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"DESIGN OF UNDERGROUND PIPE-LINE INSPECTION ROBOT"

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Abstract: ***Pipelines are an extremely important instrument since they are utilized for a wide range of purposes in numerous industries, including the transmission of fuel, oils, gas, and water.Over time, they are prone to aging, corrosion, cracks, mechanical damage etc.., and ignorance of these problems leads to accidents which incures huge losses in terms of both economy and lives. This demonstrates how pipes in industrial facilities must inevitably be inspected on a regular basis for increased security and efficiency. These days, there are numerous methods for examining pipes, including magnetic particle and X-ray examination. By precisely locating leaks and removing obstructions, this pipe inspection robot seeks to eliminate the need for human intervention in labor-intensive and hazardous tasks.***

Keywords: Aging, corrosion, cracks, mechanical damage, X-rays, magnetic particle inspection method, leakage, blockages.

I. INTRODUCTION

The pipeline inspection robots are highly Useful to detect the pipelines or small tunnels internal cracks. It is more important for increasing performance and life of pipelines. There are many pipeline inspection robots system have been developed, and this pipeline inspection robots which are classified into several elementary forms according to the movement mechanism. Thus, many kinds of mechanism have been developed, such has wheel type, caterpillar type and passive type. Among them, wheel type and caterpillar type pipeline inspection robots were mostly popular.

One of the engineering specialties with the greatest rate of growth is robotics. Today, robotics is employed in many different industries, particularly the industrial sector.

Primarily robots are designed in such a way that they reduce human intervention for labour intensive and hazardous work environment. Sometimes it is also used to discover inaccessible workplace which is generally impossible to access by humans.

Robots are conceptualized to eliminate the human factor labour intensive are dangerous and inaccessible work environment. The use of robots is very common in this age of automation and it is no longer exclusively used by manufacturing industries. In most of the industries pipelines are tools for transporting oils, gases and other fluids. Thus, the inspection of pipes is extremely important for improving the reliability and security of the industries.

II.PROPOSED SYSTEM ARCHITECTURE

The robot's architecture allows it to pinpoint the precise spot in the pipe where the leak has occurred. The LDR sensor is used to assist detect cracks. The obstructions are identified using an infrared sensor, and they are removed using a driller. On an Arduino UNO, the codes needed to identify obstacles and cracks were written and loaded. The microprocessor, motor driver, wireless camera, and several sensors that comprise the controlling system were affixed to the model and synchronized with the mechanical component.

A PVC pipe of six inches diameter was used for testingoutputs. When external ambient light intensity surpasses a certain the pipeline inspection robot. Temperature sensing is donethreshold.
by the robot which is monitored on terminal display The video camera mounted on it gives the insight view of the position and location of the target. This video will be monitored on laptop. On a laptop, this video will be watched.

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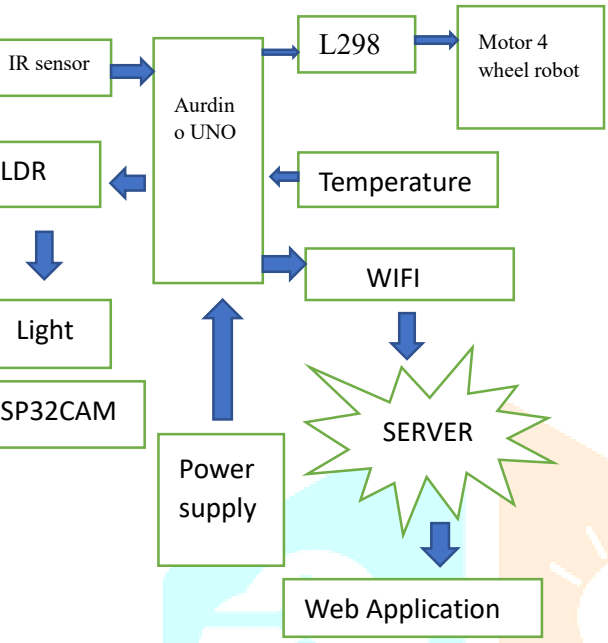

Fig. 1: Block Diagram

III. HARDWARE REQUIREMENTS

1. ArduinoUno:

A microcontroller board based on the ATmega328 is called the Arduino Uno (datasheet). It features a 16 MHz ceramic resonator, 6 analog inputs, 14 digital input/output pins (six of which can be used as PWM outputs), a USB port, a power jack, an ICSP header, and a reset button. Everything required to support the microcontroller is included; all you have to do is power it using a battery, an AC-to-DC converter, or a power source computer via a USB cable to get going.

2. IR Sensor:

Avoiding Obstacles Using Infrared One set of infrared transmitting and receiving tubes is included in the IR Sensor Module (Active Low).. The green indicator LED illuminates when the processing is completed by the onboard comparator circuitry. The module's tail contains pins for Vcc, GND, and output, making it a three-wire interface. Between 3.3 and 5V, it functions flawlessly. The output pin generates a digital signal (a low-level signal) in response to obstruction or reflection. The effective distance range of operation is 2cm to 80cm, with the on-board preset aiding in fine-tuning.

3. LDR Sensor module:

• The ambient brightness and light intensity are often detected using a photosensitive resistor module, which is most sensitive to environmental light intensity.

• When external ambient light intensity surpasses a certain threshold, the DO port outputs high and the module D0 outputs low

• The MCU is directly attached to the digital output D0, which senses changes in the ambient light intensity by detecting high or low TTL.

4. DHT11 Temperature and Humidity Sensor:

The complicated temperature and humidity sensor with a calibrated digital signal output is a feature of the DHT11 Temperature and Humidity Sensor. Through the use of the unique digital signal acquisition

It guarantees great long-term stability and high dependability thanks to its approach and temperature and humidity sensor technologies. This sensor, which links to a high performance 8-bit microcontroller and has a resistive-type humidity measurement component and an NTC temperature measurement component, offers great quality, quick response, anti-interference ability, and cost-effectiveness.

5. Motor and driver:

The widely used L293D integrated circuit can operate between 6 and 12 volts with a maximum output current of 1 amp. Although the IC is a little tricky to connect and operate on its own, the Compact L293D Motor Driver greatly simplifies the process.
Special features of the board include:
four motor direction indicator LEDs,
socket pin connectors for simple logic interfacing, Schottky EMF protection diodes,and user-accessible enable pins.

IV. SOFTWARE REQUIREMENTS

1. Arduino IDE:

The open-source Arduino project makes it simple for enthusiasts to utilize the potent Atmega chips. You may write code and upload it to the Atmega chip using the Arduino IDE program. After that, the chip runs the code. The majority of 3D printer electronics are Arduino-compatible; they make use of the Atmega chip and let users upload their own code. RAMPS, Minitronics, and Megatronics are examples of this. 'Firmware' is the software that converts machine instructions into physical movements before you can use the electronics. Here, Marlin, Sprinter, and Repetier are among the available alternatives. This page does not discuss the firmware itself. This firmware can be uploaded to your electronics using Arduino.

2. Adafruit IO:

Adafruit IO is a platform that adds value to data. Our main goal is to make things simple to use and require minimal programming for basic data connectivity.
IO comes with client libraries that encapsulate our MQTT and REST APIs. IO is based on Node.js and Ruby on Rails. Right now, Adafruit IO is in beta.

After reading that. Create two feeds on your feeds page:
1. Photocell: This feed will upload light data to adafruit.io from your device.

2. on off - this feed will communicate data from adafruit.io to your device, functioning as an on/off switch.

V. CONCLUSION:

The robotic systems' ability to adjust to the inner diameters of the pipes is a critical design objective. This robot's main benefit is that, thanks to its straightforward operation, it may be employed in situations where pipe diameter varies. To determine whether this robot could be used for pipeline inspection, a 6 to 8-inch diameter pipe inspection robot was created. We utilized a pair of sensors and an Arduino Uno chip to control the DC motor.

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