

NLP Enabled Automation for Classroom Operations

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Abstract— To implement a low cost and secure Android based Classroom Automation System using Natural Language Processing (NLP). The system is voice based as we use voice to ON/OFF appliances of classroom. The system can be made secure by sharing the android application only accessible to authorized user. When the 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 will be used as a interface for the appliances connected to the relay board and programmed in a manner that they respond to mobile inputs.

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I. INTRODUCTION

1.1 Brief overview of the project

Now a days, Automation plays an 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 the work efficiency and comfort of a human being, automating environment is an 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 simplest ways. Controlling the lights, fans and appliances by just using voice command is the simplest way of automation.

Speech recognition is an advancing field with lots of research happening in this field. Speech recognition 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.

1.1.1 Scope

The scope of this field is limitless and has emerged as a winner in various areas ranging from Medicine, Engineering, Computer Science, Space and Technology, Automobiles and so on. The center of purpose is utilizing IoT based technology in accomplishing automation for classrooms. In this project, we propose an approach to control and manage electrical equipment such as fans and

lights based on human presence. Our focus is towards building a solution which could help in reducing overutilization of energy resources.

1.1.2 Purpose

ClassroomAutomation 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.

1.1.3 Objective of the study

The main objective of the project are:

The objective is to automatically operate fans, lights and other appliances using a android application. The user should input using voice commands for required action to be performing required action.

2. Literature Review:

2.1 Related Study:

[1] IoT Based Secured Classroom Automation System Using NLP- 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. It 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.

[2] Smart Classroom using Raspberry Pi- The acute perseverance of implementing this project is to convey out the new ways of collaboration among the individual and the technology. The development will reach most of the anticipation as it is controlled via voice where we don't even have to touch, so which is easy and saves energy. The appliances and other systems generally used in households and organization will be able to manage. Households and organizations are consuming much power today than industries and businesses.

[3] IoT based Classroom Automation using Arduino- This paper proposes the method which will help the teacher present in the classroom to allow them to control the classroom using android application in the Android smartphone. The overall system design is mainly based on Arduino Mega

2560. The appliances are to be controlled by the Android Application. The android application is developed using Blynk software or Blynk android application. We can supervise the state of sensors connected in the Arduino board and we can control the modules by simply enabling some options in the android application in our smart phone.

3. Existing System:

Previously, a classroom 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 classroom automation system which involves control and automation of class appliances through mobile application from remote location.

4. Proposed System:

The proposed system uses Remote Network protocol and. The problem of interference can be solved if a specific remote network is given to each application. The proposed system controls the fans, lights and other devices using android app over remote network. This automation system uses Raspberry pi which create a remote 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.

5. System Analysis:

System Analysis is the process of analyzing a system with the potential goal of improving or modifying the system. Analysis is breaking down the problem into smaller elements of study and ultimately providing a better solution. During the process of system development, Analysis is an important aspect. This involves gathering and interpreting facts, diagnosing the problem and using the information to recommend improvements to the system ultimately, the goal is to give a computerized solution.

5.1 System Study

Raspbian OS:

Raspbian is an unofficial port of Debian Wheezy armhf with compilation settings as adjusted to produce optimized "hardfloat" code that will run on the Raspberry Pi. This provides significantly faster performance for applications to make heavy use of floating point arithmetic operations. All other applications will also gain some performance through the use of advanced instructions of the ARMv6 CPU in

Raspberry Pi.

Although Raspbian is primarily the efforts of Mike Thompson and Peter Green (plugwash), it has also benefited greatly from the enthusiastic support of Raspberry Pi community members who wish to get the maximum performance from their device.

5.1 Requirement Analysis

Software requirement analysis is the method of analysis that examines the requirement. Requirement analysis is critical to the success or failure of a software project. The requirements should be documented, actionable, measurable and testable.

5.2.1 Functional Requirements

Functional requirements specify which output file should be produced from the given file they describe the relationship between the input and output of the system, for each functional requirement a detailed description of all data inputs and their source and the range of valid inputs are must be specified.

In software engineering, a functional requirement defines a function of a software system or its component. A function is described as a set of inputs, the behaviour, and outputs. In

requirements engineering, it specifies the particular results of a system. A requirements analyst generates use cases after gathering and validating a set of functional requirements.

The Functional Requirements Specification documents the operations and activities that a system must be able to perform.

- Functional Requirements should include:
- Descriptions of data to be entered into the system
- Descriptions of operations performed by each screen
- Descriptions of work-flow performed by the system
- Descriptions of system reports or other outputs
- Who can enter the data into the system

The functional requirements for the IoT-based smart classroom automation system are:

- Open the Android application
- Provide voice commands (On/Off) to the system.

5.2.2 Non Functional Requirements

In system engineering and requirements engineering, a non-functional requirement is a requirement that specifies criteria that can be used to judge the operation of a system, rather than specific behaviors. The plan for implementing non-functional requirements is detailing the system architecture.

1. Usability

This section includes all of those requirements that affect usability. It will be very easy to use for the naïve user. The software is simple, user-friendly interface so that the user can save time and confusion.

2. Reliability

The system is more reliable because it uses the APIs developed by Google that work even in a noisy environment. Also at the receiver side, a Python platform is used that makes the code more reliable.

3. Performance

This system exhibits high performance because it is well optimized and is developed by using high-level languages which will give response to the end user in a very less amount of time.

4. Supportability

This system is designed to be cross-platform supportable. The system is supported on a wide range of hardware and any software platform. This system also uses Python and hence it is highly portable.

. Flexibility

If we intend to increase or extend the functionality of the software after it is deployed, it should be planned from the beginning. New modules can be easily integrated to our system without disturbing the existing modules or modifying the local schema of existing applications.

5.2 Software Requirement

The minimal software specifications of the proposed system are:

- Operating System: Raspbian OS.
- Technology: NLP
- IDE: Thonny

5.3 Hardware Requirement

The minimal hardware specifications of the proposed system are:

- Raspberry Pi 3B+
- Channel Relay
- Power supply

6. System Architecture:

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

In this project, various concepts of Windows, 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, and 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. The output waveform of comparator shown in Fig 8. Power waveform of the single tail comparator is shown in Fig 9.

REFERENCES

- [1]. P. Nirmala, T. Manimegalai, J. R. Arunkumar, S. Vimala, G. Vinoth Rajkumar, Raja Raju, "A Mechanism for Detecting the Intruder in the Network through a Stacking Dilated CNN Model", *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 1955009, 13 pages, 2022. <https://doi.org/10.1155/2022/1955009>.
- [2]. D. Sathyanarayanan, T. S. Reddy, A. Sathish, P. Geetha, J. R. Arunkumar and S. P. K. Deepak, "American Sign Language Recognition System for Numerical and Alphabets," 2023 International Conference on Research Methodologies in Knowledge Management, Artificial Intelligence and Telecommunication Engineering (RMKMATE), Chennai, India, 2023, pp. 1-6, doi: 10.1109/RMKMATE59243.2023.10369455.
- [3]. J. R. Arunkumar, T. S. Reddy, "Developing Ethiopian Yirgacheffe Coffee Grading Model using a Deep Learning Classifier" *International Journal of Innovative Technology and Exploring Engineering (IJITEE)* ISSN: 2278-3075, Volume-9 Issue-4, February 2020. DOI: 10.35940/ijitee.D1823.029420.
- [4]. Ashwini, S., Arunkumar, J.R., Prabu, R.T. et al. Diagnosis and multi-classification of lung diseases in CXR images using optimized deep convolutional neural network. *Soft Comput* (2023). <https://doi.org/10.1007/s00500-023-09480-3>
- [5]. J.R.Arunkumar, Dr.E.Muthukumar," A Novel Method to Improve AODV Protocol for WSN" in *Journal of Engineering Sciences* ISSN NO: 0377-9254 Volume 3, Issue 1, Jul 2012.
- [6]. R. K. A. Shameem, P. Biswas, B. T. Geetha, J. R. Arunkumar and P. K. Lakshini, "Supply Chain Management Using Blockchain: Opportunities, Challenges, and Future Directions," 2023 Second International Conference on Informatics (ICI), Noida, India, 2023, pp. 1-6, doi: 10.1109/ICI60088.2023.10421633.
- [7]. Arunkumar, J. R. "Study Analysis of Cloud Security Challenges and Issues in Cloud Computing Technologies." *Journal of Science, Computing and Engineering Research* 6.8 (2023): 06-10.
- [8]. J. R. Arunkumar, R. Raman, S. Sivakumar and R. Pavithra, "Wearable Devices for Patient Monitoring System using IoT," 2023 8th International Conference on Communication and Electronics Systems (ICCES), Coimbatore, India, 2023, pp. 381-385, doi: 10.1109/ICCES57224.2023.10192741.
- [9]. S. Sugumaran, C. Geetha, S. S, P. C. Bharath Kumar, T. D. Subha and J. R. Arunkumar, "Energy Efficient Routing Algorithm with Mobile Sink Assistance in Wireless Sensor Networks," 2023 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI), Chennai, India, 2023, pp. 1-7, doi: 10.1109/ACCAI58221.2023.10201142.
- [10]. R. S. Vignesh, V. Chinnammal, Gururaj.D, A. K. Kumar, K. V. Karthikeyan and J. R. Arunkumar, "Secured Data Access and Control Abilities Management over Cloud Environment using Novel Cryptographic Principles," 2023 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI), Chennai, India, 2023, pp. 1-8, doi: 10.1109/ACCAI58221.2023.10199616.
- [11]. Syamala, M., Anusuya, R., Sonkar, S.K. et al. Big data analytics for dynamic network slicing in 5G and beyond with dynamic user preferences. *Opt Quant Electron* 56, 61 (2024). <https://doi.org/10.1007/s11082-023-05663-2>
- [12]. Krishna Veni, S. R., and R. Anusuya. "Design and Study Analysis Automated Recognition system of Fake Currency Notes." *Journal of Science, Computing and Engineering Research* 6.6 (2023): 16-20.
- [13]. V. RamKumar, S. Shanthi, K. S. Kumar, S. Kanageswari, S. Mahalakshmi and R. Anusuya, "Internet of Things Assisted Remote Health and Safety Monitoring Scheme Using Intelligent Sensors," 2023 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI), Chennai, India, 2023, pp. 1-8, doi: 10.1109/ACCAI58221.2023.10199766.
- [14]. R. S. Vignesh, R. Sankar, A. Balaji, K. S. Kumar, V. Sharmila Bhargavi and R. Anusuya, "IoT Assisted Drunk and Drive People Identification to Avoid Accidents and Ensure Road Safety Measures," 2023 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI), Chennai, India, 2023, pp. 1-7, doi: 10.1109/ACCAI58221.2023.10200809.
- [15]. I. Chandra, G. Sowmiya, G. Charulatha, S. D, S. Gomathi and R. Anusuya, "An efficient Intelligent Systems for Low-Power Consumption Zigbee-Based Wearable Device for Voice Data Transmission," 2023 International Conference on Artificial Intelligence and Knowledge Discovery in Concurrent Engineering (ICECONF), Chennai, India, 2023, pp. 1-7, doi: 10.1109/ICECONF57129.2023.10083856.
- [16]. G. Karthikeyan, D. T. G, R. Anusuya, K. K. G, J. T and R. T. Prabu, "Real-Time Sidewalk Crack Identification and Classification based on Convolutional Neural Network using Thermal Images," 2022 International Conference on Automation, Computing and Renewable Systems (ICACRS), Pudukkottai, India, 2022, pp. 1266-1274, doi: 10.1109/ICACRS55517.2022.10029202.
- [17]. R. Meena, T. Kavitha, A. K. S, D. M. Mathew, R. Anusuya and G. Karthik, "Extracting Behavioral Characteristics of College Students Using Data Mining on Big Data," 2023 International Conference on Artificial Intelligence and Knowledge Discovery in Concurrent Engineering

- (ICECONF), Chennai, India, 2023, pp. 1-7, doi: 10.1109/ICECONF57129.2023.10084276.
- [18]. S. Bharathi, A. Balaji, D. Irene, J. C. Kalaivanan and R. Anusuya, "An Efficient Liver Disease Prediction based on Deep Convolutional Neural Network using Biopsy Images," 2022 3rd International Conference on Smart Electronics and Communication (ICOSEC), Trichy, India, 2022, pp. 1141-1147, doi: 10.1109/ICOSEC54921.2022.9951870.
- [19]. I. Chandra, G. Sowmiya, G. Charulatha, S. D. S. Gomathi and R. Anusuya, "An efficient Intelligent Systems for Low-Power Consumption Zigbee-Based Wearable Device for Voice Data Transmission," 2023 International Conference on Artificial Intelligence and Knowledge Discovery in Concurrent Engineering (ICECONF), Chennai, India, 2023, pp. 1-7, doi: 10.1109/ICECONF57129.2023.10083856. I. Chandra, K. V. Karthikeyan, R. V. S. K. M. Tamilselvi and J. R. Arunkumar, "A Robust and Efficient Computational Offloading and Task Scheduling Model in Mobile Cloud Computing," 2023 International Conference on Artificial Intelligence and Knowledge Discovery in Concurrent Engineering (ICECONF), Chennai, India, 2023, pp. 1-8, doi: 10.1109/ICECONF57129.2023.10084293.
- [20]. Revathi, S., et al. "Developing an Infant Monitoring System using IoT (INMOS)," International Scientific Journal of Contemporary Research in Engineering Science and Management 6.1 (2021): 111-115.
- [21]. R. K. A. Shameem, P. Biswas, B. T. Geetha, J. R. Arunkumar and P. K. Lakineni, "Supply Chain Management Using Blockchain: Opportunities, Challenges, and Future Directions," 2023 Second International Conference on Informatics (ICI), Noida, India, 2023, pp. 1-6, doi: 10.1109/ICI60088.2023.10421633.
- [22]. J. R. Arunkumar, "Comprehensice Analysis of Security Issues in Cloud Computing Technologies", Journal of Science, Computing and Engineering Research, 6(5), 06-10, June 2023.
- [23]. S. Sugumaran, C. Geetha, S. S. P. C. Bharath Kumar, T. D. Subha and J. R. Arunkumar, "Energy Efficient Routing Algorithm with Mobile Sink Assistance in Wireless Sensor Networks," 2023 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI), Chennai, India, 2023, pp. 1-7, doi: 10.1109/ACCAI58221.2023.10201142.
- [24]. I. Chandra, K. V. Karthikeyan, R. V. S. K. M. Tamilselvi and J. R. Arunkumar, "A Robust and Efficient Computational Offloading and Task Scheduling Model in Mobile Cloud Computing," 2023 International Conference on Artificial Intelligence and Knowledge Discovery in Concurrent Engineering (ICECONF), Chennai, India, 2023, pp. 1-8, doi: 10.1109/ICECONF57129.2023.10084293.
- [25]. R. S. Vignesh, A. Kumar S, T. M. Amirthalakshmi, P. Delphy, J. R. Arunkumar and S. Kamatchi, "An Efficient and Intelligent Systems for Internet of Things Based Health Observance System for Covid 19 Patients," 2023 International Conference on Artificial Intelligence and Knowledge Discovery in Concurrent Engineering (ICECONF), Chennai, India, 2023, pp. 1-8, doi: 10.1109/ICECONF57129.2023.10084066.
- [26]. DC Jullie Josephine, J. Sudhakar, T. Helan Vidhya, R. Anusuya, G. Ramkumar, "An Improved Multi class Breast cancer classification and Abnormality Detection based on Modified Deep Learning Neural Network Principles", Deep Learning in Biomedical Signal and Medical Imaging, CRC Press, Taylor and Francis, 2024.
- [27]. R. Anusuya, Pragya Vashishtha, "Real Automatic Number Plate Image Detection With Yolo Algorithms", Journal of Science, Computing and Engineering Research, 7(7), July 2024.
- [28]. K. Shetty, S. Tyagi, A. Jha, D. N. M. K. Rao, J. R. Arunkumar and L. R., "Natural Language Processing in Strategic Planning Analysis," 2024 Second International Conference Computational and Characterization Techniques in Engineering & Sciences (IC3TES), Lucknow, India, 2024, pp. 1-5, doi: 10.1109/IC3TES62412.2024.10877514.
- [29]. S. Sugumaran, C. Geetha, S. S. P. C. Bharath Kumar, T. D. Subha and J. R. Arunkumar, "Energy Efficient Routing Algorithm with Mobile Sink Assistance in Wireless Sensor Networks," 2023 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI), Chennai, India, 2023, pp. 1-7, doi: 10.1109/ACCAI58221.2023.10201142.
- [30]. R. S. Vignesh, A. Kumar S, T. M. Amirthalakshmi, P. Delphy, J. R. Arunkumar and S. Kamatchi, "An Efficient and Intelligent Systems for Internet of Things Based Health Observance System for Covid 19 Patients," 2023 International Conference on Artificial Intelligence and Knowledge Discovery in Concurrent Engineering (ICECONF), Chennai, India, 2023, pp. 1-8, doi: 10.1109/ICECONF57129.2023.10084066.
- [31]. Jullie Josephine DC, Sudhakar J, Helan Vidhya T, Anusuya R, Ramkumar G. 15 An Improved Multi. Deep Learning in Biomedical Signal and Medical Imaging. 2024 Sep 30:237.
- [32]. Arunkumar, J.R., Anusuya, R., Chilukuri, P., Ramkumar Prabhu, M. (2024). Secure Data Transfer and Deletion Using Secure Encryption Algorithm in Cloud Computing. In: Singh, N., Bashir, A.K., Kadry, S., Hu, YC. (eds) Proceedings of the 1st International Conference on Intelligent Healthcare and Computational Neural Modelling . ICIHCNN 2022. Advanced Technologies and Societal Change. Springer, Singapore. https://doi.org/10.1007/978-981-99-2832-3_84
- [33]. G. Manoharan, P. D. Sawant, J. Vanitha, M. Lourens, R. Anusuya and I. Bhati, "Cognitive Computing for HR Decision-Making," 2024 Second International Conference Computational and Characterization Techniques in Engineering & Sciences (IC3TES), Lucknow, India, 2024, pp. 1-5, doi: 10.1109/IC3TES62412.2024.10877480.
- [34]. S. Sivakumar, R. Anusuya, V. Nagaraju, L. P. Narendruni and R. Thamizhamuthu, "QoS Based Efficient Link and Consistent Routing in Wireless Sensor Network," 2023 International Conference on Intelligent and Innovative Technologies in Computing, Electrical and Electronics (IITCEE), Bengaluru, India, 2023, pp. 1241-1246, doi: 10.1109/IITCEE57236.2023.10091080.