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Industrial Disaster Control Systems in Unmanned Aerial Vehicles

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ABSTRACT:The frequency of catastrophes is rising. Whether a disaster is caused by anything man-made or something natural, the effects are always serious and will take a long time to resolve with human strength alone. To cut down on time and human exposure, robotic technologies are being used more and more in search and rescue operations. It has suffered from a lack of environmental adaptability. Every robot is built differently in order to carry out the tasks assigned to it more effectively and efficiently. For continuous industry monitoring without human interaction, our concept suggests a hanging robot. With the use of forward and backward motors, a hung robot may travel along a rope path from one location to another. .

I.INTRODUCTION

In this paper, we suggest a hanging robot to monitor the environment. Gas, temperature, and LDR sensors are used to monitor the gas level, temperature level, and light intensity level of the environment, respectively. If the gas and temperature values exceed the normal range, an alert signal is automatically delivered to the buzzer and the appropriate authorities. In the case of a fire, the light dependent level is monitored using an LDR sensor, The gas, temperature, and fire sensor measurements will be continually monitored using a microprocessor. If a fire (light) is detected, the RF transmitter attached to the microcontroller transmits a signal to the ground unit's RF receiver. When the RF receiver detects the signal, it instantly activates the actuator, causing the spray to operate as a fire extinguisher. This protects industries against harm caused by abnormal changes in the environment. Hence, hanging robots are primarily intended to protect industries from serious harm. The causes of the tragedy are discovered sooner utilising hanging robots, avoiding industrial damage.

II.LITERATURE SURVEY

TITLE:Loading of hanging trolleys on overhead conveyors with industrial robots.

AUTHOR:Torstein A. Myhre, Aksel A. Transeth, Olav Egeland.

YEAR : May 2015.

They proposed a task of manipulating moving items with robot manipulators is difficult because it requires precise tracking of the objects. The loading and unloading of items from an overhead conveyor is an example of a sort of industrial use. In this research, we provide a strategy for the interaction of an industrial robot and a free swinging object as a robotic solution to this issue. Our method relies on particle filtering for visual tracking, and the object's equations of motion are incorporated into the filtering process. In particular, a weighted likelihood function is built using the Fisher information matrix. This project's second addition is that we identify obscured picture features and do not include them in the probability function calculation

TITLE : SLIP-Model-Based Dynamic Gait Generation in a Leg-Wheel Transformable Robot With Force Control

AUTHOR : Yun-Meng Lin, Hung-Sheng Lin, Pei-Chun Lin

YEAR : JAN 2017

A leg-wheel transformable robot's pronking and trotting behaviours are proposed to be developed using models. The spring-loaded inverted pendulum (SLIP) model is used as the motion template, and the parameters and state condition appropriate for implementation in the robot are chosen after investigating its stable running motion. The SLIP model and robot are mapped in order to translate the SLIP model running into the pronking and trotting behaviours of the robot. The leg-spring wheel's effect is produced by using force control and motor current feedback. The SLIP model's four alternative fixed-point trajectories were used to control the robot to begin four distinct dynamic behaviours with varying stiffness and stride. The experimental outcomes demonstrate the effectiveness of the suggested technique in triggering the dynamic behaviours.



TITLE : A Novel Potential Field Controller for Use on Aerial Robots

AUTHOR : Alexander C. Woods and Hung M. La, Senior Member, IEEE

YEAR : APRIL 2019

Drones, also referred to as unmanned aerial vehicles, offer a wide range of possible uses in practical situations. Drones need sophisticated planning and navigation algorithms in order to navigate through and interact with the environment safely. The extended potential field controller (ePFC) described in this study enables an airborne robot, or drone, to track a moving target position securely while dodging any impediments in its way. The Lyapunov technique is used to assess the proposed ePFC's stability, and MATLAB is used to simulate the suggested ePFC's performance. In order to show the controller's usefulness, it is finally put into use on an experimental platform in a lab setting. An enhanced PFC (ePFC) that may use the relative velocities between a drone and a target or obstacles as control feedback was demonstrated in this project. The stability of the ePFC was then demonstrated using Lyapunov techniques. Also, the performance of the proposed controller in comparison to a conventional PFC was assessed by simulation. The test demonstrates that by decreasing overshoot and settling time when travelling between waypoints, the ePFC performs noticeably better than a regular PFC.

TITLE : Raspberry Pi Based Energy Efficient Industrial Automation System.

AUTHOR :Dr. V. Ramya, G. ThirumalaiRajan

YEAR : Jan 2016

By the use of the credit card-sized Raspberry Pi single board computer, this idea suggests a wireless industrial automation system that is both secure and energy-efficient. This project's goal is to manage the electricity utilities, regulate industrial equipment, and keep track of staff productivity. All of these are carried out using a server computer and a Wi-Fi network. This server computer is password-protected, and only the authorised individual is able to open it. This project's major goals are to use less energy and to inform the public of urgent concerns in the sector.

TITLE : Omni-directional Gait of Limb Mechanism Robot Hanging from Grid-like Structure.

AUTHOR : Kenji inoue, Taisuketsurutani, tomohitotakubo

YEAR : OCT 2006

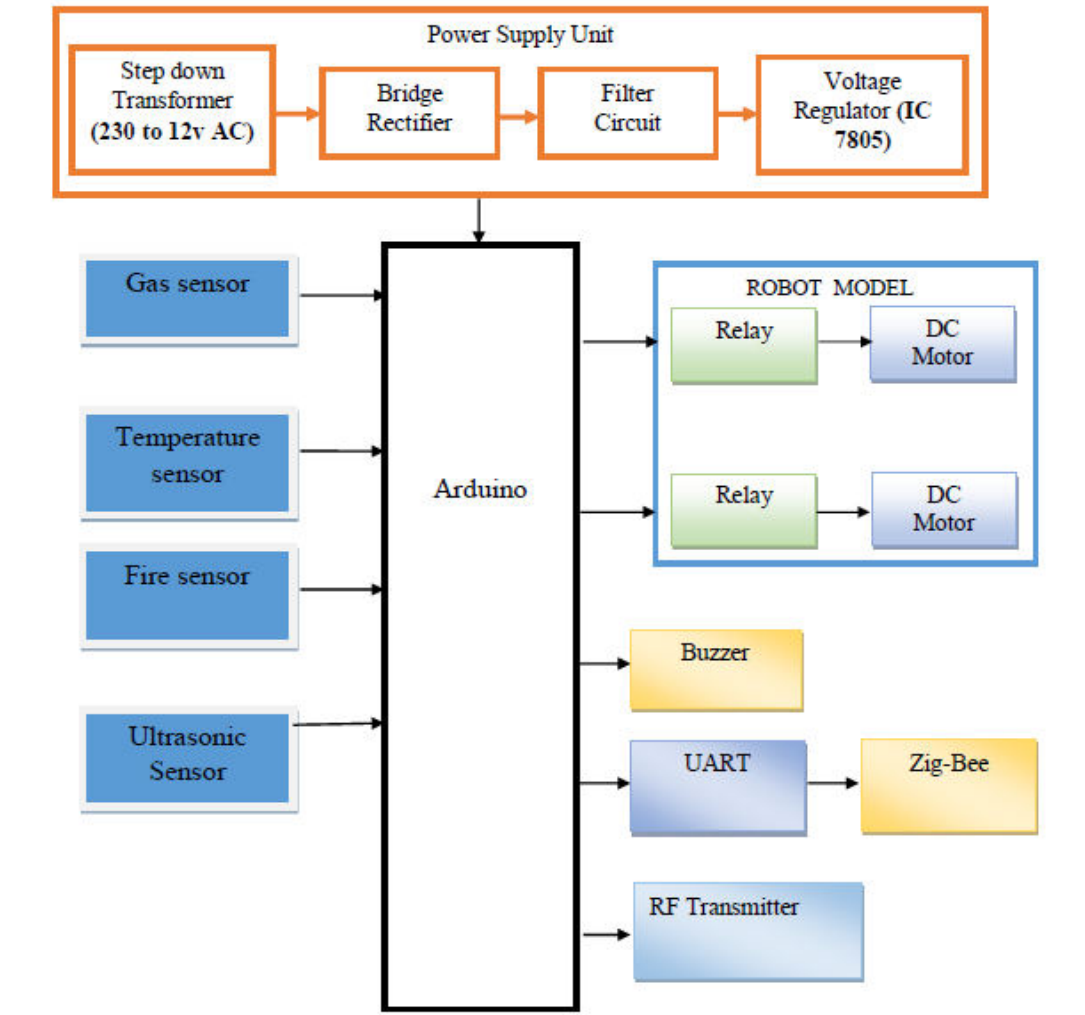
It is suggested to suspend limb mechanism robots with omnidirectional gaits from grid-like structures. A grid-like structure is made up of several bars that are arranged in a matrix in a horizontal plane; the grid spacing is indeterminate and not necessarily constant. Six legs make up a robot and a hemispherical form on each foot allows it to catch onto the bar. Tripod gait controls the robot's movement, which hangs from the grid-like structure utilising two sets of three legs alternately.

III.PROPOSED SYSTEM

In this paper we proposed a hanging robot for industrial monitoring in this project. The hanging robot can move from one location to another and is controlled by transmitting a comment through a zigbee pair. The gas, temperature, and fire sensor values will be watched using a microcontroller, and the information will be continuously updated to the basic station.If the server value for gas (co2) and temperature rises, the allot signal is automatically transmitted to the buzzer and the authorised individual.n the gas of fire, the light dependent level is measured using an LDR sensor.If a fire (light) is detected, the RF transmitter sends a signal to the ground unit's RF receiver. When the signal is received, the receiver unit activates the actuator, which causes the spray to operate as a fire extinguisher. Hence, a change in sensor value informs the authority person to take the appropriate action, and if a fire is detected, the fire extinguisher is activated. Consequently, with this hanging robot, industrial damage may be reduced to a greater extent. The hanging robot is mostly used in the industrial and petroleum industries. Without the assistance of a person, data may be gathered and controlled via ZigBee. If the value of the gas and temperature sensors increases, a warning signal is sent to the buzzer, and in the event of a fire, the light intensity is measured using an LDR sensor.This has a safety configuration for halting the gas flow and cooling fan if the sensor readings change, which means that precautionary measures will be implemented automatically.

IV. BLOCK DIAGRAM

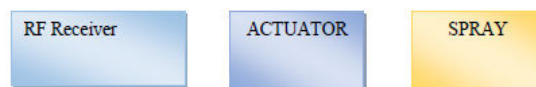
TRANSMITTER UNIT:



RECEIVING UNIT 1:



RECEIVING UNIT 2:



V.SOFTWARE REQUIREMENTS

(a) Embedded C

The C Standards committee created Embedded C as a set of language extensions for the C programming language to solve issues of commonality between C extensions for various embedded devices. The C language has traditionally needed nonstandard extensions to implement exotic features like fixed-point arithmetic, many separate memory banks, and fundamental I/O operations. The C Standards Committee expanded the C language in 2008 to solve these problems by establishing a uniform standard that all implementations must follow. It has a variety of features not found in standard C, including named address spaces, fixed-point arithmetic, and fundamental I/O hardware addressing. Embedded C uses most of the syntax and semantics of standard C, e.g., main() function, variable definition, data type declaration, conditional statements (if, switch, case), loops (while, for), functions, arrays and strings, structures and union, bit operations, macros, etc.

(b) Arduino IDE

The Arduino Integrated Development Environment or Arduino Software (IDE) contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

VI.COMPONENTS DESCRIPTION

(a) GAS SENSOR

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 the type and concentration of the gas can be estimated.

(b) TEMPERATURE SENSOR

To convert temperature into such an electrical value, a temperature sensor is utilised. With the aid of conditioning circuits, the temperature sensor's detecting element will reflect changes in the ambient temperature. The output voltage of the LM34 series is directly proportional to the temperature in degrees Fahrenheit. Because of this, they are a better option.

(c) FIRE SENSOR

It can be challenging to configure automatic fire detection to prevent false alarms in the immediate welding area since it often detects heat or smoke. Yet, these systems could also be used in other parts of the workshop. Sprinklers and/or automated fire service calls can both be set up in automatic systems. As a fire cannot be seen through the filter glass when arc welding, the welder usually won't be aware of one. There shouldn't be any danger while welding in a space designed specifically for that purpose because it won't include any flammable materials. Nonetheless, a fire watcher should be on duty if welding is being done in a space that wasn't designed for it. One of the stipulations for the hot work permit will be this. If a fire starts, the watcher must stop the welder and put out the flames. The watcher should receive instruction on how to utilise fire extinguishing tools and how to sound the alarm. When welding is complete, the area should be reviewed around 30 minutes later to make sure there is no additional risk of a fire starting.

(d) ZIGBEE

Zigbee communication is specially built for control and sensor networks on IEEE 802.15.4 standard for wireless personal area networks (WPANs), and it is the product from Zigbee alliance. This communication standard defines physical and Media Access Control (MAC) layers to handle many devices at low-data rates. These Zigbee's WPANs operate at 868 MHz, 902-928MHz, and 2.4 GHz frequencies. The data rate of 250 kbps is best suited for periodic as well as intermediate two-way transmission of data between sensors and controllers. Zigbee is a low-cost and low-powered mesh network widely deployed for controlling and monitoring applications where it covers 10-100 metres within the range. This communication system is less expensive and simpler than the other proprietary short-range wireless sensor.

(e) BUZZER

A buzzer or beeper is an audio signalling device, which may be piezoelectric .A Piezo electric buzzer can be driven by an oscillating electronic circuit or other audio signal source.

(f) UART

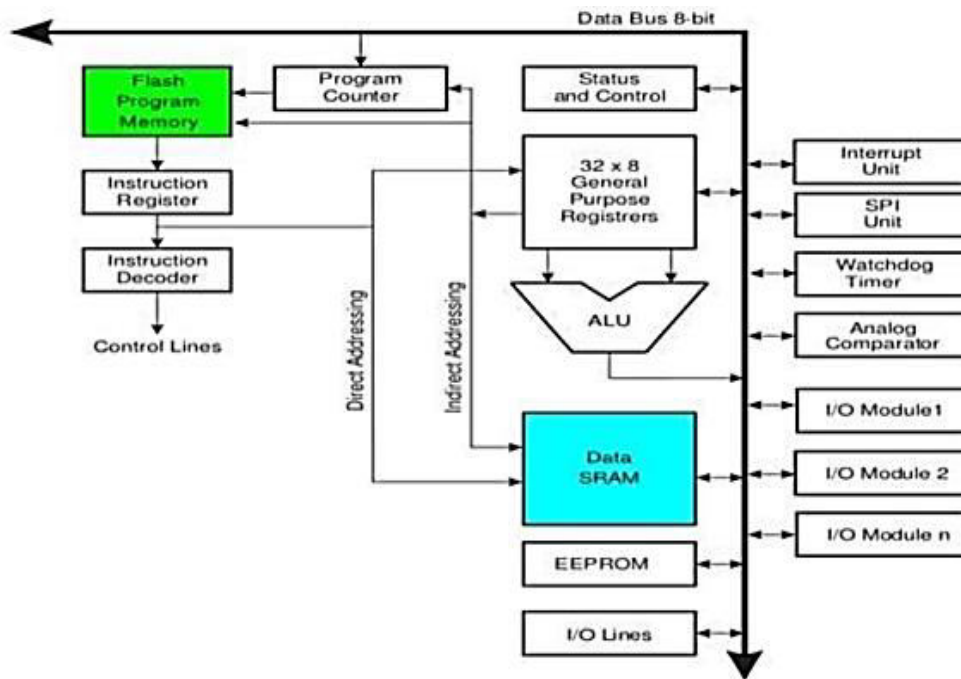
UART (Universal Asynchronous Receiver Transmitter) is a dedicated hardware associated with serial communication. The hardware for UART can be a circuit integrated on the microcontroller or a dedicated IC. This is in contrast to SPI or I2C, which are just communication protocols .UART is one of the most simple and most commonly used Serial Communication techniques. Today, UART is being used in many applications like GPS Receivers, Bluetooth Modules, GSM and GPRS Modems, Wireless Communication Systems, RFID based applications etc. Converts the bytes it receives from the computer along parallel circuits into a single serial bit stream for outbound transmission on inbound transmission, converts the serial bit stream into the bytes that the computer handles Adds a parity bit (if it's been selected) on outbound transmissions and checks the parity of incoming bytes (if selected) and discards the parity bit Adds start and stop delineators on outbound and strips them from inbound transmissions.

(g) STEPPER MOTOR

A stepper motor is an electromechanical device that converts electrical power into mechanical power. Also, it is a brushless, synchronous electric motor that can divide a full rotation into an expansive number of steps. The motor’s position can be controlled accurately without any feedback mechanism, as long as the motor is carefully sized to the application. Stepper motors are similar to switched reluctance motors. The stepper motor uses the theory of operation for magnets to make the motor shaft turn a precise distance when a pulse of electricity is provided.

(h) ARDUINO

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.



(i) RELAY

Relays are normally used in the control panels, manufacturing and building automation to control the power along with switching the smaller current values in a control circuit. However, the supply of amplifying effect can help

control the large amperes and voltages because if low voltage is applied to the relay coil, a large voltage can be switched by the contacts. If preventive relays are being used, it can detect overcurrent, overload, undercurrent, and reverse current to ensure the protection of electronic equipment. Last but not the least it is used to heat the elements, switch on audible alarms, switch the starting coils, and pilot the lights.

VII. CONCLUSION

In our work we have implemented a simple and cost effective robot, which is multi-purpose of the ARDUINO controlled robot in nature. Mainly it is designed for uses in the gas and petroleum industry. This robot can travel with the help of a rope using a dc motor through ARDUINO, and can be controlled by a wireless network of ZigBee modules with a base station. It is used in hazardous environments. In industries to reduce manual overhead we have implemented a system using ZIGBEE in industry to monitor as well as to inform the responsible person to take appropriate measures. The hanging robot is a real-time monitoring system developed with simple hardware which simplifies the possibility of an error free security system. Thus industrial monitoring robots used to monitor the abnormal conditions and parameters of the industry. A new RF for transfer of parameters from robot to base station. The actuator presses the fire extinguisher in case of fire detection in industries. Thus prevents the industries from severe damage.

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