

Tunnel Drilling Default Detection

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ABSTRACT

Cross boarder tunnels are commonly used ways for illegal activities for nation security. Cross boarder tunnel detection is one of the most common concerns for national security. There are various methods already available. But unfortunately, all of them are highly expensive and cannot monitor and controlled remotely. In this paper, a cost effective sensor based method is proposed to detect the tunnel which is accurate and with the help of Internet-of Things, the sensory data can be monitored remotely. The necessary action command can be provided remotely as well.

INTRODUCTION

Cross border tunnel detection is the detection of tunnel deep inside the earth in border area. Now a day's national security is the major concern for any nation. There are many cross boarder tunnels existing used by terrorists and militants for smuggling of weapons, drugs and human trafficking. Therefore, a solution is required to overcome this problem. There are many topologies used in tunnel detection. The first ever Cross Border Tunnel Detection technology was experimented at U.S.-Mexico border near Otay Mesa, San Diego, CA . This is experimental site for different cross boarder tunnel detection technologies. Most important technologies are Radio Imaging Method(RIM), radio frequency electromagnetic method, Ground Penetrating Radar(GPR), Tunnel Detection Focused Source Electromagnetic (TDFSEM), synchronized electromagnetic wave gradiometer, ultrasonic sensor, seismic sensors. RIM is having higher frequency data and provides better detection but has problem in detection in secondary radiation. Therefore, mostly closed boreholes are not detected. Radio frequency electromagnetic method is robust and applicable in variety of geological settings but it is having limited potential without conductor. Ground Penetrating Radar is good in far depth of investigation with high spatial resolution from the earth surface. It also automatically removes the unwanted shallow effects because it has high signal to noise ratio. GPR can detect only one dimensional inversion . TDFSEM removes static noise

but the produced electromagnetic field is less effective. Synchronized Electromagnetic Wave gradiometer uses no physical contact from standoff transmitters to remote transmitter. In this technology, Post processing of data is not needed but the system is highly expensive. Ultrasonic Sensor is better method for the distance estimation but not accurate .

LITRETURE SURVEY

A number of techniques have focused on the detection of defaults in continuous surfaces by using computer vision-based sensors. Some of these techniques are based on the segmentation of the original image, either by using a fixed threshold as in a threshold computed from the previous images as in or a different threshold for each image column, as in . Other authors have worked on the previously processed images, as in some have worked on entropy where the use of the Hough transform is proposed; or on morphological filters, as in or on different edge detection filters. More specifically, the detection of cracks has been addressed in many areas, such as the inspection of concrete and asphalt infrastructures. One of the most developed fields is the detection of cracks in roads, these being one of the infrastructures with the largest surface anywhere in the world. The simplest and most common detection method is direct image segmentation, given that cracks are usually darker than the surrounding areas. Morphological filters are then applied to the segmented images in order to join the cracks and remove the segmentation noise, as is done for example in . Other works have addressed a more elaborate segmentation, such, where the Neighboring Difference Histogram Method (NDHM), which compares each pixel with the histogram of the surrounding pixels, is used; or where the images are divided into different zones, to which a modified Otsu thresholding algorithm is applied and the resulting entropy is computed. Other methods are based on the search for seeds that are merged by taking into account the fact that the cracks appear as elongated. Recently, Convolutional Neuronal Networks has been used to detect cracks, as can be found in where cracks are detected at pixel level.

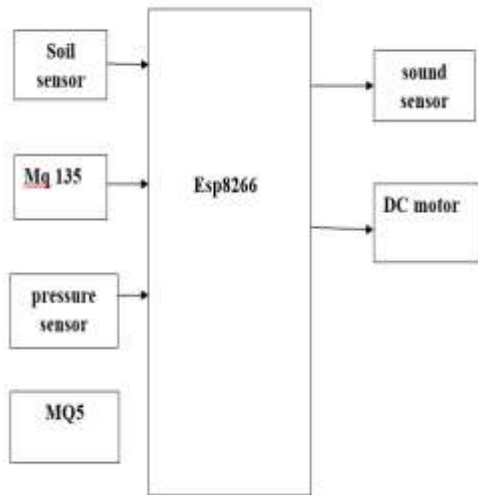
EXISTING SYSTEM

The existing tunnel drilling fault detection systems often suffer from several disadvantages, including limited sensor integration, lack of real-time monitoring, and inadequate coverage of potential failure scenarios. The proposed system addresses these drawbacks by incorporating a diverse set of sensors that collectively monitor critical aspects of the drilling environment.

PROPOSED SYSTEM

The proposed system integrates various components to achieve effective tunnel drilling defauly detection. Now we are using soil sensor and gas sensor for detecting the causes. Sound sensor will used in any sound will produce means that sensor will detect the sound.

BLOCK DIAGRAM



HARDWARE REQUIREMENT

- Nodemcu(esp8266)
- Soil sensor
- MQ 135
- Pressure sensor
- MQ5
- Sound sensor
- DC motor

SOFTWAE REQUIREMENT

- Arduino ide

HARDWARE DESCRIPTION

NODEMCU

SOIL SENSOR



This sensor mainly utilizes capacitance to gauge the water content of the soil (dielectric permittivity). The working of this sensor can be done by inserting this sensor into the earth and the status of the water content in the soil can be reported in the form of a percent. This sensor makes it perfect to execute experiments within science courses like environmental science, agricultural science, biology, soil science, botany. The capacitive soil moisture sensor is primarily used as they are made of a corrosion-resistant material giving it a long service life. The resistance is inversely proportional to the soil moisture: The amount of water in the soil determines conductivity. More water in the soil results in higher conductivity and hence offers lower resistance. The less water in the soil results in poor conductivity and hence the resistance is high.

MQ 135



A gas sensor is a device which detects the presence or concentration of gases in the atmosphere. Based on the concentration of the gas the sensor produces a corresponding potential difference by changing the resistance of the material inside the sensor, which can be measured as output voltage. Based on this voltage value the type and concentration of the gas can be estimated.

PRESSURE SENSOR



A pressure sensor is a device that measures the force applied on a surface per unit area and converts it into an electrical signal. These sensors are widely used in various applications across industries, including automotive, medical, industrial, and environmental monitoring. The key details about pressure sensors include the types, working principles, applications, and considerations.

MQ5



This is an extremely simple to utilize minimal expense semiconductor Gas sensor Module with simple and computerized yield. This module utilizes MQ5 gas sensor as a gas detecting component. It requires no outside parts simply plug in Vcc and ground pins and you are all set. For Computerized yield the limit worth can be effectively set by an on-board potentiometer. Utilizing this module you can without much of a stretch connection point MQ5 gas Sensor to any Microcontroller, Arduino or even Raspberry Pi. This Gas Sensor module is delicate to LPG, flammable gas and Town Gas. it is likewise little aversion to liquor and smoke.

DC MOTOR



A machine that converts DC electrical power into mechanical power is known as a Direct Current motor. DC motor working is based on the principle that when a current carrying conductor is placed in a magnetic field, the conductor experiences a mechanical force.

SOFTWARE DESCRIPTION

Arduino Software (IDE) is an open-source company, project, and user community for computer hardware and software. It designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control physical objects. The task's items are disseminated as open-source equipment and programming, which are authorized under the GNU Lesser Overall population Permit (LGPL) or the GNU Overall population Permit (GPL),[1] allowing the production of Arduino sheets and programming conveyance by anybody. Arduino sheets are accessible economically in preassembled structure, or as DIY units.



Arduino board plans utilize different chip and regulators. The sheets are furnished with sets of advanced and simple information/yield (I/O) sticks that might be connected to different development sheets (safeguards) and different circuits. The boards have serial communications interfaces, some of which are USB (Universal Serial Bus), which can also be used to load programs from personal computers. On some models, USB is included. The microcontrollers are ordinarily modified utilizing a vernacular of elements from the programming dialects C and C++. As well as utilizing customary compiler toolchains, the Arduino project gives an incorporated improvement climate (IDE) in view of the Handling language project.

CONCLUSION

This paper is based on the three-dimensional laser scanning technology to obtain the point cloud data of the initial support surface of the railway tunnel, and expounds the use of the tunnel point cloud data, through the B-spline interpolation method and the S-G smoothing method based on the curvature limitation, to obtain the flatness calculation reference plane. The normal vector distance formed by the intersection of the normal line drawn from the original point cloud and the flatness calculation datum plane is proposed, and the normal vector distance is used as the basis for flatness calculation, and two concepts based on the detection of the surface flatness of the initial support of the tunnel are introduced: the whole Flatness and local flatness. Through the analysis of the flatness distribution map and the flatness calculation results, the feasibility of the application of the three-dimensional laser scanning technology in the surface flatness detection of the initial support of the tunnel engineering is verified and discussed.

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