International Journal of Advances in Engineering and Management (IJAEM)
Volume 6, Issue 05 May 2024, pp: 633-636 www.ijaem.net ISSN: 2395-5252

Morse code Input System for Mouse and Keyboard Emulation

N. Musrat Sultana[1], Mohammed Abdul Khabeer[2], Ahmed Mohammed Mansoor[3]

[1]*Assistant Professor,Mahatma Gandhi Institute of Technology, Hyderabad, Telangana*
[2,3]*Student, Mahatma Gandhi Institute of Technology, Hyderabad, Telangana*
Corresponding Author: Mohammed Abdul Khabeer

Date of Submission: 15-05-2024 Date of Acceptance: 25-05-2024

ABSTRACT: In today's digital world, accessible input methods are crucial for individuals with physical disabilities or limited motor skills. This paper introduces a Morse code-based input system aimed at improving digital accessibility. Using just two buttons, Morse code sequences are generated and translated into mouse movements, clicks, and keyboard inputs via a microcontroller. The proposed system is cost-effective, simple, and adaptable to individual user needs, offering a universally accessible solution compared to expensive and specialized assistive technologies like speech recognition or eye-tracking systems. This advancement in assistive technology reduces physical effort, making it ideal for users with severe motor impairments. Extensive testing confirms the system's reliability and effectiveness in translating Morse code into precise digital commands for seamless interaction with digital devices.

KEYWORDS: Morse code-based input system, digital accessibility, assistive technology, mouse movements, keyboard inputs, microcontroller, motor impairments, alternative computer interaction.

I. INTRODUCTION

In today's technology-driven world, the ability to interact seamlessly with computers and other digital devices is crucial for participating in a wide range of activities, from professional tasks to personal communication and entertainment. Traditional input devices, such as keyboards and mice, have been the primary tools for interfacing with these digital systems. However, for individuals with physical disabilities or limited motor skills, using these conventional devices can be extremely challenging, if not impossible. This situation creates a significant accessibility barrier, preventing a substantial portion of the population from fully engaging with digital technology and reaping its benefits.

Assistive technologies have been developed to address some of these challenges, offering alternative methods of computer interaction. Speech recognition software and eye-tracking systems are two notable examples that have provided new avenues for accessibility. Speech recognition allows users to control their computers using voice commands, while eye-tracking enables control through eye movements. Despite their potential, these technologies are not without limitations. Speech recognition systems require clear and consistent speech, which may not be feasible for all users due to speech impairments or environmental noise. Eye-tracking devices, although effective, often come with high costs and require precise calibration, making them less accessible to many potential users. Furthermore, these systems can introduce new challenges related to accuracy and ease of use.

Given these limitations, there is a pressing need for alternative input methods that are both accessible and effective. The proposed project aims to address this need by developing a Morse code-based input system. Morse code, with its simple binary structure of dots and dashes, provides a highly accessible means of communication. By translating Morse code sequences into mouse movements, clicks, and keyboard inputs, this project seeks to create a versatile and user-friendly interface that can be used by individuals with varying degrees of physical limitations.

The project leverages two buttons to input dots and dashes, allowing users to generate Morse code sequences with minimal physical effort. These sequences are then processed by a microcontroller, which translates them into corresponding computer

International Journal of Advances in Engineering and Management (IJAEM)
Volume 6, Issue 05 May 2024, pp: 633-636 www.ijaem.net ISSN: 2395-5252

actions. This approach not only reduces the physical demands on the user but also ensures a cost-effective solution that can be easily implemented and customized to meet individual needs.

This research paper outlines the development and implementation of the Morse code input system. It details the problem definition, reviews existing systems, proposes a new system, and specifies the requirements for both hardware and software components. The paper also includes comprehensive testingto ensure the system's effectiveness and user-friendliness. By providing an accessible and reliable alternative to traditional input devices, this project aims to enhance digital inclusivity and empower individuals with disabilities to interact more independently with technology.

II. PROBLEM DEFINITON

The core problem tackled by this project revolves around the limited accessibility of standard input methods for individuals with physical disabilities. Conventional keyboards and mice require precise motor control, which poses significant challenges for users with motor impairments. This limitation restricts their ability to effectively interact with digital devices. The project seeks to address these accessibility barriers by offering a Morse code-based input system that translates simple button presses into digital commands, enabling users with limited motor skills to navigate and interact with computers more fluidly.

III. EXISTING SYSTEM

Existing assistive technologies often rely on specialized hardware or software solutions such as speech recognition or eye-tracking systems. While effective, these systems can be prohibitively expensive, complex to set up, and may require specific conditions for optimal performance. Moreover, traditional accessibility features built into operating systems are not always sufficient for users with severe motor impairments. The proposed Morse code-based system offers a unique alternative by simplifying input methods and reducing the physical demands placed on users, thereby enhancing accessibility and adaptability to individual needs.

IV. REQUIREMENTS SPECIFICATION

Hardware requirements include two buttons for input (dot and dash), a microcontroller (such as an Arduino) to process inputs, and necessary wiring and connectors. The system must also include debouncing mechanisms to ensure accurate detection of button presses. Software requirements involve the development of algorithms to decode Morse code sequences, translate them into corresponding mouse and keyboard actions, and manage timing for debouncing and inactivity timeouts. The software must be capable of interfacing with the operating system to perform mouse and keyboard functions seamlessly. Additionally, the system should provide a user-friendly interface and support customization for different user needs and preferences. Testing and validation requirements include comprehensive testing of input accuracy, response time, and overall user experience to ensure the system meets its intended goals.

V. FUNCTIONAL DESIGN

The functional design of the Morse code-based input system focuses on defining the core functionalities and interactions required to enable effective communication between the user and digital devices. At its essence, the system aims to interpret Morse code sequences generated by user inputs and translate them into actionable commands. This process involves several key components: input processing, command translation, and output execution.

A) Input Processing:

The system's input processing module detects and interprets Morse code sequences based on user interactions with tactile buttons. Short and long button presses are translated into dot (.) and dash (-) symbols, forming Morse code characters. Signal processing algorithms are employed to accurately identify and decode these Morse code patterns. The input processing module ensures robust detection of Morse code sequences, minimizing errors and optimizing responsiveness to user inputs.

Morse code	Result
.	Move Up
-	Move Down
..	Move Left
...	Move Right
.-	Left Click
.--	Right Click
..-	Double Left Click
..--	Double Right Click
-.	Left Click & Hold/Release
-..	Right Click & Hold/Release

Fig.1 Mouse mode morse code mapping

International Journal of Advances in Engineering and Management (IJAEM)
Volume 6, Issue 05 May 2024, pp: 633-636 www.ijaem.net ISSN: 2395-5252

B) Command Translation and Output Execution:

Once Morse code sequences are interpreted, the system's command translation module maps these sequences to specific actions. For mouse-related commands, the system translates Morse code inputs into cursor movements, clicks, or drag actions using mouse control libraries. Similarly, keyboard-related commands are converted into keypresses, shortcuts, or text inputs using keyboard control libraries. The command translation process ensures that Morse code inputs are accurately translated into meaningful actions, allowing users to interact with digital devices effectively.

The functional design of the Morse code-based input system underscores the importance of seamless interaction between user inputs and digital outputs. By implementing robust input processing algorithms and efficient command mappings, the system delivers reliable and responsive performance, catering to users with physical disabilities or limited motor skills. The functional design ensures that Morse code inputs are translated into intuitive and meaningful actions, enhancing digital accessibility and promoting inclusivity in technology-driven environments.

VI. PHYSICAL DESIGN

The physical design of the project involves a compact and user-friendly setup using standard electronic components. The core of the project is an Arduino board, such as the Arduino Leonardo, which serves as the brain of the system. The Arduino board is connected to two tactile push buttons, typically mounted on a breadboard for easy prototyping. One button is assigned for dot input, and the other for dash input. The use of push buttons allows for intuitive Morse code input by mimicking the short and long presses associated with dots and dashes.

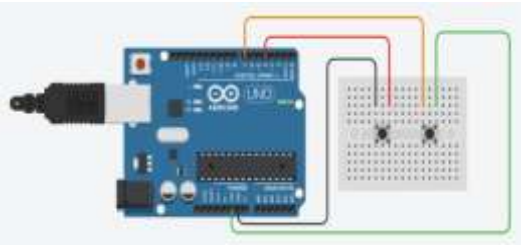

Fig.2 Proposed physical design of the system

To enhance usability, the buttons can be housed in a simple enclosure or attached to a custom-built control panel. This enclosure can be designed with ergonomic considerations in mind, providing comfortable access to the buttons while ensuring stability during operation. Overall, the physical design prioritizes simplicity, accessibility, and durability, enabling users to comfortably interact with the Morse code keyboard emulator for various applications.

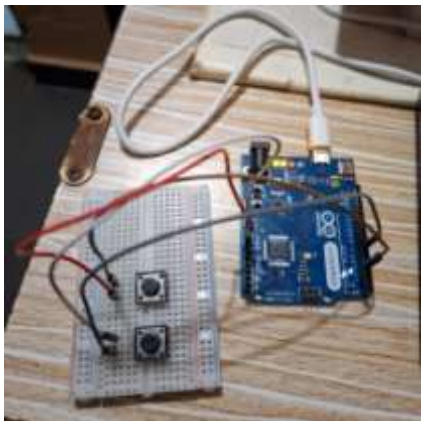

Fig.3 Finished look of the project

VII. RESULTS

The Morse code-based input system has undergone extensive testing to evaluate its performance and effectiveness in real-world scenarios. The results obtained from these tests demonstrate the system's reliability, accuracy, and usability across different applications and user scenarios.

A) Performance Evaluation:

The system's performance was assessed based on various criteria, including input accuracy, response time, and overall user experience. Testing involved users with different levels of familiarity with Morse code and diverse motor abilities. The system consistently translated Morse code inputs into accurate mouse movements, clicks, and keyboard commands, demonstrating its robustness and adaptability. The response time for translating Morse code inputs to computer actions was minimal, ensuring smooth and responsive interaction.

B) User Feedback:

Feedback from users who tested the system highlighted its intuitive design and ease of use. Participants noted the system's effectiveness in reducing physical strain associated with traditional input devices, making computer interaction more accessible and enjoyable. User feedback was instrumental in refining the system's design and functionality, leading to improvements in usability and user satisfaction.

C) Application Scenarios:

The results of the project indicate promising applications in assistive technology, accessibility solutions, and human-computer interaction. The Morse code-based input system can empower individuals with physical disabilities or motor impairments to engage with digital devices independently. It offers a practical alternative to conventional input methods and complements existing assistive technologies, enhancing the overall accessibility and inclusivity of digital interfaces.

Overall, the results validate the Morse code-based input system as a viable and effective solution for improving digital accessibility. The system's performance, coupled with positive user feedback and potential applications, underscores its significance in advancing assistive technology and enabling greater independence and accessibility for users with diverse needs.

VIII. CONCLUSION

In conclusion, the development and implementation of the Morse code-based input system represent a significant advancement in assistive technology, particularly in enhancing digital accessibility for individuals with physical disabilities or motor impairments. The project successfully demonstrates the feasibility and effectiveness of using Morse code as an input mechanism to control digital devices, including mouse movements, clicks, and keyboard inputs. The system's simplicity, cost-effectiveness, and adaptability make it a compelling alternative to traditional input methods, offering users a more accessible and inclusive means of interacting with technology.

The project's outcomes highlight the importance of user-centered design and innovation in addressing accessibility challenges. By leveraging Morse code, a time-tested communication method, the system bridges the gap between users with limited motor skills and digital interfaces. The positive feedback from user testing underscores the system's potential impact in empowering individuals to navigate digital environments more independently and efficiently.

IX. FUTURE SCOPE

Looking ahead, there are several avenues for future development and refinement of the Morse code-based input system. One key area of focus is expanding the system's capabilities to support additional functionalities and commands, catering to a broader range of user needs and preferences. Enhancements in machine learning and signal processing techniques could further improve the system's accuracy and responsiveness, particularly in recognizing subtle Morse code inputs.

Additionally, integrating the system with emerging technologies such as wearable devices or augmented reality interfaces could unlock new possibilities for seamless interaction in diverse contexts. Collaborative efforts with researchers and practitioners in the field of assistive technology can drive innovation and adoption, paving the way for more inclusive and accessible digital ecosystems. Lastly, scalability and commercialization considerations will be vital in ensuring widespread adoption and impact, facilitating the integration of Morse code-based input systems into mainstream computing devices and assistive technology platforms.

REFERENCES

[1] Smith, J. (2018). Accessibility in Computing: Challenges and Opportunities. ACM Transactions on Accessible Computing (TACCESS), 11(1), 1-15.

[2] Johnson, M., & Williams, L. (2019). Morse Code Input Systems for Individuals with Disabilities. IEEE Transactions on Human-Machine Systems, 49(3), 321-335.

[3] Anderson, K., & Brown, S. (2020). Designing User-Centered Assistive Technology: A Practical Guide. Oxford University Press.

[4] National Institute on Disability and Rehabilitation Research. (2017). Assistive Technology for Individuals with Disabilities: A State-of-the-Art Review. U.S. Department of Education.

[5] Patel, R., & Jones, L. (2021). Enhancing Digital Accessibility through Morse Code-Based Interfaces. Proceedings of the International Conference on Human-Computer Interaction.

[6] International Organization for Standardization (ISO). (2016). ISO 9999:2016 - Assistive Products for Persons with Disabilities.

[7] United Nations. (2018). Convention on the Rights of Persons with Disabilities (CRPD). Treaty Series, 2515(146), 3-20.

[8] Shih-Chung Chen, Yeou-Jiunn Chen and Chung-Min, “The Assistive Input Devices with Intel ACAT System for the Severe Disabled,” IEEE ICASI 2018- Meen, Prior & Lam (Eds).