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Iot Industrial Automation Using Raspberry Pi

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ABSTRACT
This page contains the concept of IOT , Industrial automation using IOT and Raspberry pi. In previous few years, Internet of Things or IOT plays a vital role for new generation automation companies. It helps to connect everything around you to internet including wearable devices, metering devices and environmental sensor. Here we can remotely control and monitor industrial device parameters by using IOT and Raspberry Pi . The system uses the raspberry pi as controller and server, the programming is done in the python language. Raspberry Pi is a tiny, low-sized, and very cheap computing platform that is being used to deploy applications of different kinds. Here we propose efficient industry automation system that allows user to efficiently control industry appliances/machines over the internet.

KEYWORDS – *Industrial Automation, Internet of Things, Raspberry pi, Python Language*

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I. INTRODUCTION

We hear a lot of things about industrial automation and internet of things because it is a new emerging technology.

Today the multitude of internet connections around the world are used directly by humans such as computers and mobile handsets, in other words we can call it human to human communication. In future, it's possible that we can have not only human-human communication but also device-device communication which is called "Internet of Things" where Things refers to various electronic devices. The term 'Internet of Things' was first coined by Kevin Ashton at a launch in 1998, describing the IoT as a system in which the digital world is connected to the physical world that forms the global network. With IoT not only can we access information from any location, at any time, from anyone, but we can also control and monitor various devices from any location, at any time, from any network, for any authorized person, this technology is called Internet of Things (IoT).

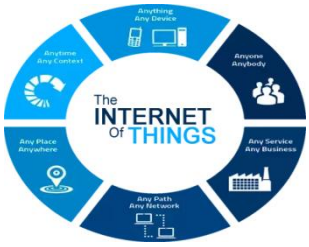

Figure 1: Internet of Things

The IoT concept aims to make the Internet ubiquitous and immersive. So speeding up the Internet to enable it by any authorized person to easily access and interact with a wide variety of device devices for example, home gadgets, test cameras, surveillance sensors, actuators, cars, indicators, etc., IoT will enhance system development. many of which use a very large amount and variety of data generated by Item to provide new benefits to citizens, industry, and government sectors.

Also Industrial automation is the use of control systems, such as computers or robots, as well as information technology to handle various processes and equipment in the industry to replace man. It is the second step beyond the scope of industrialization.

Automation is the use of various operating systems such as machinery, industrial processes, boilers and oven

heating, switching telephone networks, directing and stabilizing ships, aircraft and other applications with minimal or reduced human intervention.

In this project we propose an effective industry plan that allows the user to effectively control the industry / equipment online. We use a separate sensor (Temperature sensor, Moisture sensor, camera, Gas Sensor) to monitor industry equipment with the help of smartphones..

II. METHODLOGY

1. OVERVIEW

The main device controller in the project is single board computer Raspberry Pi . It is used to establish communication with the remote IOT server using the IOT protocols over the WiFi connection.

The power supply on the circuit board provides 5vdc to the Raspberry Pi controller and the LCD.. The Raspberry Pi controller has built-in WiFi, USB, and A/V ports. The programming of the Raspberry Pi controller is done is Python language. The Raspberry Pi controller runs the Raspbian OS which is based on Linux OS. There are Four relay connected to the output pins of the Raspberry Pi controller. Four different industrial instruments are connected to these relays. And a four different sensors are also connected to Raspberry pi. The Raspberry Pi board communicates with the remote server based I0T platform by means of built-in WiFi. The control commands are provided by the user in the I0T platform. These commands are then communicated to the Raspberry Pi controller over the WiFi using I0T protocols. According to these commands, the Raspberry Pi controller turns the relays 0n and off. An LCD is also connected to the Raspberry Pi controller which is used to display the device status as well as other messages.

2. BLOCK DIAGRAM

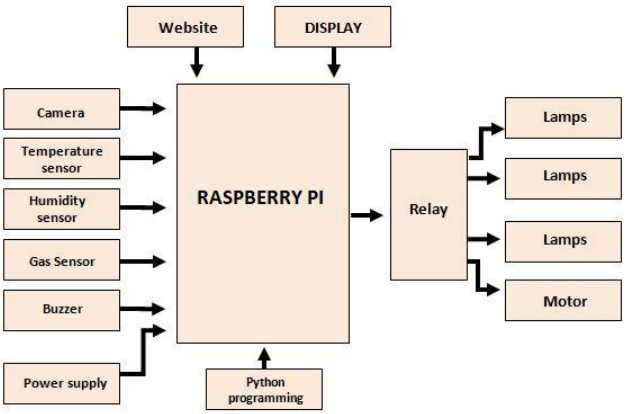

Figure 2: Block Diagram

3. HARDWARE USED:

Raspberry Pi, LCD Display, Wifi Module, Relay Temperature sensor, Humidity sensor, Gas sensor, Camera, Rectifier, Regulator, Resistors, Capacitors, Transistors, Power Supply, Cables and Connectors, Diodes, LED, Transformer/Adapter, Switch. IC, IC Sockets, Motor, Lamps.

Some of Hardware descriptions are given below:

i. Raspberry Pi:

Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor 0r TV and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing and to learn how to program in languages like Scratch and Python. Raspberry Pi can do everything we'd expect a desktop computer to do, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games. Raspberry Pi4 is the latest iteration of the Raspberry Pi product family and it offers the fastest performance when compared with the previous generations.

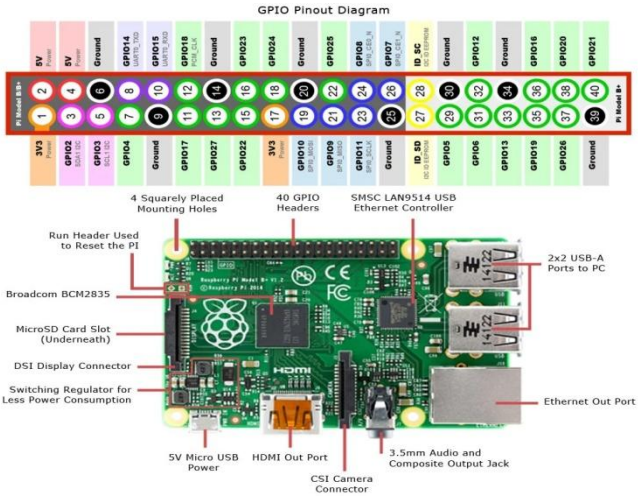

Figure 3: Raspberry Pi

ii. RELAY:

In layman's words, the relay is a switch. Technically speaking, a relay is an electromagnetic switch in which a small control signal (usually from a microcontroller) in a Relay installation will control a high power supply (frequency AC mains).

Since this is a function based on the Raspberry Pi, let's talk about the Raspberry Pi. The Raspberry Pi computer, although a powerful tool, runs on 3.3V Logic.

If you want this powerful computer to control your electrical loads, such as the LED strap that works in your garden or kitchen, you can't connect them directly as the power straps work on the AC Mains supply and the Raspberry Pi runs on 3.3V DC (technically).

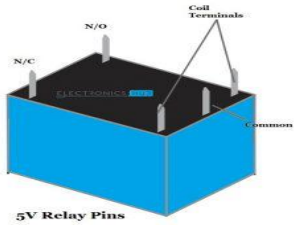

Figure 4: Relay

iii. RELAY MODULE:

Although the Relay Coil needs a small stream to get power, driving it directly from the Raspberry Pi (hence, any Microcontroller like 8051 or Arduino) is not a good idea.An easy way to drive a Relay Coil with a Transistor. The following figure shows the connection required in relation to the transfer.

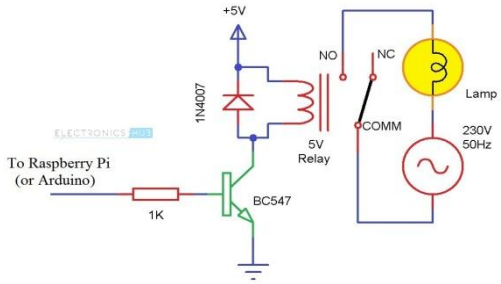

Figure 4: Circuit Diagram of Relay Module

The circuit shown above will drive the low-value transfer of objects (Transistor, current opposition, Relay and Diode).

The Relay Module is a simple circuit board that contains the transmission itself and all the necessary equipment needed to drive the relay and the connectors needed to connect the load.

I have used a four channel relay module in this project. It is basically, four relays with all the circuitry on a single board.

Figure 5: Relay Module

iv. Temperature Sensor

A temperature sensor is an electronic device that measures the temperature of its environment and converts the input data into electronic data to record, monitor, 0r signal temperature changes.

The ds18b20 temperature sensor is suitable for projects such as weather stations and switching systems. these sensors are easy to set up on the Raspberry Pi. They are equal to the transistor and use only one wire in the data signal.

Figure 6: Temperature Sensor

v. Humidity Sensor

The dht11 is a low-cost temperature and **humidity sensor**. Dht11 is not the fastest **sensor** around, but the cheap price of this sensor makes it useful for experimenting or projects where you don't require new readings multiple times a second. The device only needs three connections to Pi + 3.3v, ground and single pin GPI0.

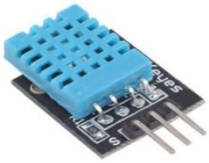

Figure 7: Humidity Sensor

vi. Pi Camera Module

The Raspberry Pi supports the Pi camera module which is portable light weight camera . the communication between the Raspberry Pi and Pi camera is done by using the MIPI camera serial interface protocol. It is generally used in machine learning, image processing or in surveillance projects.

vii. Wifi Module

The landscape of wireless sensor networks is changed by low power, low-cost Wi-Fi modules. Autonomous, Wi-Fi sensors connect to a standard, widely available wireless network infrastructure. They send sensor data in addition to standard TCP / IP which transports their data anywhere in the world from any computer or smart phone. These programs have the advantage of covering long distances but are closed programs.

Likewise Zigbee radio-based sensor networks are also a closed system. Both the wireless sensor networks require additional gateway hardware to access sensor data online or from LAN users. Gates introduce one point of failure and additional costs.

viii. LCD display

This display is a cool way to display specific details from the Raspberry Pi without requiring expensive or complicated display settings.

A 16 × 2 display unlike a touch screen or a standard LCD screen is best used to display short messages or details.

4. SOFTWARE USED

i. **Raspbian 0S**: Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. An operating system makes our Raspberry Pi run which is the set of basic programs and utilities. Raspbian OS provides more than a pure operating system, it has over 35000 packages and pre-compiled

software bundled in a nice format which is easy to install on Raspberry Pi.
later, all these Raspbian packages were optimized for best performance. However,
Raspbian OS is still under active development for improving the performance and stability of more and more Debian packages..

ii. **Apache HTTP Server**: Apache is an open-source and free web server software that owns about 46%of websites worldwide. Apache HTTP Server is the official name which is developed by the Apache Software Foundation and also maintained by the Apache SF. it allows the owners of website to use content on the web. It can be installed in any operating system like Linux, Unix, Windows, FreeBSD, Mac 0S etc.

iii. **TCP /IP** : The full form of TCP/IP is "Transmission Control Protocol / Internet Protocol". It is developed by ARPANET (Advanced Research Project Agency Network). It is a set of protocols that define how two or more computers can communicate with each other. It is Standard Internet communication protocols that allow digital computers to communicate over long distances. The Internet is a packet-switched network, in which information is broken into small packets, sent individually over several different routes at the same time, and then retrieved at the receiving end. TCP is the component that collects the data packets and reassigns them, while the IP is responsible for ensuring that the packets are sent to the correct destination. There are four layer of TCP/IP model (Application Layer, Transport Layer, Internet Layer, Network Interface).
Raspberry Pi uses 'dhcpcd' to configure TCP / IP across all its network interfaces. 'Dhcpcd' daemon was written by Roy Marianes and is intended to be an all-in-one ZeroConf client for systems such as UNIX.

III. APPLICATION

Industry and office:- We can use sensors in wide area over the machines and instruments. Control and monitor elements by using concept of Artificial Intelligence and IoT**.**
Hospital and Labs:- We can plot sensors on patient's body and Doctor can check current status on his android phone and also take necessary actions and decisions towards it.
Home:- We can implement sensors to household appliances and monitor and control with the help of authorized person.

IV. FUTURE SCOPE

In future, we can use different parameters or device by taking the reference of this project and make the industry fully automated. We can use weight sensor, PH sensor, color sensor, length and domination sensor. By using these sensors we can increase the productivity and accuracy. Industrial automation will be more and more acceptance from industries because of its high benefits such as, increased quality, productivity, accuracy and safety at low cost. The overall this thing can be done by Internet Of Thing (IOT).

V. CONCLUSION

We conclude that by implementing this system we can access the live data and also control the device interfaced with our system. This is one of the innovative project based on smart phone to control our home or office smartly. Smart phone is nowadays an unavoidable device. So The project which are based on smart phone will decrease the additional hardware cost and also It is easy to handle. This project will enhance our industrial security with simple cost.

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