Industrial Automation using IoT: A Review

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Abstract— The revolution of the Internet was the catalyst that changed the future of communication forever. It allows for the transfer of information despite the geological barriers that separate the computers. As time has progressed, we have developed new technologies that have allowed us to move from the First generation of the Internet into the current transition into the Fourth generation. This generation has been propelled by the concept of the Internet of Things (IoT). Currently, the Internet is able to collect data on each individual that accesses it. IoT or internet of things is a technology that deals with bringing control of physical devices over the internet. Here we propose efficient industry automation system that allows user to efficiently control industry appliances/machines over the internet.

Keywords: IoT, Wi-Fi Modem, AVR Studio, ZigBee, APRAnet AOL

I. INTRODUCTION

Industrial automation is the use of control systems, such as computers or robots, and information technologies for handling different processes and machineries in an industry to replace a human being. It is the second step beyond mechanization in the scope of industrialization. The Internet of Things (IoT) [1] [5] is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The term Internet of Things was first coined by Kevin Ashton cofounder and executive director of the Auto-ID Centre at MIT, first mentioned the Internet of Things in a presentation he made to Procter & Gamble in 1999. Only in 2011, the number of interconnected devices on the planet overtook the actual number of people. Currently there are 9 billion interconnected devices and it is expected to reach 24 billion devices by 2020. The First generation of the Internet began in the 1970 through APRAnet (Advanced Research Projects Agency Network). This was a protected network that allowed the exchange of information via computers that were situated in different areas within the United States. It is believed amongst many other inventions, that APRAnet was designed for military purposes. Nonetheless, the network was designed to ease information from one area to the next. Although there were many problems pertaining to the compatibility of networks, it advanced and thus created the First generation of the Internet.

The Second Generation began in the 1990's accompanied by AOL. As computers and the internet gained popularity and accessibility, AOL allowed its consumers to access the internet in a whole new way. It allowed people to log-on and gave them access to things such as chat rooms, web browsing, and email. Although email already existed, it gained immense popularity in this generation.

The Third generation began in the 2000 which we still are in today. It is primarily dominated by social media's, such as Myspace, Facebook, Flickr, Twitter, Tumbler, etc. These social media's allow people all around the world to communicate easily. This generation is also characterized by connecting people in a more advanced way. Dial-up was replaced by broadband giving consumers faster speeds and lower prices.

Society is currently in the process of transitioning from the Third to the Fourth generation. The Fourth generation is represented by the Internet of Things (IoT). The Internet of Things is an exciting new concept that involves the networking of all physical devices, in order to function more cohesively as one unit to assist everyday life. It works by implanting sensors or Radio frequency identification tags (RFIT) [6] in machines in order to monitor and collect data from that machine to increase efficiency. It connects virtually everything to the internet. This concept will have a major impact on businesses as well as the average household.

II. LITERATURE SURVEY

Industrial automation using CAN protocol [3][4] describe project is implemented to control the industrial loads that are run by DC motor based on the temperature variations of the process. Various process control systems are depends on the temperature. So this project achieves this with the use of CAN protocol which is highly efficient and reliable low-cost communication. Two microcontrollers are used in this project, one for acquiring temperature data and the other for controlling the DC motor. CAN Controller MCP2515[3][4] and CAN transceiver MCP2551 are connected to both microcontrollers to implement CAN communication for exchanging the data but disadvantage practically it is limited to 110 nodes due to the hardware transceivers. It supports cabling up to 250 meters.

Industrial automation using ZigBee [2] describe the transmitter section, the Zigbee module is configured in such a way that it receives the data collected from the microcontroller and sends it to the remote receiver. In this system, the microcontroller is programmed to collect the data from an analog to digital converter that continuously monitors temperature, voltage and current parameters. At the receiver side, the Zigbee [2] module receives all the sent data from a Zigbee transmitter within the range of communication. This data is further transferred to the microcontroller using an embedded circuitry wherein the microcontroller program compares all these data parameters with predefined set limits. If any parameter exceeds its limit, then the microcontroller sends command signals to a relay driver IC, which is responsible to operate different loads such as motors, relays, circuit breakers, etc. All these parameters' information is also displayed on LCD display as a Human machine interface. In this way, industrial parameters can be easily monitored and controlled through the short range low cost and low powered

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Zigbee communication technology. It supports two ways communication between transmitting devices and controllers at 10-100 meters distance.

III. SYSTEM OVERVIEW

IOT or internet of things is a technology that deals with bringing control of physical devices over the internet. Here we propose efficient industry automation system that allows user to efficiently control industry appliances, machines over the internet. For demonstration of this system we use 2 loads as industrial appliances or machines and a motor to demonstrate as an industrial motor. An Arduino family microcontroller for processing all user commands. A Wi-Fi modem is used to connect to the internet and receive user commands. On sending commands through the internet they are first received by our Wi-Fi modem. The modem decodes information and passes it to the microcontroller for further processing. The microcontroller then switches loads and operates the motors as per receiver's commands. Also it displays the system state on an LCD display. Thus we automate entire industry using online GUI for easy industry automation. We use the website as IP address to connect with the page.The basic block as shown in fig.1. As shown in fig the power supply unit is used for the conversion of available power of one set of characteristics to meet specified requirements. Typical application of power supplies includes converting raw input power to a controlled or stabilized voltage and/or current for the operation of electronic equipment.

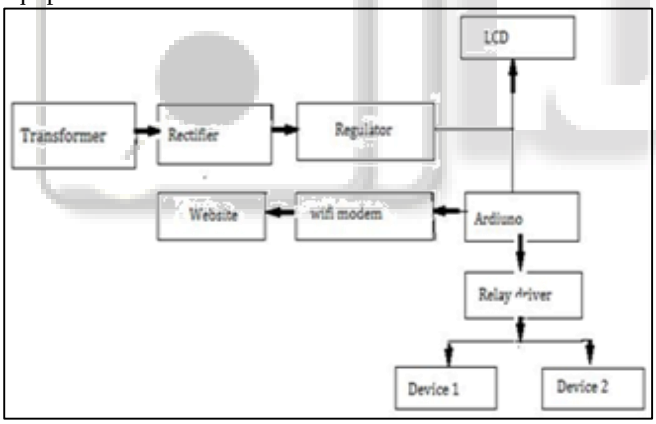

Fig. 1: Block diagram of proposed Industrial Automation Using IOT.

Liquid-crystal display (LCD) is a flat-panel display or other electronic visual display that uses the light-modulating properties of liquid crystals. Arduino is an open-source prototyping platform based on easy-to-use hardware and software.

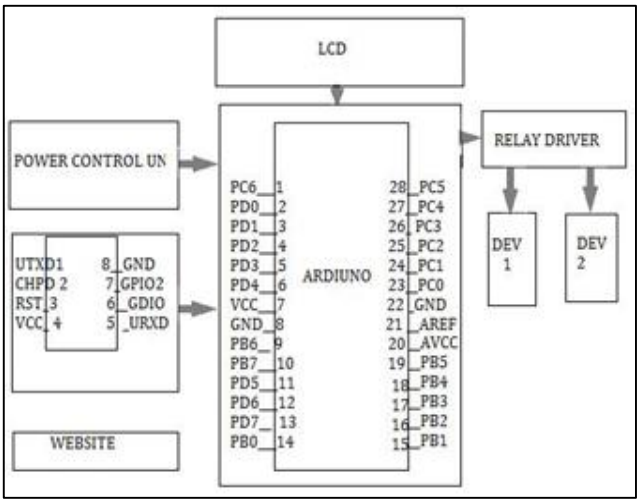

Fig. 2: Block diagram of proposed Industrial Automation Using IOT.

Wireless connectivity is contributory in the Internet of things period and the use of wireless solutions in industrial automation is increasing rapidly at all levels of automation systems. Industrial automation systems utilize wireless communication to connect remote and local facilities and equipment to increase operational efficiency. A wireless automation system contains a mix of network technologies, equipment and systems including enterprise and automation systems, network equipment, control devices and field devices. Wi-Fi is widely used for backbone communications as well as in monitoring and control applications. In our proposed system we used Wi-Fi modem ESP8266. The Wi-Fi module is as shown in fig 3.

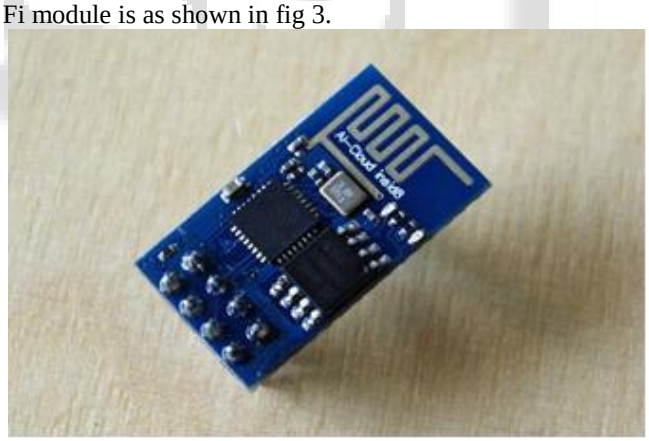

Fig. 3: ESP8266 Wi-Fi modem.

The ESP8266 Wi-Fi Module is independent SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network.

The ESP8266 is capable of either introducing an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module is programmed with an AT command. The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community. This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry,

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including the front-end module, is designed to occupy minimal PCB area.

IV. CONCLUSION

The paper gives a literature review on exiting industrial automation system. The paper provides current technology that deals with bringing control of physical devices over the internet. Here we propose efficient industry automation system that allows user to efficiently control industry appliances/machines over the internet.

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