TV Reliability Testing, Monitoring and controlling using IoT

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Abstract
Present world is world of internet. Considering the concept of existing IoT system, in this paper we will try to explain the Industrial IoT system. IoT is a combination of communication system and embedded system which connects hardware devices to the network or internet. The recent trend in the industries, also known as the Industrial Internet of Things (IoT), is the Industrial Internet. Industrial IoT empowers industrial engineering to create smart machines with detection, analyse, control and monitor with the help of combination of communication system and embedded system. The main aim of this paper is to summarize importance of Industrial IoT which will control as well as monitor industrial processes. Industrial IoT and is the future of industries.

1. Introduction
The 'Internet of Things' comprised of the network of devices such as home appliances, vehicles and other items embedded with electronics, software, sensors, actuators and connectivity which enables these things to connect and exchange data. The term 'Thing' in 'Internet of Things' is having wide meaning. For example, a thing within the IoT can be a person with a implanted heart monitor, a pet with biochip transponder, a vehicle that has built-in sensors to alert the user if tire pressure is low or any other natural or artificial object that an IP address can be assigned to, thus gaining the ability to transfer data over a network.

Because of this, it creates very chances to integrate the physical world to the computer or similar systems directly, which is beneficial in efficiency, economy and easing human efforts.

The purpose of the Industrial IoT is not to replace human or human work, but to enhance and optimize it. One of the greatest advantages of Industrial IoT has seen as reduced human errors and manual labour, thus improves overall efficiency so that both money and time both can be saved. Here again the aim is to increase the automation level at domestic and commercial levels. In future, IIoT is likely to implement more unified device protocols and architectures that will allow electronics machines to communicate seamlessly and thereby enhance interoperability.

The Industrial IoT and Consumer IoT are two different concepts, though there's some similarity between the two. Consumer IoT devices can be from smartwatches to smart home devices (and light bulbs, fans and door locks etc.), and even shoes or clothes. Fundamentally the core idea of the consumer IoT is, however,

the same as that of the IIoT; i.e. to use sensors and automation to make processes more efficient and reliable.

1.2 Motivation of Research Work:

Despite having modern testing facilities, industries need to depend on the continuous human monitoring for the entire process. This becomes very difficult, as the entire testing and reliability process demands real-time monitoring, record keeping as well as quick rectification of the problems occurred. For all of these, industrial IoT comes in mind.

1.3 Objectives of Research:

1. Energy saving; as if there is no one to monitor or control at the place and at that time, it will automatically switched off.
2. To control, operate, receive feedback and record the events as and when we required.

1.4 Problem Identification:

From the referred papers I found that industries are still using traditional ways for reliability testing of electrical devices which leads to human error, late recognition of fault, no record of fault occurrence.

As continuous monitoring is required for testing there is a waste of manpower as well as cost. Also even if fault occurs, that electrical device consumes power, so there is a waste of electricity too. Testing person not able to record of fault occurrence time.

In case of security and safety services, user can get the immediate status of remotely connected safety panel but user cannot control or give command to rectify the problem. Thus requires a real time two way communication for such processes.

1.5 Research Gap:

Proposed system will be having real time two way communications with the help of website connected to cloud on one side and on another side system will use ESP8266 Wi-Fi module connected to cloud and electrical devices by means of GPIO pins.

This system fulfills the requirement of real time monitoring with the help of General purpose input pins connected to photo-sensors that detects light intensity of electrical device screen. When screen is OFF for more than 2 minutes in-between switching test, system will report fault immediately to website over internet. Website will record or log fault time. As soon as testing person notices fault, tester will switch OFF that particular electrical device. Other devices will be in continuous testing phase.

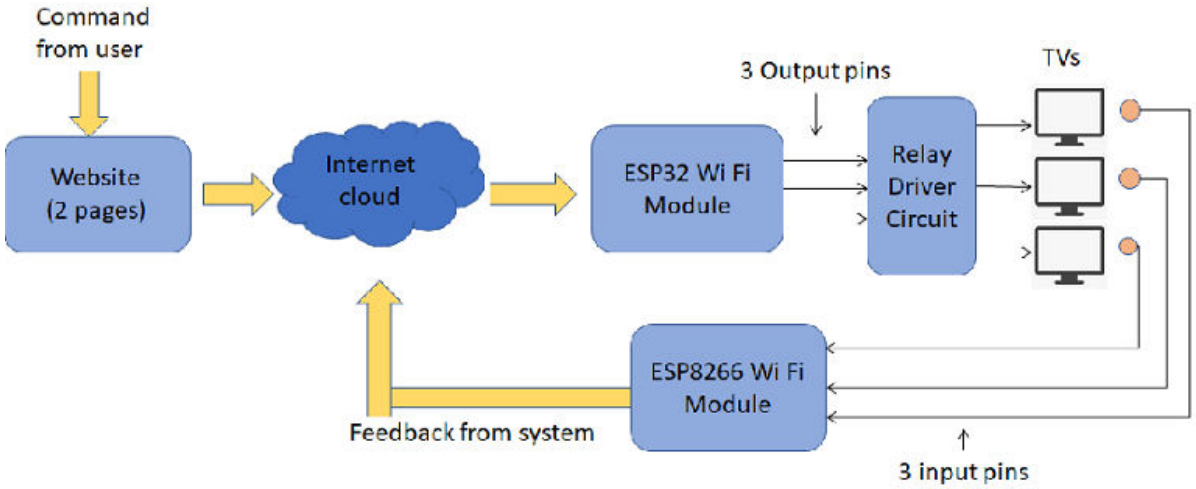
1.6 Existing System

In existing system, all work related to reliability testing and industrial processes is done manually or in some other industries IoT network is implemented to just monitor several common parameters used in industries such as voltage, power, liquid level and DC motor speed control etc. In existing system there is only one-way communication so as to get status of remote located devices. User cannot give commands over network to control the device. Only testing person can quickly communicate to person nearby to that remote device. In this paper, Industrial reliability testing of TVs can be controlled and monitored using IoT

for different applications. In this proposed system ESP8266 and ESP32 Wi-Fi modules are used to get command from user over internet and drive the output circuit. And further with the help of sensors get the status of device and send back it to ESP32 and then to user over internet. So, the testing person can make decision and again can give command to WiFi module to drive output devices placed remotely. ESP8266 and ESP32 both are most unified Wi-Fi module in the industry; it consists of inbuild microcontroller and antenna with less expense.

2. Project Description:

2.1 Hardware Design:



This Proposed system consists of user side i.e. internet connected website operated by tester in industry. Two webpages are configured in one websites, one is for giving command and another is for receiving feedback. For demonstration three different industrial applications i.e. TVs are taken under considerations. Commands such as Device ON and OFF, and ON/OFF cycle count can be configured in webpage. Consider three TVs under reliability testing, which needs to make ON and OFF. User can enter count let's say 500 count in webpage for all three devices and then make devices ON. Count that has been entered will get communicated to ESP32 Wi-Fi Module over internet and its output pins of WiFi Module can be made High and Low accordingly with prefixed delays.

The ESP8266 and ESP32 both Wi-Fi Modules are self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 and ESP32 are capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 and ESP32 modules comes pre-programmed with an AT command set firmware, meaning, user can simply connect to Arduino device and get WiFi-ability. This modules has a powerful on-board processing and storage capability that allows it to integrate with the other sensors and other application specific devices through its General Purpose Input Output pins with minimal development up-front and minimal loading during runtime.

On another end where TVs are located, photo sensors attached to TV's screen will detect screen light. If screen gets OFF in-between ON/OFF cycle and remains OFF for more than 1 minute, it will get detected by ESP8266 input pins. Then ESP8266 will send "Device OFF" message over internet and further to webpage. Device OFF time will get logged in webpage noting actually operating time of device. Testing person will get actual "Device operating OK" time.

To drive three electrical devices i.e. TVs (operating on 230 V) Relay driver circuit is used, which takes input from ESP32 Output pins and switches between ON and OFF.

2.2 Software Design

2.1.1 Website Development

1. As web browsers became increasingly more common and are easy to operate, we will use web browser and thus website to get connected to cloud. For this proposed system we will need cloud connected personal computer so that our website can establish communication over internet. Widely used open source general purpose **PHP (Hypertext Preprocessor)** scripting language will be used to make 1 website that contains 2 webpages, one for giving command and another for monitoring feedback. These 2 webpages will work simultaneously.

2.1.2 ESP8266 Wi-Fi Module Programming

The ESP8266 and ESP32 are System on a Chip (SoC), manufactured by the Chinese company Espressif. ESP8266 module consists of a 32-bit micro controller Tensilica L106 unit (MCU) and a Wi-Fi transceiver. ESP32 module consists of Tensilica Xtensa LX6 microprocessor. ESP8266 module has 17 GPIO pins* (General Purpose Input/output pins), and also an analog input whereas ESP32 has 34 programmable GPIOs. This means that we can program both modules like any normal Arduino or other microcontroller also we get Wi-Fi communication, so we can use it to connect to Wi-Fi network, connect to the Internet, host a web server with real web pages. There are different ways to program the ESP8266 and ESP32, but we'll be using the Arduino IDE to program both modules.

3. Advantages of system

- Increased efficiency
- Cost savings and Time savings
- Energy savings
- Easy to control whenever necessary.
- Improved and intelligent connectivity between devices or machines
- Enhanced industrial safety

4. Application of Project

- Reliability testing in any industry
- Safety and Security systems e.g. gas leak detection, fire detection system
- Manhole monitoring during construction
- Logistics and Inventory control
- Safety of workers in industries
- Remote power generation monitoring and control
- Transport radio network performance monitoring

5. Conclusion:

The concept used in this project makes use of Website on personal computer, internet cloud, ESP32 and ESP8266 Wi-Fi Module to give command to remote located devices for operation and to take feedback from sensors to know the status of remote devices. According to feedback testing person can take decision and note the actual operating time and fault occurrence time.

By providing extremely detailed data in real time, the IIoT can help companies understand their business processes better and, by analysing the data coming from sensors, can make their testing processes or any other industrial processes more efficient and even open up new revenue streams. The IIoT can also give them an insight into the broader supply chain, which will allow industrial businesses to coordinate and create further efficiencies.

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