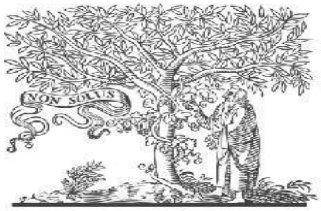
International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

COPY RIGHT



ELSEVIER SSRN

IJIEMR Transactions, online available on 10th Apr 2024. Link :http://www.ijiemr.org/downloads.php?vol=Volume-13&issue=Issue 04

10.48047/IJIEMR/V13/ISSUE 04/08

Title **SMART HAND GLOVES**

Volume 13, ISSUE 04, Pages: 63-70

Paper Authors Mr. Rajesh Tanna | Ms. Madaka Reshmi | Mr. Akula Bala Pavan Kumar | Ms. Mounika Kinjangi | Ms. Thanuja Sravya Maddala

USE THIS BARCODE TO ACCESS YOUR ONLINE PAPER

To Secure Your Paper As Per UGC Guidelines We Are Providing A Electronic Bar Code

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

SMART HAND GLOVES

Mr. Rajesh Tanna [1] | Ms. Madaka Reshmi [2] | Mr. Akula Bala Pavan Kumar [3] | Ms. Mounika Kinjangi [4] | Ms. Thanuja Sravya Maddala [5]

*[1]Dept. Of Electrical and Electronics Engineering, Vignan's Institute of Information Technology, Visakhapatnam, India
rajesh.tanna2321@gmail.com [1]

*[2]Dept. Of Electrical and Electronics Engineering, Vignan's Institute of Information Technology, Visakhapatnam, India
madakareshmi29@gmail.com [2]

*[3]Dept. Of Electrical and Electronics Engineering, Vignan's Institute of Information Technology, Visakhapatnam, India
pavankumarakula10@gmail.com [3]

*[4]Dept. Of Electrical and Electronics Engineering, Vignan's Institute of Information Technology, Visakhapatnam, India
monikasrinivas321@gmail.com [4]

*[5]Dept. Of Electrical and Electronics Engineering, Vignan's Institute of Information Technology, Visakhapatnam, India
thanujasravyam@gmail.com [5]

ABSTRACT: This article introduces Smart Hand Gloves, an innovative technology designed to help individuals with physical disabilities, especially those who are with speech impaired persons and old people for whom communication is a bit difficult. This paper presents an overview of recent developments in smart hand glove technology, highlighting their diverse applications and functionalities The gloves utilize advanced technology to detect hand gestures, enabling users to communicate and interact with the environment more effectively. Through comprehensive research of existing literature and user requirements analysis, this study explains the design principles and development of the Smart Hand Gloves. Practical implementations and user testing demonstrate the efficiency and usability of the gloves in real-world scenarios, highlighting their potential to enhance the quality of life for speech impaired individuals. Additionally, the gloves are incorporated with programming done in C++ for hand gesture recognition. The Arduino micro controller that we used here will detect the movement of fingers and will give output in the form of audio and text message through DF Mini player and GSM Module. For the continuous power supply to this smart hand glove, we are adding BMS (Battery Management System) to charge the battery. Future directions for research and development in this field are also discussed, emphasizing the importance of inclusive and accessible technologies.

KEYWORDS: Contactor, DF MINI Player, Hand Gesture, Glove, Speaker, GSM Module, Arduino, Micro controller, Commands, smart hand gloves, sign, audio.

INTRODUCTION: The dumb and paralyzed people communicate with the help of sign languag e. To cover the gap between the deaf and dumb pe ople and people, it has been given a technological upgrade using gesture recognition system. Gesture recognition is a widely explored field in favour of dumb, paralyzed and old people who are not able t o talk. A lot of work has been done in the past few years to improve the project in more efficient way. This paper emphasizes the improvement done over the years to increase efficiency and accuracy. In an other way it acts as a language interpreter and prov ides a simplified way for communication between speech impaired community and normal

people. In this paper we have presented brief sum maries of different past attempts which were made for making smart hand gloves using various techno logies. The authors of "A Real-time Portable Sign Language Translation System" ref.[1]. Their syste

m aims to provide real-time translation of sign lan guage into spoken language, offering communicati on between individuals who use sign language a. T he system likely involves the use of sensors or cameras to capture sign language gestures. Similarly, the design in ref. [2,3,19] also converts sign language to text. In Hand-talk Gloves with Flex Sensors the authors in ref. [4] present an examination of gloves equipped with flex sensors. The authors in ref. [5] Tracking of Human Movement Using Small Inertial/Magnetic Sensor Modules implements the project using small inertial/magnetic sensors instead of flex sensors by integrating inertial and magnetic sensors, the system can accurately track the movement and orientation of the user in real-time. The authors conducted a survey and highlighted the significance of the systems in enhancing human capabilities, facilitating intuitive interaction with technology, and advancing fields such as healthcare in ref. [6,15,17]. In their publication, they delve into the field of vision-based hand gesture recognition. Their study in ref. [7,14] explores the application of computer vision techniques to interpret hand gestures, aiming to enable natural human-computer interaction. Similarly, in ref. [8,9,11] also describes the review conducted on the visual interpretation of hand gestures for human-computer interaction. This paper in ref. [10] contributes to advancements in sensory data glove technology, particularly in calibration techniques utilizing neural networks. This paper in ref. [12,16] explores a system for recognizing gestures using Hall-effect sensors. In ref. [18] the authors designed a project for dumb and impaired people using automation technology. The authors of ref. [20], likely outlines the design and implementation of the gloves equipped with sensors for capturing hand movements at international conference on power. We extended our project using contactors adding emergency communication option and the user can interact. Our project mainly aims to be more budget friendly and portable; it has been given a technolo gical upgrade using gesture recognition system. W e can also add the contactors and the commands ar e logically programmed by incorporating it in the micro controller.

PROBLEM DEFINITION: Selecting a problem statement for designing a smart hand glove utilizing contactors involves identifying a specific challenge or application area where such a device can provide significant value. One possible problem statement could be "Developing a smart hand glove with integrated contactors for enhancing motor rehabilitation therapy in patients especially for dumb and recovering from injuries or neurological conditions or for disabled, elderly people". This problem statement addresses a specific need in the healthcare domain, where precise control and feedback mechanisms are crucial for effective rehabilitation. By incorporating contactors into the glove design, therapists can customize rehabilitation exercises and provide real-time feedback to patients. Additionally, such a device could offer remote monitoring capabilities, allowing therapists to track patient progress and adjust therapy plans accordingly. This problem statement aligns with the objective of utilizing contactors to enhance functionality and user interaction while addressing a meaningful application area with potential societal impact.

IMPLEMENTATION: The work of this project starts from the movement of hand gloves where the contactors are attached to the tip of the fingers of gloves. Initially the contactor value is high and when there is a contact between the ground and high the value of the contactor changes to zero when it experiences grounding. Here Micro-Controller is used for programming and interfacing purposes through Arduino. The

ATMega328p micro controller serves as the main control unit of the smart gloves. It processes input from contactors and controls the output devices. The DF Mini Player is used to store and read the command that conveys the Message from hand movements. The audio output which is amplified is sent to a speaker which is received from DF Mini Player. GSM Module sends the SMS to the given phone number through cellular network.

DESIGN AND DEVELOPMENT: The design of smart gloves allows us to create a device that is ca pable of tasks like sending messages and playing a udio through the speaker. The design of hand glov es is made such that it is portable, and can be under stood by dumb, and disabled people. The software program is written in C++ and is incorporated in A TMega328p micro controller. The components inv olved in this smart glove include ATMega328p, G SM Module, DF Mini player, Amplifier (PAM840 3), PC4845-C Power Bank Module, lithium-ion ba ttery, capacitors, crystal oscillators, 2-pin push butt on, 2-pin terminal blocks, LED, speakers.

PROCEDURE FOLLOWED: The ATmega328P micro controller serves as the main control unit of the smart gloves. It processes input from sensors and controls the output devices. GSM module enables communication capabilities, allowing the gloves to send/receive messages or data via cellular networks. DF Mini Player is a sound module that can store and play audio files. It can be used to provide feedback or alerts through audio signals. Resistors and capacitors are used for various purposes such as voltage division, filtering, and timing. Crystal oscillator(16MHz) provides clock signal for timing operations of the micro controller. Amplifier circuit amplifies audio signals from the DF Mini Player to drive speakers or headphones. Push button switches allow the user to trigger specific actions or modes in the gloves. Terminal blocks provide easy connections for external components or peripherals. Lithium-ion battery powers the entire system, providing portability and flexibility. LED indicators provide visual feedback or status indications to the user. PC4845-C power bank module regulates the voltage from the battery to ensure stable power supply to the components. Users can wear gloves and interact with them through contact points. The gloves provide feedback to the user through audio signals (via the DF Mini Player), visual indicators (LED's), and possibly through messages sent/received via GSM. Overall, the smart hand gloves integrate various hardware components and software functionalities to provide communication capabilities, feedback mechanisms, and user interaction features tailored to the needs of the target user group.

BLOCK DIAGRAM: The power supply is given to the ATMega328p micro controller that is logically programmed and contactors are incorporated into smart gloves to provide haptic feedback. Once the power is supplied to a smart hand glove with five contact points, the contactors will likely close i.e., one of the five is grounded and remaining four are followed by commands that are incorporated in ATMega328p micro controller which is programmed logically, allowing electrical current to flow through the circuit. This can activate various functionalities, triggering feedback mechanisms within the glove. Initially, the four contactors are high, and the grounded one is low. Whenever the ground contactor is in touch with the other high contactors, the result will be low. If the contactors make contact with the ground, it's possible that this action could be programmed to trigger a specific command or response. This command could vary depending on the user's need. When the contactors are triggered then the signal is sent to the DF Mini player.

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

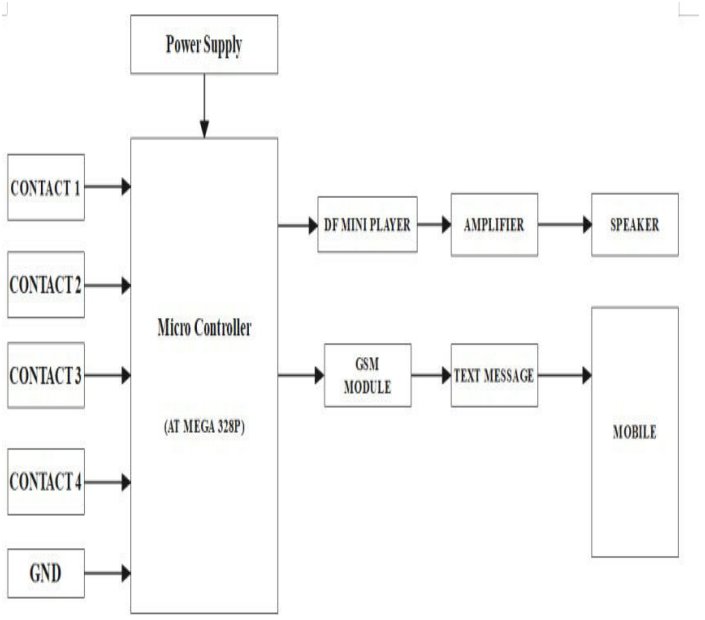


Fig.1: Block Diagram of Smart Hand Gloves

They are commonly used for audio playback modules that can be integrated into a smart hand glove system. The DF Mini player could be programmed to respond to certain triggers, such as the contactors touching the ground. For example, it could be programmed to play a specific audio prompt or command in response to this trigger. This audio prompt could provide feedback to the user or signal the activation of a particular function within the glove. The DF Mini player sends the signal to the Amplifier that amplifies audio signals. The signal from DF Mini player is of low amplitude, the amplifier is used to convert it to high amplitude and amplifies audio signals from the DF Mini Player to drive speakers. When a user interacts with the gloves (e.g., pressing a button, making a hand gesture), the micro controller interprets the input and triggers appropriate actions. For instance, upon receiving a message via GSM, the micro controller can activate the DF Mini Player to play an alert sound and illuminate an LED indicator. Similarly, the

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

micro controller can send messages or data through GSM based on specific conditions or events detected by contactors. For example, when the contactors touch the ground, the GSM module could be programmed to send a notification or alert message to a designated phone number, indicating the action taken by the glove.

FLOWCHART: The flowchart outlines the operational logic and interactions between the components used in making smart hand gloves. This process begins with the supply of power from lithium-ion batteries. Initially, the flow starts with the user input, where the smart hand gloves detect specific hand gestures or movements with the user's hand movements, the contactors integrated on the fingertips of the gloves detect the grounding. These inputs are processed by Arduino micro controller, which interprets the gestures and triggers corresponding commands from the given program. The inputs are not processed by the Arduino micro controller unless the hand movements are detected. If a specific gesture indicates a desire to play specific command, the Arduino activates the DF Mini player to start playing the selected audio files. Here, we use an amplifier to amplify the selected audio files and improve the modulation of the audio. Simultaneously, the Arduino checks for the outgoing messages through the GSM module.

Finally, the Arduino coordinates with the contactors to provide tactile feedback or control external devices based on predefined gestures. This flowchart illustrates the seamless integration of various components to create an interactive and versatile wearable technology solution.

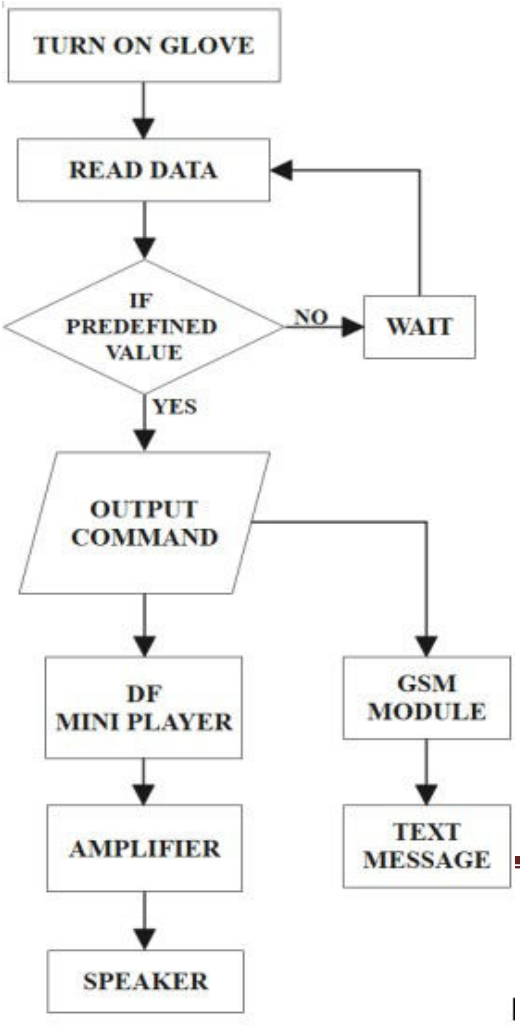


Fig.2: Flowchart of Smart Hand Gloves

RESULTS AND DISCUSSIONS: The outcome of this work was some words were successfully displayed into text and voice which helps speech impaired people to communicate with normal people easily. There is another feature in this

system which makes normal people communicate with them also through an android application which can convert people's voice into text and sign language.

So, this project is quite feasible to develop two-way communication between speech impaired hearing impaired and normal people

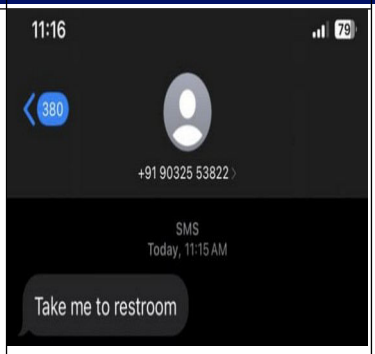
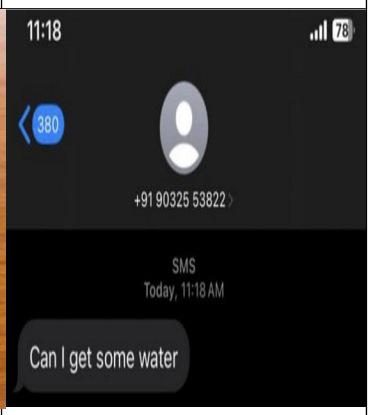
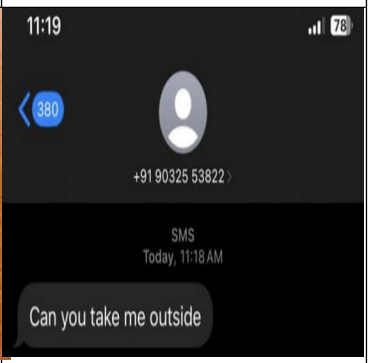
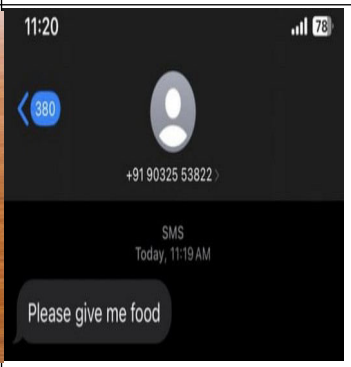
Hence, the outputs of the design are the ones that use and are displayed with a predefined voice command. The output from the other, which uses the Arduino, is successfully tested with both the gloves. When the bend was not to the required limit, the command will fail to turn on/off the appliance, because the resistance value is equal to the condition given in the Arduino, and if the condition is equal, the output was displayed in text and audio signal through speaker if the condition is not equal then there is no output. Finally, the result was obtained for the proposed project. The result and outcome of smart hand gloves are transformative advancements in various fields. These gloves enable enhanced interaction, safety, integration and control, leading to improved efficiency, productivity, and experience. In healthcare, they facilitate remote monitoring, rehabilitation, and training.

The signs and outcomes are shown below in the table. The commands are given to the program in ATMega328p micro controller where the gestures are recognized and transformed into text messages to the emergency number which is already stored in the programmed logically. Overall, the smart hand glove using contactors represents a technology to revolutionize user integration and interaction with devices in diverse contexts. The accuracy and reliability of gesture recognition algorithms were evaluated through extensive testing, demonstrating high levels of performance across diverse hand movements and gestures.

Moreover, the application of smart hand gloves in assistive technologies yielded transformative outcomes for individuals with disabilities. By enabling intuitive and accessible communication methods, smart hand gloves empowered users with

disabilities to interact with digital interfaces, access information, and communicate effectively. This led to improved independence, social inclusion, and quality of life for users with diverse needs.

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

SIGN	OUTPUT
	
	
	
	

CONCLUSION: The project is a smart glove that is worn by a person to communicate with others in emergency conditions. Contractors are incorporated on the glove, and this contactor provides discrete values to the Arduino each time of the contact. In this way the instructions are programmed, and this signal is given to the speaker and GSM module to send audio output and SMS to the given mobile number respectively. So, we observed and analyzed various research papers and products available in the market for reference. Smart hand gloves represent a transformative technology with vast potential across industries. By integrating contactors, and communication modules, these gloves offer enhanced interaction, safety, and control. From virtual reality experiences to remote operations and healthcare applications, smart gloves redefine human-computer interaction. However, challenges such as loss of signal must be addressed through solutions like offline modes, redundancy, and signal amplification.

With continued innovation, which paves the way for a more connected future. This technology holds promise in fields such as healthcare, rehabilitation, industrial automation, and consumer electronics. Safety measures ensure user well-being, while efficient power management systems optimize battery usage for prolonged operation. Overall, the smart hand glove using contactors represents a technology to revolutionize user integration and interaction with devices in diverse contexts.

FUTURE SCOPE: This type of communication is very important for paralyzed persons to express their needs to others. So, this is further improved by making it wireless using Bluetooth module or with Wi-Fi module to make it comment to their user and precision of the contactor also will be improved. This further can be implemented in cases where a smart hand glove loses signal to its GSM module, several solutions can be employed. These include implementing an offline mode with

local storage for data, switching to alternate communication channels like Bluetooth or Wi-Fi, and automatic retry mechanisms to establish connection when signal improves. User notifications can act to improve connectivity, while redundancy in GSM modules or SIM cards enhances reliability. Signal amplification techniques or external antennas can improve signal, and offline functional priority ensures important features remain accessible.

REFERENCES:

[1] Lih-Jen kau, Wan-Lin Su, Pei-Ju Yu and Sin-Jhan Wei, " A Real-time Portable Sign Language Translation System", IEEE 58th International Midwest Symposium on Circuits and Systems (MWSCAS), 2015.

[2] Rastogi Kanika and Bhardwaj Pankaj, "A Review Paper on Smart Glove - Converts Gestures into Speech and Text", International Journal on Recent and Innovation Trends in Computing and Communication, vol. 4, no. 5, pp. 92-94, ISSN 2321-8169.

[3] Gujrati Ambika, Singh Kartigya, Khushboo, Sora Lovika and Mrs.Ambikapathy., "Hand-talk Gloves with flex Sensors: A Review", International Journal of Engineering Science Invention ISSN , vol. 2, no. 4, pp. 43-46, 2013.

[4] Yun Xiaoping, R. Bachmann Eric, Moore Hyatt and Calusdian James, "Self-Contained Position Tracking of Human Movement Using Small Inertial/Magnetic Sensor Modules", IEEE International Conference on Robotics and Automation, 2007.

[5] Laura DiPietro, Angelo M. Sabatini and Paulo Dario, "A survey of Glove-Based systems and their applications", IEEE Transactions on systems, Man and Cybernetics-part C: applications &review, vol.38, no.04, pp. 461-482, July 2008.

[6] P. Garg, N. Aggarwal and S. Sofat, "Vision based hand gesture recognition," World Academy of Science, Engineering and Technology, vol. 3, 2009.

[7] V. Pavlovic, R. Sharma and T. S. Huang, "Visual interpretation of hand gestures for human-computer interaction: a review," IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 19, no. 7, pp.677-692, July 1997.

[8] P. Halarankar, S. Shah, H. Shah and J. Shah "Gesture recognition technology: a review," International Journal of Engineering Science and Technology (IJEST), vol. 4, no 11, 2012.

[9] C. S. Fahn and H Sun, "Development of a sensory data glove using neural-network-based calibration," Corrections of IC-AT 2000 Proceeding, pp 239 – 245, 2000.

[10] C. S. Ingulkar and A. N. Gaikwad, "Hand data glove: a wearable real time device for human computer interaction," International Journal of Science and Engineering, vol. 1, pp-99-104, 2013.

[11] N. Tran, S. Fugate, M. Ceruti, L. Duffy and H. Phan, "Hall-effect sensor gesture recognition, information coding, and processing", US patent 8,421,448 B1, Apr 16, 2013

[12] Vis maya A P, Sarita B P, Keerthana Sudesh P C and Manjusha TS," Smart Glove Using Arduino With Sign Language Recognition System", IJARIIE-ISSN(O)-2395-4396, Vol-6 Issue-2 2020.

[13] R Liang and M Ouhyoung, "A real-time continuous gesture recognition system for sign language," Third IEEE International Conference on Automatic Face and Gesture Recognition, pp. 558-567, Japan, 1998.

[14] K.Hema Vani, "Gesture recognition to voice conversion using electronic hand glove".

[15] Gesture Control of Home Appliances Using Flex Sensor Manoharan S., Ragul R., Ramanathan S. K. S., Vijay M., Palanivel R.

[16] Khushboo Kashyap,“ Digital Text and Speech Synthesizer Using Smart Glove for Deaf and Dumb,” ISSN:2278-909 International Journal.

[17] Dr. Akey Sangeetha and Dr. Rajesh Sharma R,” Design of Effective Smart Communication System for Impaired People Article in Journal of Electrical Engineering Automation,” -March 2021 DOI: 10.36548.

[18] Harmeet Kaur, Amit Saxena, Abhishek Tandon and Keshav Mehrotra,” A Review paper on evaluation of smart glove international journal of Scientific Research”.

[19] Y.Guo and Gong,” Development of Smart Gloves for Gesture Recognition Based on Embedded System”, 2020 IEEE International Conference on Power, Intelligent Computing and Systems (ICPICS) (pp. 501-505). IEEE.