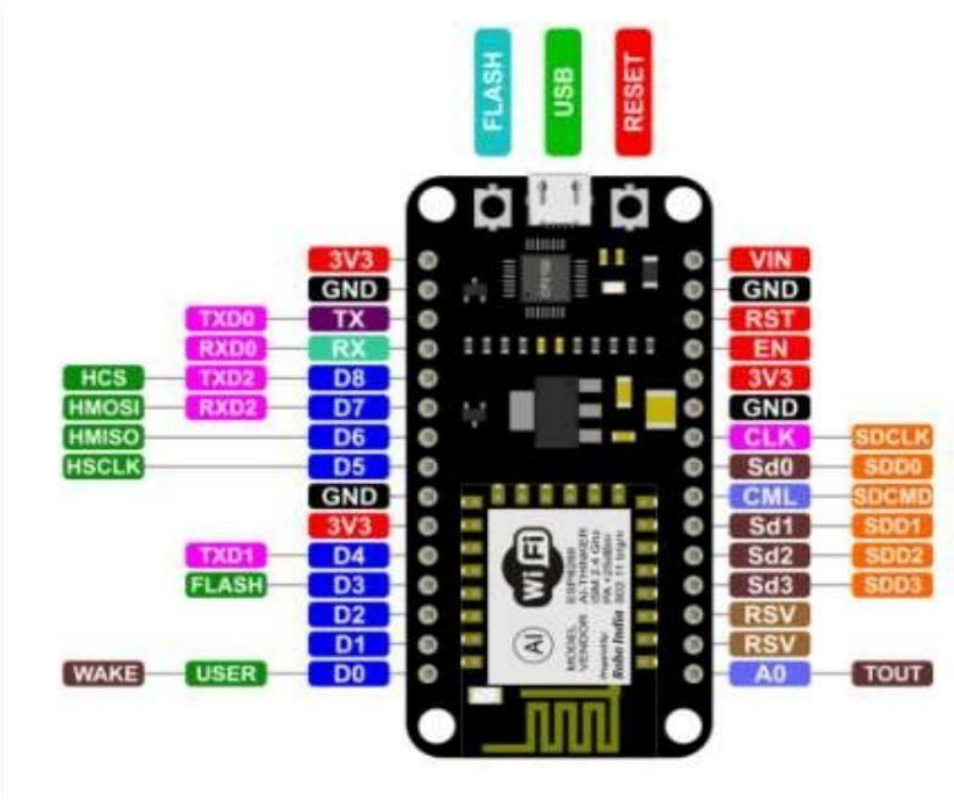
Users can convert the change of conductivityto correspond output signal of gas concentration through a simple circuit. MQ-6 gas sensor can detect kinds of flammable gases, especially has high sensitivity to LPG (propane). It is a kind of low-cost sensor for many applications. It has good sensitivity to flammable gas(especially propane) in wide range, and hasadvantages such as long lifespan, low cost and simple drive circuit &etc. It is widely used in domestic gas leakage alarm, industrial flammable gas alarm andportable gas detector.

NODE MCU

INTRODUCTION

The Node MCU is an open source firmware and development kit that helps you to prototype your IoT product with Arduino IDE or in few Lau script lines. It includes firmware which runs on the ESP8266 Wi-Fi SoC and hardware which is based on theESP-12 module. In this tutorial we explain how to use Node MCU with Arduino IDE**.**



OVERVIEW

Espressif's ESP8266EX delivers highly integrated Wi-Fi SoC solution to meet users' continuous

demands for efficient power usage, compact design and reliable performance in the Internet of Things industry.With the complete and self-containedWi-Fi networking capabilities, ESP8266EX can perform either as a standalone application or as the slave to a host MCU. When ESP8266EX hosts the application, it promptly boots up from the flash. The integrated high-speed cache helps to increase the system performance and optimize the system memory. Also, ESP8266EX can be applied to any microcontroller design as a Wi-Fi adaptor through SPI / SDIO or I2C / UART interfaces. ESP8266EX integrates antenna switches, RF balun, power amplifier, low noise receive amplifier, filters and power management modules. The compact design minimizes the PCB size and requires minimal external circuitries. Besides the Wi-Fi functionalities, ESP8266EX also integrates an enhanced version of ensilica's L106 iamond series 32-bit processor and on-chip SRAM. It can be interfaced with external sensors and other devices through the GPIOs. Software Development Kit (SDK) provides sample codes for various applications. Espressif Systems' Smart Connectivity Platform (ESCP) enables sophisticated features including fast switch between sleep and wakeup mode for energy-efficient purpose, adaptive radio biasing for low-power operation, advance signal processing, spur cancellation and radio co-existence mechanisms for common cellular, Bluetooth, DDR, LVDS, LCD interference mitigation.

Conclusion:

This project presents low cost, low power, and simple system for device control while LPG leakage and fire situation. Additional details may include microcontrollers and GSM module.Industry has higher application in industry and domestic purpose where safety is very important.

After this project performance, can conclude that detection of the LPG gas leakage is incredible in the project system. Applicable usefully in the industrial and domestic purpose. In danger situations we are able to save the life by using this system. An alert is indicated by the GSM module. A sensor node senses gas like CO2, oxygen, propane. The estimated range of transmission and consumption of power is obtained.The simple procedures and Arduino UNO Micro controller area used to build the sensor.

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Irving Sax