# IoT Based Secured Classroom Automation System Using NLP

Vaishnavi Kulkarni	Amrutvahini college of Engineering, Sangamner
Komal Mali	Amrutvahini college of Engineering, Sangamner
Kalyani Wakchoure	Amrutvahini college of Engineering, Sangamner
Priyanka Wani	Amrutvahini college of Engineering, Sangamner

## Abstract

The primary aim to implement a low cost and secure Android based classroom Automation System using Natural Language Processing (NLP), Wireless Fidelity (Wi-Fi) and wireless sensor. The system is voice based as well as sensor based we use voice to ON/OFF appliances of classroom and sensor for detecting the condition of appliances and send the alert message to the user. The system will be secure as it is only accessible to authorized user. After authentication user sends a voice command to the mobile device, which interprets the message and sends that proper command to the specific appliances. The mobile device acts as a central console as it determines what operation must be completed by which appliance to full the user's request. The Raspberry pi is interfaced with the appliances connected to the relay board and programmed in a manner that they respond to mobile inputs. The system is useful to reduce extra power consumption and for emergency conditions.

Keywords: IoT, NLP, Wi-Fi module, ADS, HAS, Wireless Sensor Network, Raspberry Pi.

# 1. Introduction:

Now a day, Automation plays important role in all work places and living homes. Classroom Automation is done with the help of Internet of Things (IoT). In order to increase work efficiency and comfort of a human being, automating environment is imperative. There has been a significant development in the area of automation using different protocols for common purpose. It is common to see most of the people have involved their selves into mobile phones throughout the day; hence with the help of mobile phone, most of the daily household task can be accomplished by making its use.

People want to do everything in the most simple ways. Controlling the lights, fans and appliances by just using voice command is the most simple way of automation. Speech recognization is an advancing field with lots of research happening in this field. Speech recognization can be used to unlock door, the lights and fans can also be made automated by sign motion detectors and temperature sensors. Natural Language Processing (NLP) is a prominent field of Artificial Intelligence. Natural Language Processing (NLP) is the processing [1] of natural language in order to drive meaning from it. It helps the computer to understand text like humans do.

In the proposed system, some basic techniques of Natural Language Processing like tokenization, removal of stop-words and parsing are used to understand the voice command. The proposed system uses Wi-Fi based Local

Area Network protocol and uses wireless sensor [2]. The problem of interference can be solved if a specific Local Area Network is given to each application. The proposed systems controls the fans, lights and other devices using android app over LAN. This automation system uses Raspberry pi which create a Local Area Network which programmed by using python and all the appliances can be controlled by the voice commands on a android app. The android app is made using android language. It also reduces the need for any personal contact with any of them as it delivers a wholesome experience of wireless, voice controlled system.

## 2. Literature Survey:

Different technologies such as Internet of Things, Artificial Intelligence and Natural Language Processing are used to provide cost effective solution. System also used GSM (Global System for Mobile), NFC (Near-Field Communication) etc. The paper represents main aim of project for providing a fully automated voice based solution that our users can rely on, to perform more than just switching ON/OFF the appliances. The user sends a voice command through speech to the mobile device, which interprets the message and sends the appropriate command to the specific appliance. In this mobile device is act as a central console. It determines what operation must be completed by which appliance to fulfill the user's request. This project uses Arduino Boards that are interfaced with the appliances and programmed in a manner that they respond to mobile inputs [1].

This paper presents the design and implementation of an Ethernet based intelligent automated system for save electrical energy using a INTEL GALILEO 2ND generation development board. This board can be used in large organizations like a University or an office. This system uses the available infrastructure in a classroom that includes surveillance camera and Ethernet connectivity so as to reduce the cost. It is monitored and controlled from a web server located at the control room using the Internet. It does not require human involvement [2].

This paper presents a proposed system for Smart Home Automation technique using Raspberry Pi with the help of technique IoT and it is done by integrating cameras and motion sensors into a web application. Home appliances are connected through a monitor based internet. Raspberry Pi operates and controls motion sensors and video cameras. This system uses Computer Vision Technique (CVT). The motion is detected, the cameras will start recording and Raspberry Pi device alerts the owner through an SMS and alarm call [3].

This paper presents the design and implementation of a low cost also flexible and secure cell phone based home automation system. The design is based on a Arduino BT board and the home appliances are connected via relay board. Wireless communication is takes place between cell phone and the Arduino BT .This system is designed to be low cost and it is scalable. Authentication is being used to only allow authorized users from accessing the appliances at home[4].

In this paper a home automation system that uses IR sensor, Bluetooth and GSM to control appliances using android application. The motivation behind the development of this system is to let people know about these technologies, and make the system as simple as possible for an ordinary person to understand. The result of this research is the implementation of home automation system which involves control and automation of home appliances through mobile application from remote locations [5].

This Paper defines methodology that provides low cost home automation system using WiFi.WiFi is used for inter-networking of smart devices. A wireless sensor network is design for controlling and monitoring system environmental, safety and electrical parameter of smart connected home devices. User provides Android Application based GUI for easy controlling over Light, Fan Speed, Humidity, Water Tank level. Additional facility provide in that fire alarm security, motion detection and gas leakage detection using various sensors[6].

In this paper, the home automation is improved by considering a Wireless sensor node. A smart home integrates various electrical appliances in the home and automates them with no or minimum user intervention. The smart home keeps track of different environment variables present and guides the appliances to work according to the needs of the user. Not only automating the home appliances of daily usage but also notifying the user about the price of his electric bill in regular interval and automatically booking the gas cylinder, if the level of the gas reaches lower than the threshold [7].

This paper works on controlling home appliances using Smart phone with the help of Wi-Fi and ZigBee as communication protocol and raspberry pi as server system. The user here will move directly with the system through

a web-based interface over the web, whereas home appliances like lights, fan and door lock are remotely controlled through easy website. The system is totally based on the web application to control the appliances [8].

In this paper IoT enhancing a network to collect and analyse the data from various sensors and actuators which send data to mobile phone. Safety issues as intrusion, fire, gas leakage, theft overcome using different technology. IoT provides connectivity between devices, system, services, network and control system .A web page used for user entry. For authentication username and password is provide. After successfully login user control the door by open/close button and watch live streaming video of desired location, for that webcam is connected to one of USB port present on Raspberry Pi [9].

In this paper, proposed a system ACS and DDEM algorithm to design an intelligent power management system to ongoing power supply of home sensor network. Here developed adaptive classification scheme (ACS) to classify power source type of home automation sensor in smart home, dynamic distribution energy management algorithm to adjust energy distribution for establishing intelligent home automation management system [10].



In this system architecture system provide the android application for user interaction purpose. For accessing the application system provide user name and password. The user simply gives voice command through mobile device. This voice command is converted into text by using speech recognition module. This text is passed to the Natural Language Processing. In the NLP we used Stop Word Removal Algorithm, it identify the operation perform on which appliances and appliances are control. For mobile device and appliances connectivity we used Raspberry Pi as an interface.

Natural Language Processing converts speech into text. The system is secured for access from any user or intruder. The users are expected to acquire pairing password for the Raspberry pi and the cell phone to access the home appliances. This adds a protection from unauthorized users. This system can be used as platform for any appliances that requires ON/OFF switching applications without any internet connection. System will be helpful for

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normal user also and physically disabled user also as we provide simply voice command to ON/OFF the appliances. Sometimes if we forgot to off the appliances inside the classroom, in this situation system will be useful to the user.

System uses water level sensor for measure level of water, smoke sensor for smoke detection and temperature sensor for measure the temperature. If level goes beyond its threshold limit then alert message is send to the user with the mobile application. The appliances will be connected to the Raspberry Pi board with help of relay driver modules which will facilitate the ON/OFF actions based on the load given. The system will be connected to the internet through Wi-Fi and a cloud interface will be created to control the appliances from a remote location.

## 3.2 Natural Language Processing (NLP):

The natural language processing (NLP) is a field of computer science that helps us to infer what the user is trying to say through his voice commands. The NLP in our project gives the user the freedom to interact with the home appliances with his/her own voice and normal language rather than complicated computer commands. Natural Language Processing (NLP) is a field of computer science, artificial intelligence, and computational linguistics that helps computer system understand and respond to commands given in natural (human) language. NLP is can be categorized in the field of human-computer interaction. Most of the challenges in NLP are listed as follows: human language understanding, enabling computers to derive meaning from the voice commands given to it through human(natural) language, and others involve natural language interaction between computers and humans. Most of the latest NLP algorithms are built upon machine learning, especially statistical machine learning.

### 3.3 Stop Word Removal (Algorithm):

The process of converting data to something a computer can understand is referred to as pre-processing. One of the major forms of pre-processing is to filter out useless data. In natural language processing, useless words (data), are referred to as stop words.[5] Though "stop words" usually refers to the most common words in a language, there is no single universal list of stop words used by all natural language processing tools, and indeed not all tools even use such a list.

#### 4. Advantages:

- 1. Ability to control appliances using voice command.
- 2. System provide Security to users.
- 3. To reduce extra power consumption (i.e Save elecricity).
- 4. System is useful to reduce human efforts

#### 5. Limitations:

- 1. System is not supported for crowdy area because voice command is not detected in the crowd.
- 2. If any faults occur in the sensor then we cannot able to detect level of water and smoke detection.

## 6. Application:

**1.Lighting control system :** A smart network that incorporates communication between various lighting system inputs and outputs, using one or more central computing devices.

**2.Home robots and security :** a household security system integrated with a home automation system can provide additional services such as remote surveillance of security cameras over the Internet, or access control and central locking of all perimeter doors and windows.

**3.Heating, ventilation and air conditioning (HVAC) :** it is possible to have remote control of all home energy monitors over the internet incorporating a simple and friendly user interface.

**4.Household and industrial applications :** System is useful in home,offices,labs, classrooms,industries to ON/OFF devices in emergency conditions.

**5.Occupancy-aware control system :** It is possible to sense the occupancy of the home using smart meters and environmental sensors like CO2 sensors, which can be integrated into the building automation system to trigger automatic responses for energy efficiency and building comfort applications.

**6.Door Lock System :** System is helpful for automatic door lock system by using sensors and voice commands and sometimes by using motion.

**7.Classrooms :** Sometimes we forgot to off the appliances inside the classrooms, at that situation system provide good solution in emergency cases.

### **Conclusion:**

In this project, various concepts of Ubuntu,Python,IoT,Android and Raspberry Pi has been incorporated in order successfully implement the system. The system may be employed in many places like banks, hospitals, labs, offices etc that dramatically avoid the hazard of unauthorized entry. The system is introduced design and implementation of a low cost, flexible and wireless solution to the automation. The system is secured for access from any user or intruder. The users are expected to acquire pairing password for the Raspberry pi and the cell phone to access the home appliances. This adds a protection from unauthorized users. This system can be used as platform for any appliances that requires ON/OFF switching applications without any internet connection.

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