A MINOR PROJECT REPORT ON

SMART GLOVES FOR SPEECH DISABLED PERSON

SUBMITTED BY

SANJAI S	**(927622BEE095)**
SHANMITHA R	**(927622BEE104)**

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

M.KUMARASAMY COLLEGE OF ENGINEERING

(An Autonomous Institution Affiliated to Anna University, Chennai)

THALAVAPALAYAM, KARUR-639113

MAY 2025

BONAFIDE CERTIFICATE

Certified that this report titled **"SMART GLOVES FOR SPEECH DISABLED PERSON"** is the bonafide work of **SANJAI (927622BEE095)** and **SHANMITHA R (927622BEE104)** who carried out the work during the academic year (2024-2025) under my supervision. Certified further that to the best of my knowledge the work reported here in does not form part of any other project report.

SIGNATURE	SIGNATURE
Mr.M.RAMESH M.E.,	**Dr.J.UMA M.E., Ph.D.,**
SUPERVISOR	HEAD OF THE DEPARTMENT
Assistant Professor	Professor& Head Department of
Department of Electrical and	Electrical and Electronics Engineering
Electronics Engineering	M Kumarasamy College Of
M.Kumarasamy College Of	Engineering, Karur.
Engineering, Karur.	

Submitted for Minor Project IV (18EEP302L) viva-voce Examination held at M Kumarasamy College of Engineering, Karur-639113 on ………………

DECLARATION

We affirm that the Minor Project report titled "**SMART GLOVES SPEECH DISABLED PERSON"** being submitted in partial fulfillment for the award of **Bachelor of Engineering in Electrical and Electronics Engineering** is the original work carried out by us.

REG.NO	STUDENT NAME	SIGNATURE
927622BEE095	**SANJAI S**	**------------------------**
927622BEE104	**SHANMITHA R**	**------------------------**

VISION AND MISSION OF THE INSTITUTION

VISION

To emerge as a leader among the top institutions in the field of technical education.

MISSION

- ✓ Produce smart technocrats with empirical knowledge who can surmount the global Challenges.
- ✓ Create a diverse, fully-engaged, learner - centric campus environment to provide Quality education to the students.
- ✓ Maintain mutually beneficial partnerships with our alumni, industry and Professional associations.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

To produce smart and dynamic professionals with profound theoretical and practical knowledge comparable with the best in the field.

MISSION

- ✓ Produce hi-tech professionals in the field of Electrical and Electronics Engineering by inculcating core knowledge.
- ✓ Produce highly competent professionals with thrust on research.
- ✓ Provide personalized training to the students for enriching their skills.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Graduates will have flourishing career in the core areas of Electrical Engineering and also allied disciplines.

PEO2: Graduates will pursue higher studies and succeed in academic/research careers

PEO3: Graduates will be a successful entrepreneur in creating jobs related to Electrical and Electronics Engineering /allied disciplines.

PEO4: Graduates will practice ethics and have habit of continuous learning for their success in the chosen career.

PROGRAMME OUTCOMES (POs)

After the successful completion of the B.E. Electrical and Electronics Engineering degree program, the students will be able to:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/Development of solutions: Design solutions for Complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.

PO4: Conduct Investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning in formed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. **PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

The following are the Program Specific Outcomes of Engineering Students:

PSO1: Apply the basic concepts of mathematics and science to analyze and design circuits, controls, Electrical machines and drives to solve complex problems.

PSO2: Apply relevant models, resources and emerging tools and techniques to provide solutions to power and energy related issues & challenges.

PSO3: Design, Develop and implement methods and concepts to facilitate solutions for electrical and electronics engineering related real world problems.

Abstract (Key Words)	**Mapping of POs and PSOs**
Assist speech-disabled and physically challenged individuals, detect hand movements, control external electrical appliances.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12. PSO1, PSO2, PSO3.

ACKNOWLEDGEMENT

We gratefully remember our beloved **Founder Chairman, (Late) Thiru. M. Kumarasamy** whose vision and legacy laid the foundation for our education and inspired us to successfully complete this project.

We extend our sincere thanks to **Dr. K. Ramakrishnan, Chairman, and Mr. K. R. Charun Kumar, Joint Secretary**, for providing excellent infrastructure and continuous support throughout our academic journey.

We are privileged to extend our heartfelt thanks to our respected Principal, **Dr. B. S. Murugan, B.Tech., M. Tech., Ph.D.,** for providing us with a conducive environment and constant encouragement to pursue this project work.

We sincerely thank **Dr. J. Uma, B.E., M.E., Ph.D., Professor and Head, Department of Electrical and Electronics Engineering,** for her continuous support, valuable guidance, and motivation throughout the course of this project.

Our special thanks and deep sense of appreciation go to our Project Supervisor. **Mr. M. Ramesh M.E., Assistant Professor, Department of Electrical and Electronics Engineering,** for his exceptional guidance, continuous supervision, constructive suggestions, and unwavering support, all of which have been instrumental in the successful execution of this project.

We would also like to acknowledge **Dr. T. Hariharasudhan M.E., Ph.D., the Project Coordinator, Assistant Professor, Department of Electrical and Electronics Engineering**, for his constant encouragement and coordination that contributed to the smooth progress and completion of our project work.

We gratefully thank all the **Faculty members** of the **Department of Electrical and Electronics Engineering** for their timely assistance, valuable insights, and constant support during various phases of the project.

Finally, we extend our profound gratitude to our **parents and friends** for their encouragement, moral support, and motivation, without which the successful completion of this project would not have been possible.

TABLE OF CONTENTS

ABSTRACT

The project presents the development of a smart glove designed to assist speech-disabled and physically challenged individuals in communication and basic appliance control through hand gestures. The system utilizes an ADXL345 accelerometer sensor to detect hand movements, which are processed by an Arduino Uno microcontroller. The glove operates in two distinct modes: voice mode and device mode, selectable via a mode switch. In voice mode, specific gestures trigger pre-recorded voice messages stored in the APR9600 voice module, which are then played through a speaker to convey essential needs such as "I need water" or "I need help." In device mode, gestures are used to control external electrical appliances like a fan and a light via relay modules, enabling physically challenged users to interact with their environment. A 16x2 LCD display provides real-time feedback, showing the current operating mode and accelerometer readings. The system is powered by a regulated 5V DC supply converted from the standard 230V AC using a step-down transformer and voltage regulator. The entire project is programmed using Embedded C in the Arduino IDE. This smart glove serves as a low-cost, wearable solution to improve the quality of life and independence of individuals with speech and physical impairments.

PROBLEM IDENTIFICATION

Many individuals with speech disabilities or physical challenges face significant difficulties in communicating their basic needs or interacting with their environment independently. Everyday tasks such as expressing the need for water, food, or assistance become complicated, leading to frustration and emotional stress for both the individuals and their caregivers. Traditional methods of communication, such as sign language or written notes, often require the presence of a second person who understands the specific signs or is literate, which compromises the individual's privacy and autonomy. Moreover, not all caregivers or family members are trained in sign language, and not all users are literate or physically capable of writing. Physically challenged individuals may also face difficulties in performing routine activities like turning on lights, fans, or other home appliances, which are simple tasks for an able-bodied person but a daily struggle for them. Inaccessibility to such basic controls can contribute to a feeling of dependence and a lack of empowerment. While some assistive technologies exist, they are often expensive, complex to use, and not tailored to the individual’s specific needs. In rural or low-income communities, access to advanced medical or communication technologies is minimal, making the situation even more challenging.

CHAPTER 1

LITERATURE REVIEW

INTRODUCTION

This chapter discusses the projects and their inferences related to the "Smart Glove for Speech-Disabled and Physically Challenged Individuals." Communication and environmental control are significant challenges for people with speech and physical disabilities, often resulting in dependence on others for basic needs. Traditional assistive methods, such as sign language or caregiver support, may not always be practical or universally understood. Recent technological advancements, particularly in gesture recognition and wearable electronics, offer promising alternatives. This project presents a smart glove system that uses an ADXL345 accelerometer to detect hand gestures, which are then interpreted by an Arduino Uno microcontroller. Depending on the selected mode, the system either plays pre-recorded voice messages through a speaker or controls appliances like fans and lights via relay modules. Real-time feedback is provided on an LCD display, and the entire system operates on a regulated 5V DC power supply. The proposed solution promotes independence, enhances communication, and simplifies home automation for users with physical or speech limitations.

Paper 1: Smart Hand Gloves for Disabled People

Inference: This paper presents a glove that uses flex sensors to recognize finger movements and convert them into text displayed on an LCD. The system helps in basic gesture-to-text conversion for communication but lacks voice output or the ability to control external devices.

Paper 2: Gesture Controlled Home Automation System for Physically Disabled

Inference: This study discusses a system where simple hand gestures control home appliances using an accelerometer and microcontroller. While effective for device control, it does not address communication needs or include any voice feedback mechanisms.

Paper 3: Assistive Glove for Speech-Impaired People Using Flex Sensors

Inference: This work focuses on converting hand gestures into pre-defined text displayed on an app. It helps speech-impaired individuals communicate but does not support voice output or any integration with home appliance control.

Paper 4: Voice-Assisted Smart Glove for Mute People

Inference: A glove-based system that translates sign language gestures into speech using pre-recorded audio. Although it supports voice feedback, it does not include any provision for device control, making it limited to communication purposes only.

Paper 5: Smart Glove for Physically Challenged People

Inference: This paper outlines a basic prototype where hand gestures are used to control a wheelchair via a wireless connection. It addresses physical mobility but does not support voice communication or appliance control.

CHAPTER 2

PROPOSED METHODOLOGY

2.1 BLOCK DIAGRAM:

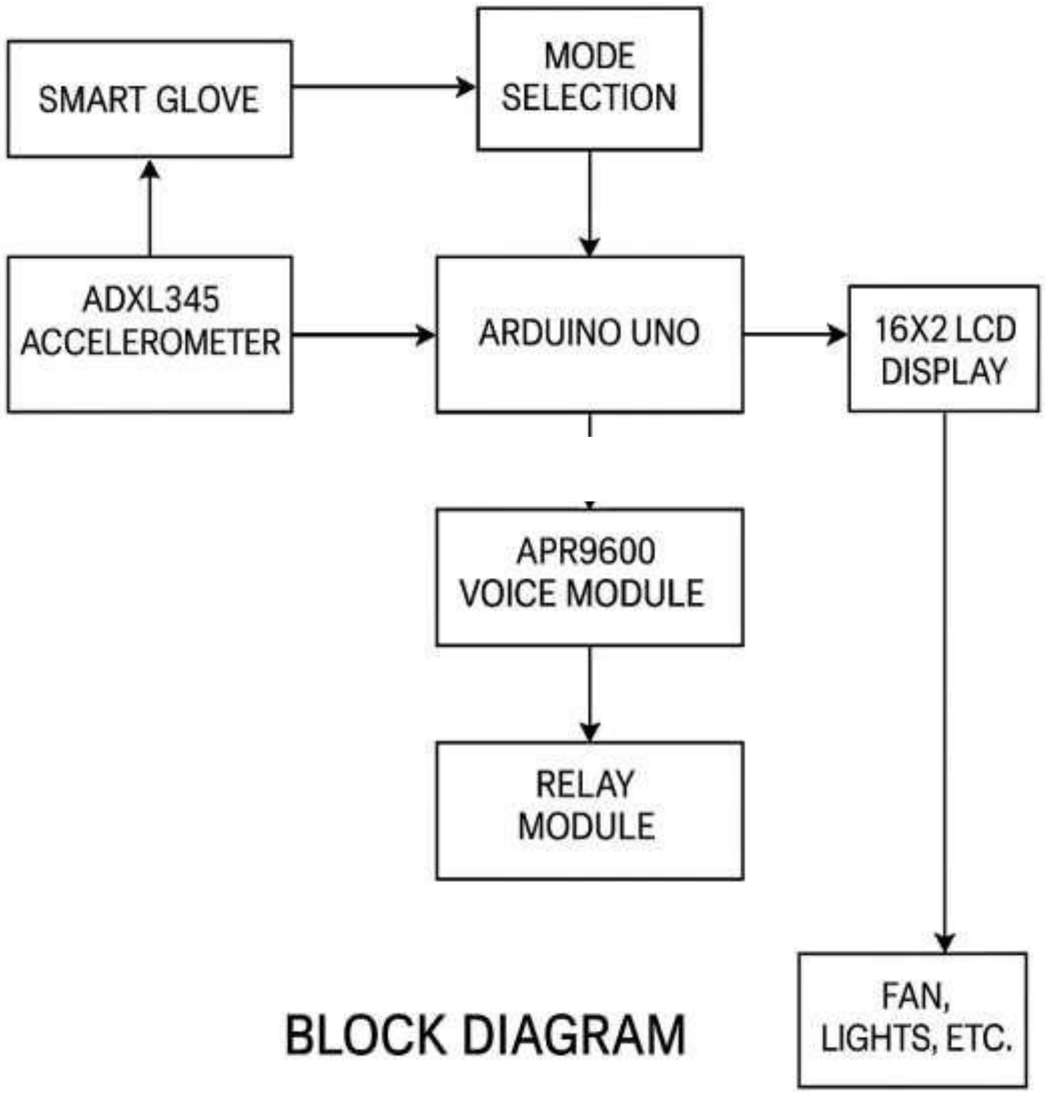

Figure.2.1 BLOCK DIAGRAM

The block diagram illustrates the architecture of the smart glove system designed to assist speech-disabled and physically challenged individuals. At the core of the system is the ADXL345 accelerometer, mounted on a glove, which detects hand gestures and sends data to the Arduino

Uno microcontroller. A mode selection switch allows the user to choose between Voice Mode and Device Mode. In Voice Mode, the Arduino triggers the APR9600 voice module to play pre-recorded voice messages corresponding to specific gestures, enabling communication. In Device Mode, the Arduino activates a relay module to control household appliances like fans and lights. A 16x2 LCD display provides real-time feedback by displaying the current mode and action taken, enhancing usability. The entire system is powered by a regulated 5V DC supply, ensuring reliable performance of all components.

2.2 DESCRIPTION:

Figure.2.1 Adxl345 Accelerometer

2.2.1 ADXL345 ACCELEROMETER :

The ADXL345 is mounted on the glove and continuously monitors hand orientation and motion. When the user performs a specific gesture, the sensor detects the pattern of acceleration. These values are sent to the Arduino Uno, which processes the data to determine the gesture performed. Based on this input, the system either plays a voice message (Voice Mode) or controls a device like a fan or light (Device Mode).

2.2.2 ARDUINO UNO ATmega328P:

The Arduino Uno is a microcontroller board based on the ATmega328P, used as the central controller in the smart glove system. It reads gesture data from the ADXL345 accelerometer and, based on the selected mode, either triggers the APR9600 voice module to play a message or activates relay modules to control appliances. It also updates the 16x2 LCD with system feedback and monitors the mode selection switch. With built-in I/O pins, communication protocols, and USB programming support, the Arduino Uno efficiently manages all system operations.

Figure.2.2 Arduino uno (atmega328p)

2.2.3 VOICE MODULE APR9600:

The APR9600 stores pre-recorded voice messages in its onboard memory. It can play back these messages when activated by an input signal, such as a gesture detected by the accelerometer. The playback is triggered by a microcontroller command (from the Arduino Uno).

Figure.2.3 Apr9600 Voice module

2.2.4 RELAY MODULE:

The relay contains a coil that, when energized by the microcontroller’s output signal, closes the switch and completes the circuit to the connected appliance, allowing current to flow and turning the appliance on. When the relay is de-energized, the switch opens and cuts off the current, turning the appliance off.

Figure.2.4 Relay module

2.2.5 16X2 LCD DISPLAY:

The LCD uses a liquid crystal display technology, where the crystals change their orientation when a voltage is applied, thus allowing light to pass through and forming readable text or symbols.

Figure.2.5 16x2 LCD Display

2.2.6 STEP-DOWN TRANSFORMER:

A step-down transformer is used to reduce high AC voltage from the main supply (e.g., 230V) to a lower AC voltage (e.g., 5V) suitable for powering this circuit.

Figure.2.6 Step-down Transformer

2.2.7 AC TO DC CONVERTER:

The AC to DC converter is used to convert the low-voltage AC output from the step-down transformer into a stable DC voltage. Most electronic components, including microcontrollers and sensors, require DC power to operate.

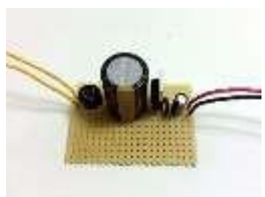

Figure.2.7 Ac to Dc Converter

2.2.8 SPEAKER:

The speaker is used to output audible sound, particularly the pre-recorded voice messages stored in the APR9600 voice module. It allows the smart glove to "speak" on behalf of the user, facilitating communication for speech-disabled individuals.

Figure.2.8 Speaker

2.2.9 SWITCH:

The mode selection switch is used to toggle between the two operational modes of the smart glove system voice mode and device mode.

Figure.2.9 Switch

2.2.10 EXTERNAL DEVICE FAN:

The fan operates on ac power and is typically turned on or off through a mechanical switch. In this project, the manual switch is replaced by a relay module, which acts as an electronically controlled switch.

Figure.2.10 External Device Fan

2.2.11 EXTERNAL DEVICE LIGHT:

The light functions as a common home appliance in the project to demonstrate the smart glove’s Device Mode capability. It allows the user to control lighting using hand gestures—enhancing accessibility and independence for speech-disabled or physically challenged individuals.

Figure.2.11 External Device Light

2.3 COST ESTIMATION:

S.NO	COMPONENT	QUANTITY	COST
1	Arduino uno	1	400
2	Adxl345 Accelerometer	1	300
3	Step-down Transformer	1	180
4	AC-DC Converter	1	50
5	16X2 Lcd Display	1	150
6	Voice Module Apr9600	1	120
7	Relay Module	2	600
8	External Device Fan, Light, Speaker, Switch	Each 1	150
9	Jumper wires	As Required	100
		TOTAL	**RS.2050**

CHAPTER 3

FUTURE SCOPE & ITS IMPLEMENTATION

This chapter brings about the future scope and the implementation plan of the Smart gloves for speech disabled person.

3.1 FUTURE SCOPE:

The proposed smart glove project has significant potential for future development and real-world application. With advancements in sensor technology, machine learning, and wireless communication, the system can be enhanced to recognize a wider range of complex gestures, enabling more expressive and accurate communication. Integration with Bluetooth or Wi-Fi modules can allow remote control of smart home devices, making the system more versatile and user-friendly. Additionally, the use of speech synthesis modules or smartphone integration could offer real-time text-to-speech conversion for more dynamic communication. For improved usability, the glove can be made more compact, comfortable, and energy-efficient using flexible electronics and wearable battery solutions. With further development, this project can evolve into a powerful assistive tool not just for speech-disabled individuals, but also for elderly users and people with limited mobility, greatly improving their independence and quality of life.

3.2 IMPLEMENTATION:

Listed below is the implementation plan of the above mentioned project. The implementation of the smart glove involved integrating multiple hardware components and programming them to work together seamlessly. The core of the system is the ADXL345 accelerometer, which was mounted on the glove to detect hand gestures by capturing real-time acceleration data across three axes. This data is continuously read and processed by the Arduino Uno microcontroller, which is programmed to recognize specific gesture patterns. A mode selection switch allows the user to toggle between Voice Mode and Device Mode. In Voice Mode, the Arduino sends a trigger signal to the APR9600 voice module, which then plays a pre-recorded voice message through a connected speaker, enabling the user to communicate essential phrases. In Device Mode, the Arduino controls relay modules that are connected to external devices like a fan and a light. Based on the recognized gesture, the corresponding relay is activated or deactivated, turning the appliance ON or OFF. A 16x2 LCD display provides visual feedback by indicating the current mode and system actions. The entire system is powered by a regulated 5V DC supply, derived from an AC source through a step-down transformer and an AC to DC converter circuit. The project was assembled on a wearable glove, ensuring comfort and mobility, and successfully demonstrated hands-free communication and home appliance control using intuitive hand gestures.

3.3 IMPLEMENTED KIT

Figure.3.1 Implementation of Smart gloves for speech disabled person

CHAPTER 4

CONCLUSION

The smart glove system developed in this project successfully demonstrates an effective assistive technology for individuals with speech and physical disabilities. By utilizing the ADXL345 accelerometer to detect hand gestures and integrating it with the Arduino Uno microcontroller, the system can interpret gestures to perform meaningful actions. In Voice Mode, it plays pre-recorded messages through the APR9600 voice module and speaker, enabling basic verbal communication. In Device Mode, it controls electrical appliances such as fans and lights via relay modules, enhancing the user’s ability to interact with their environment. The 16x2 LCD provides real-time feedback, and the entire system is powered through a reliable regulated 5V DC supply. The project proves to be low-cost, efficient, and user-friendly, with significant potential to improve the independence and quality of life for differently-abled individuals. With future enhancements like wireless connectivity and advanced gesture recognition, the system can evolve into a more powerful and adaptable assistive tool.

REFERENCE

REFERENCE LINK:

https://www.irjet.net/archives/V9/i3/IRJET-V9I353.pdf

https://www.researchgate.net/publication/343442072_SMART_SPEAKING_GLOVE_FOR_SPEECH_IMPAIRED_PEOPLE

https://www.jetir.org/papers/JETIRCD06049.pdf

https://cepdnaclk.github.io/e18-3yp-smart-glove/

https://www.researchgate.net/publication/354330209_Smart_Glove_for_the_Disabled_A_Survey