A Review on Current Trends of Automation in Industries and Study of Industry 4.0 Concept

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ABSTRACT

Automation, often known as automatic control, is the use of various control systems to operate equipment such as machinery, factory operations, boilers, heat treatment ovens, telephone network switching, ship steering and stabilisation, and other applications with little or no human intervention. The most significant advantage of automation is that it saves time, energy, and materials while also improving quality, accuracy, and precision. In domains such as Industrial Automation, wireless communication technologies are commonly used. Molds can be fastened in either a horizontal or vertical position using injection moulding machines. Wireless communication, as well as smart sensors and actuators, offer ways to improve automation technology in the long run. This paper reviews various automation techniques employed from time to time till date

Keywords: Industry 4.0, DC motor, automation, control

Introduction

A dc motor is a machine that is built to run on electricity. It is a very flexible and versatile equipment. It can handle loads that require high starting torques, as well as accelerating and retarding torques. The fundamental benefit of a dc motor is its flexibility and controllability. As a result, it's simple to adjust to drives with a wide range of speed control and quick reversals. This explains why, despite its relatively high initial investment, it continues to hold its appeal in highly competitive industrial applications. De motors account for almost a quarter of all motors produced in the world today. In addition, there are a number of ways in which dc drives outperform ac drives, as listed below:

DC motors have a long history of being utilised as adjustable and variable speed drives due to their characteristics, and as a result, a wide range of alternatives have evolved for this purpose.

Industrial Automation's New Trends

The second concern is new trends in industrial automation, for which various methodologies were utilised, such as a simulation approach for speed control of an induction motor utilising Lab view software. One of the most popular types of software is lab view. Today's industries control applications are done with the help of LABVIEW, the most important software. Only for remote processes, the user usually sits somewhere safe and away from the working environment. He or she is responsible for controlling the plant as well as ensuring that the system parameters are optimized. simulation In an industrial monitoring and control system, software is critical. In fact, the fundamental problem in the majority of challenges in the design sector come when using a large number of control circuits, as the number of control circuits increases.[3]

Control Mechanisms

The number of control circuits leads to an excess of wires. To reduce the number of hardwire circuits and to readily visualise things moving or happening graphically, we can use simulation software to implement these circuits on a simulation level. Even if it is impossible to create remote system control because it would require huge no-hardwire circuits, simulation programmes have made engineering design simple and with reduced material requirements. It claims that using Lab View as the human machine interface for the implementation is a good decision because it has a variety of applications and functions that are simple to understand and use. It also claims that this approach is more cost effective because the objectives and system defects can be identified without the circuit being implemented. To be more specific, this work is about regulating an induction motor and its variables, such as speed.[5]

The automation sector is confronting new issues, such as information security management, which is mostly due to the introduction of new ICT technologies into the field. Field solutions demonstrate a strong tendency of convergence toward common ICT solutions, particularly IP-based solutions. De-facto operating systems and communication systems This Autonomic Network concept can help smart applications in smart cities be more productive environment Investigate and innovative security management solutions in the field of automation.

Wireless data Transmission Techniques

Wireless Data Transmission is the fourth issue, and for this issue, Engineering Approach for Secure and Safe Wireless Sensor and Actuator Networks for Industrial Automation Systems was used, which includes the security concept in the context of industrial automation and provides an introduction to a holistic networks approach for automation networks that is still simple to implement. The problem is justified by comprehensive approaches, which include security protocols and work on VEST (Virginia Embedded Systems Toolkit), which focuses on the development of effective composition. However, there is a flaw in that a security solution must ensure that an attacker's cost of breaking the security solution is greater than his or her potential benefit. To deal with security needs in the context of industrial automation, a solution approach was developed using an engineering process. Data was collected and analysed at three stages of the solution: development flow, selection process inputs, and mapping requirements to actual solutions. The proposed development path ensures that correct system solutions are objectively engineered. A holistic goal definition and an iterative composition technique that inherently utilises and extends current knowledge are key elements in the flow. This all-encompassing method is dependable, safe, and secure. A ZigBee Approach to Short-Range Wireless Technologies in Industrial Automation. Bluetooth, ultra-wideband (UWB), ZigBee, and Wi-Fi are four prominent short-range wireless communication protocols. The ZigBee network, in particular, is an emerging technology for low-cost, low-power, and low-rate wireless personal area networks, with a focus on device-level communication for allowing wireless sensor networks. ZIGBEE is working on a wireless network that will be low-power and low-cost. As a result, it's becoming increasingly popular in a variety of applications, including home automation, industrial control, location and position, telecommunications, and wireless sensor networks. The ZigBee module is configured in such a way that it accepts the data collected from the microcontroller and transfers it to the remote receiver, as described in industrial automation using ZigBee [2]. The data from an analogue to digital converter that continuously monitors temperature, voltage, and current parameters is collected by the microcontroller in this system. The Zigbee [2] module on the receiver side receives all data transmitted by a Zigbee transmitter within the communication range. This information is then sent to a microcontroller through integrated circuitry, where the microcontroller programme compares all of the data parameters to predetermined set limits. If any parameter exceeds its limit, the microcontroller transmits instruction signals to a relay driver IC, which is in charge of controlling various loads including motors, relays, circuit breakers, and so on.[8]
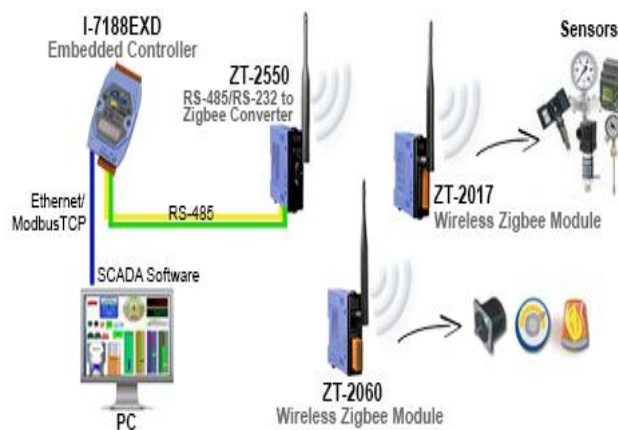

Fig i : Automation using Zigbee

GSM based automation

We can remotely control the activities of a DC electric motor using GSM technology. Lighting, security, telecommunications, access and safety, information and entertainment systems, and thermal comfort systems are all covered by the DC electric motor control system for industrial applications. The system uses a microprocessor to operate a compound DC electric motor via DTMF inband signalling. DTMF (Dual Tone Multi-Frequency) [7]
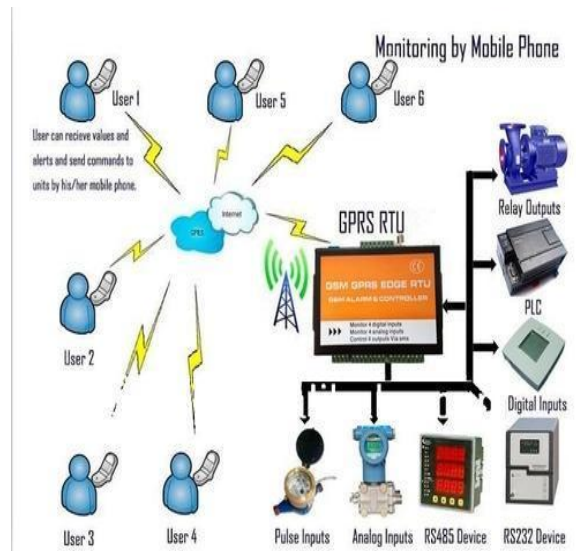
Fig-ii: Automation using GSM

To allow for this, a system will be implemented. a control/feedback system that works in real time realisation. The user initiates speed control "from fullOff to fullOn." use a mobile phone that is capable DTMF can be generated in a variety of ways. At the load end, there is a DTMF receiver. receives and decodes DTMF signals arranges and assesses the correctness or inaccuracy of the The DTMF sequences and performs the commands. the desired command found in the Tones should be entered.

Industry 4.0

The Internet revolution was the trigger that irrevocably altered the future of communication. It permits information to be sent despite the fact that the computers are separated by geological barriers. As time has passed, we've developed new technologies that have enabled us to progress from the first generation of the Internet to the current Fourth generation.

The concept of the Internet of Things has spurred this generation (IoT). Currently, the Internet has the ability to collect data on every person who uses it. The internet of things, or IOT, is a technology that allows physical equipment to be controlled over the internet. We offer an effective industry automation system that allows users to control industry appliances/machines efficiently over the internet.[1][7][6]
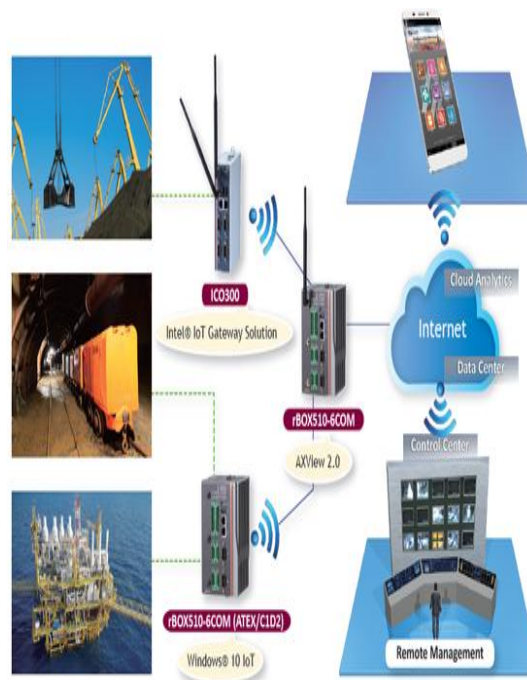

Fig iii : Automation using IOT

Conclusion

The advantages and disadvantages of various approaches used in home automation systems are examined in this proposed article. Home automation based on Bluetooth is low-cost and flexible to build, but it can only work within the Bluetooth wireless network's limited range. The advantages of a home automation system based on IoT are higher, but there are certain drawbacks, such as the fact that it can only work in the presence of the internet. Wi-Fi-based home automation systems are versatile in terms of the number of devices that may be controlled simultaneously from any location. On Android, the system is developed with a user-friendly interface. People may operate and monitor home appliances via text messages from a standard GSM phone, according to a home automation system built on GSM that has been considered. Automation systems in the future will be smarter, faster, and easier to scale. A lot of study and work is being done in this subject in order to incorporate Artificial intelligence, which will have a significant impact in this field and may lead to the development of a fully capable smart system. The review of automation technology comes to the conclusion of using IOT recent protocols and standards for wireless data transmission as one of the most suited and economical way of automation standards.

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