A Survey on Lab Automation System using IoT

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Abstract— The Internet of Things connects everyday objects intelligently to the internet to enable communication between things and people. The devices can be any physical object like smart-phones, sensors and actuators. For the objects to collect and exchange data electronics, software, sensors and network connectivity is embedded into them. IoT has made a huge impact in the way people live, work and communicate. Main objective of IoT is to manage and control physical objects around us in a more intelligent and meaningful manner and also improve quality of life by providing cost effective living including safety, security and entertainment. Lab Automation System (LAS) using Raspberry pi that employs wireless communication, which provide the user with remote control of lights, fans, and appliances within their lab. The system will automatically change on the basis of sensors' data. This system is designed with low cost and expanded in lab to control variety of devices. This system will reduce human effort for maintaining lab and also save energy.

Keywords: IoT, LAS, Energy, Sensor, Smart-Phones

I. INTRODUCTION

Lab automation system is a means that allow users to control electric appliances. Labs will become more and more self-controlled and automated due to the comfort it provides, especially when employed in a private lab. Many existing, well established lab automation systems are based on wired communication. In contrast, Wireless systems can be of great help for automation systems. With the wireless technologies such as Wi-Fi, cloud networks in the recent past, wireless systems are used every day and everywhere. Labs will become more and more self-controlled and automated due to the comfort it provides, especially when employed in a private lab. Lab automation system is a means that allow users to control electric appliances. Many existing, well established lab automation systems are based on wired communication [1]. In contrast, Wireless systems can be of great help for automation systems. With the wireless technologies such as Wi-Fi, cloud networks in the recent past, wireless systems are used every day and everywhere.

Lab automation system using IoT that is capable of controlling and automating most of the appliances through an easy manageable web interface. The proposed system has a great flexibility by using Wi-Fi technology to interconnect its distributed sensors to lab automation server. In this paper first part of paper we are discussing about background and existing system. In the second part we are discussing about proposed system and its analysis.

II. BACKGROUND AND EXISTING SYSTEMS

The Internet of things defines, sensors and actuators embedded in physical objects are linked through wired and wireless network. The term IoT was invented in 1999, initially to promote radio frequency identification technology. The IoT is about to transform the next decade. Literally, everything will be connected to everything. As we know that today's world is progressing very fast, things are becoming easy then before. People are considering the automatic devices instead of manual devices.

They just want an easier approach to some device. The field of automation is growing very fast. Internet is the basic part of the world's communication. For the last few decades the use of internet has enormously increased. IoT is a field in which you can share all your required information from your specified file even when you are busy. IoT wants to connect all potential objects to interact each other on the internet to provide secure, comfort life for human[1,2].

1) Design and Implementation of IoT Based Smart Laboratory:-Internet of things (IoT) provides a platform that allows devices to be connected, sensed and controlled remotely across a network infrastructure. Dashboard and Mobile Application has been developed for interfacing IoT smart hardware kit. From the results of implementation, it is observed that the appliances in our lab are remotely monitored and controlled, thereby reducing their energy consumption considerably. The proposed work controls and monitors the devices of the IoT lab using the dashboard developed in Node-RED or android studio Mobile Application. Devices in laboratory are connected to IoT smart hardware kit [1].

2) Implementation of IoT based smart laboratory:-IoT is a promising technology that has wasted no time spreading across the world and connecting the huge number of individuals with the devices around them. The proposed work mainly intents to provide an easy accessibility of the electrical appliances through an android application. Along with the status and energy consumption of individual devices, temperature and humidity status of the laboratory can also be monitored using sensors [2].

3) IoT based automation system for older homes: A use case for lighting system:-The integration of IoT platforms in modern building has started to offer diverse services for residents comfort and wellbeing. This paper presents the potential gained benefits of such IoT implementation for older homes by proposing an IoT – enabled control mechanism. The savings are in the form of reducing power consumed for lighting while ensuring Visual comfort for the residents [3].

4) 4.IoT based Lab Automation System:-In this paper they presented the a Lab Automation System (LAS) using Node mcu esp8266 that employs the integration of cloud networking, wireless communication, which provide the user with remote control of lights, fans, and appliances within their lab and storing the data in the cloud. The system will automatically change on the basis of sensors' data. This system is designed with low

cost and expanded in lab to control variety of devices [4, 8].

5) Home automation using IoT:-Home automation has become more and more popular in recent years. It aims at helping people manage the home appliances freely and build an autonomous environment in home. The arduino board is specially designed circuit board for programming and prototyping with microcontroller. The aim of this is full security and controlling the home appliances using wireless communication [5, 7].

6) Raspberry Pi Home Automation with Wireless Sensors using smart phone: - The devices produced enable the user to control the appliances using pre-existing devices such as their Smartphone or home computer. The interfaces are intuitive and easy to use and provide the user with a more accessible interface then those found in the home. The devices are also very easy to integrate into existing applications and require only a small amount of expertise to install. Their research shows the many types of applications for implementing home automation and the applications are not limited to those discussed in this paper. The technology used could be implemented in a wide variety of applications that require the use of sensors and appliances. This project successfully designed a system that communicates with a mobile device such as a Smartphone or laptop via Raspberry Pi to control a door sensors and a light switches and a camera to stream live video, but has many possible applications that could benefit from this work. [9].

7) Smart lab concept for different training modes as an extension of the remote lab:- This paper identifies and discusses current trends, challenges in information and Internet technologies, offers an review of state-of-the-art in development of smartphones and their usage for educational purposes, modern technologies in the development of remote and smart laboratories, benefits of the smart labs usage. The smart lab model is offered as an extension of remote lab that allows to reorganize educational process according to learning mode (face-to-face, hands-on learning, Life Long Learning, E-Learning, M-Learning, Blended learning, etc.) [10].

III. PROPOSED SYSTEM

Automation is the technology by which a process is performed with minimum human assistance. Automatic control is the use of various control systems for operating equipment such as machinery processes. In industry there are very huge labs having hundreds of computers and some other electronic components such as fans, lights, etc. to control them requires much human efforts, sometimes unnecessarily some devices get on because of that energy get lost.

IoT is creating an environment of convergence in the society. This technology environment brings a paradigm shift in our professional and personal life. Today, IoT is being implemented everywhere which is human concern like smart city, smart environment, home automation and health care. Now-a-days, automation plays a crucial role in all work places and living homes. Presently automation

techniques are implemented either using micro-controller or computer. The Raspberry Pi is a single board computer and it can be used to overcome these problems. Simply, the Raspberry Pi System functions like a computer with small setup.

The system is designed in order to achieve following Advantages of Lab Automation System:

1) Reduced installation costs: First and foremost, installation costs are significantly reduced since no cabling is necessary. Wired solutions require cabling, where material as well as the professional laying of cables (e.g. into walls) is expensive.

2) System scalability and easy extension: Deploying a wireless network is especially advantageous when, due to new or changed requirements, extension of the network is necessary. In contrast to wired installations, in which cabling extension is tedious. This makes wireless installations a seminal investment.

3) Integration of mobile devices: With wireless networks, associating mobile devices such as PDAs and Smartphones with the automation system becomes possible everywhere and at any time, as a device's exact physical location is no longer crucial for a connection (as long as the device is in reach of the network). For all these reasons, wireless technology is not only an attractive choice in renovation and refurbishment, but also for new installations.

IV. ANALYSIS OF SYSTEM

A. Problem Statement:

To implement Lab Automation System Using IoT. It is capable to control and automate most of the appliances through an easy manageable web interface.

B. Objectives:

− To control and make automation of the appliances using computer technology.
− To facilitate the wireless connectivity with system.
− To reduce power use and conservation more effective.
− To avoid human interference up to maximum extent.
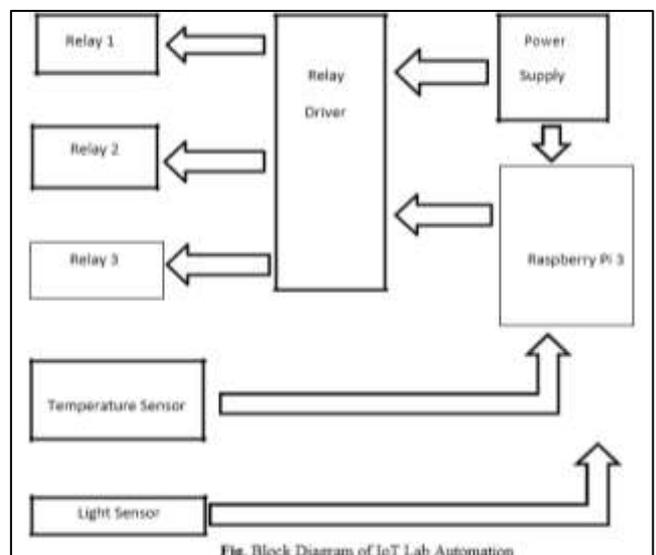
C. Block Diagram:

Fig. Block Diagram of IoT Lab Automation

In this system we are achieving the Smart lab and Lab automation both are done. In that, we can handle devices using mobile phone and also using global watch devices are on/off at particular time i.e. if lab opening time is 10am then computers are automatically on and at closing time they are automatically off. We are also using temperature and light sensors if temperature is low then fans remains off and darkness is there then lights are automatically on.

V. CONCLUSION

The lab automation using Internet of Things has been experimentally proven to work satisfactorily by connecting simple appliances to it and the appliances were successfully controlled remotely through internet. The designed system not only monitors the sensor data, like temperature, light, but also actuates a process according to the requirement, for example switching on the light when it gets dark. This will help the user to analyze the condition of various parameters in the lab anytime anywhere.

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