Project Lit Review

Group 5: Muted

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Article 1[1]

In this article, researchers propose a human-robot interaction system that allows disabled people to use Morse code to interact with robots. The system uses a modified and more flexible version of Morse code, designed for people with limited physical mobility who may not be able to provide a stable code sequence. Human-robot interaction is based on electromyogram (EMG) signals that determine the user's level of muscle activation. From the EMG signal, a Morse code command generator creates high-level commands that are passed to the robot task manager to successfully perform the corresponding task. After successfully testing the system with healthy people, the researchers express their high expectations for future testing with disabled people.

It is interesting that the researchers designed a modified version of Morse code to adapt their system to their users. We could take this approach for our project, and instead of defining a large board of users, focus on a small portion and provide a better interaction that will leave users more satisfied with our robot.

Article 2[2]

The model presented in this paper provides real-time eye-tracing for password authentication for people who authenticate themselves using Morse code. To use the system, the user must first register by giving an ID and a password. Once registration is complete, the user can log in by using the credentials provided. With the help of a web camera, the user enters PIN by flashing Morse code. In other words, by blinking. The system then uses OpenCV to decode the input and checks whether the PIN entered corresponds to the PIN in the database.

Overall, this article gives an idea of how Morse code can be used in other fields, such as computer vision, and how we could take inspiration for our project.

Article 3[3]

This article explains the development of a prototype that decodes Morse code by recognizing finger gestures in digital image computing. A camera is used to capture a sequence of video

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[1] P. Nilas, P. Rani and N. Sarkar, "An innovative high-level human-robot interaction for disabled persons," *IEEE International Conference on Robotics and Automation, 2004. Proceedings. ICRA '04. 2004*, New Orleans, LA, USA, 2004, pp. 2309-2314 Vol.3, doi: 10.1109/ROBOT.2004.1307406.

[2] M. B. N, P. R, V. S, and S. R, "Morse Code Based Secured Authentication System through Machine Learning," International Journal of Innovative Research in Technology, vol. 8, no. 2, pp. 569, July 2021, ISSN: 2349-6002.

[3] R. Li, M. Nguyen and W. Q. Yan, "Morse Codes Enter Using Finger Gesture Recognition," 2017 International Conference on Digital Image Computing: Techniques and Applications (DICTA), Sydney, NSW, Australia, 2017, pp. 1-8, doi: 10.1109/DICTA.2017.8227464.

frames that the system recognizes and converts the Morse code into readable ASCII letters or emotional symbols. Tests of the design conclude that the highest precision is 93% for recognizing letter “I” (··) and the lowest is 83% for the letter “?” (··--··). In the conclusion of this paper, the researchers indicate their intentions to use deep learning to identify finger gestures and achieve recognition in a more complex environment such as blinking an eye, slapping a leg or shaking the head.

Article 4

Braille character detection using deep neural networks for an educational robot for visually impaired people : https://sol.sbc.org.br/index.php/wvc/article/view/13492

The article is about Teaching computer programming to the visually impaired thanks to a robot called Donnie which has as its key part the need to detect Braille characters in a scaled-down environment. In this paper, we investigate the current state-of-the-art in Braille letter detection based on deep neural networks. For such, the searchers provide a novel public dataset with 2818 labeled images of Braille characters, classified in the letters of the alphabet, and present a comparison among some recent detection methods. As a result, the proposed Braille letters detection method could be used to assist in teaching programming for blind students using a scaled-down physical environment. The proposal of EVA (Ethylene Vinyl Acetate) pieces with pins to represent Braille letters in this environment is also a contribution.

Article 5

Modular Robotic Arm for Teaching Braille to Children with Normal Visual Acuity : https://ieeexplore.ieee.org/abstract/document/10226151

This paper introduces the design and development of a modular robotic arm with four degrees of freedom intended for implementation in educational environments as an interactive robotics tool for teaching the Braille system. This project arose from the need for inclusive and accessible education, using robotics to bring Braille to a broader audience and encourage collaborative learning.

Article 6

Tale of a robot: Humanoid robot assisted sign language tutoring: https://ieeexplore.ieee.org/abstract/document/6100846

This paper introduces the design and development of a robot specialized in teaching Sign Language to hearing impaired children by means of non-verbal communication and imitation based interaction games between a humanoid robot and the child. In this study, the robot will be able to express a word in sign language among a set of chosen words using hand movements, body and face gestures.

Article 7

Tactile Communication System for the Interaction between Deafblind and Robots: https://eprints.gla.ac.uk/201386/1/201386.pdf

The article discusses the development of a tactile communication system for deafblind individuals to interact with both humans and robots. This system allows deafblind people to send control signals to robots by writing block letters using various touch sensors. The characters written on the tactile sensing array of the system are recognized using a Convolution Neural Network CNN trained with data from the Extended Modified National Institute of Standards and Technology EMNIST database. Also, a mobile app was developed by the team to efficiently recognize and display the written letters. The system's efficacy is demonstrated by remotely controlling a Baxter robot to successfully execute 'pick or drop' tasks using English block letters written on the tactile sensing array.

Article 8

Human-Robot Interaction in a Robotic Guide for the Visually Impaired:
https://cdn.aaai.org/Symposia/Spring/2004/SS-04-03/SS04-03-001.pd

This article proposes a mobile robotic guide equipped with RFID sensors that serves as an indoor navigation system for visually impaired people. Users can navigate unfamiliar indoor environments with the help of these sensors. A distributed tracking and guidance system is used to reduce users' physical and mental stress. Human-robot interaction, in which users communicate with the robotic guide using voice recognition, is a crucial aspect of the system. The guide, represented by "Merlin," is able to communicate with other people in the room and solicit their assistance and cooperation when needed. The author acknowledges that speech recognition may be challenging in busy and noisy environments so he suggests considering wearable keyboards for more precise interactions.

Article 9

Human Assistance Robot using Android Technology for Human Robot Interaction:
http://jset.sasapublications.com/wp-content/uploads/2017/09/6702637.pdf

This article addresses the growing demand for devices in aging societies by introducing a robotic guide designed to help elderly and mobility-impaired people. Users can send commands to the robot using Bluetooth by using an Android app on their smartphone. The application offers user-friendly functionality and is designed to interact with a wide range of smart devices. The robot is based on a BOEbot platform, which is renowned for its lightweight, compact design and suitability for navigating tight outdoor settings. The device intends to provide people who require mobility assistance with a more straightforward, portable, and effective solution.

Robot 1

WristMorse is a Morse code trainer and communicator designed for the M5StickC Plus device.

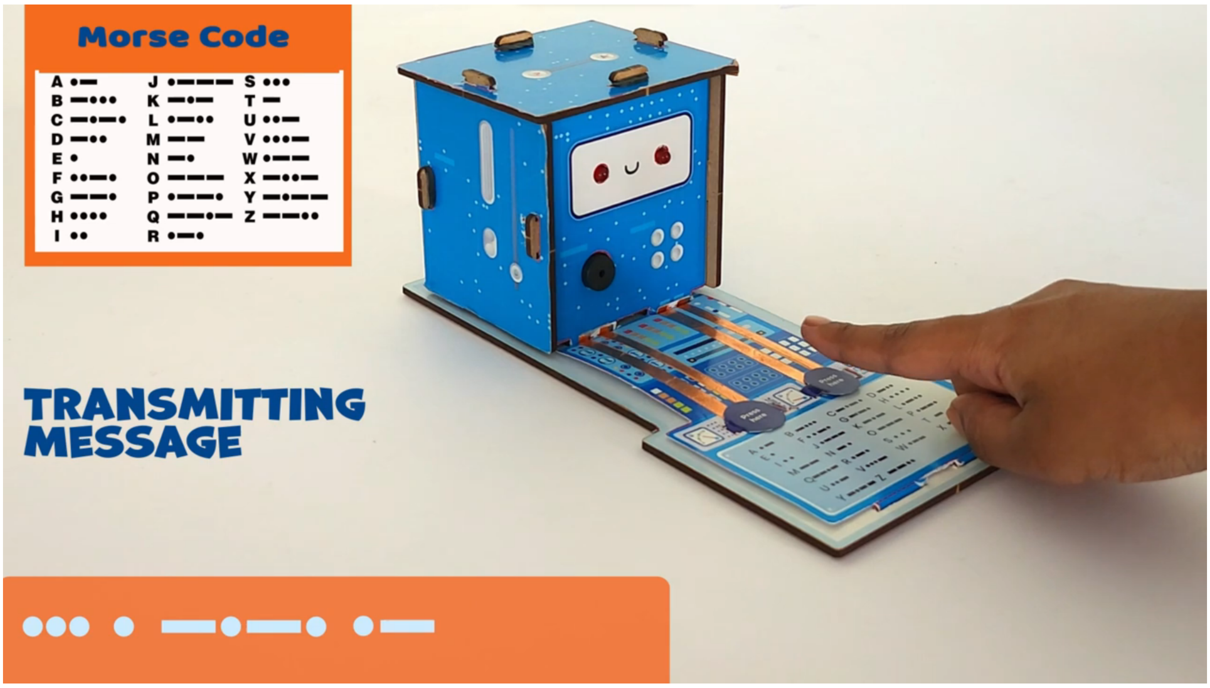
This wearable wrist device allows users to practice and write in Morse code with a user-friendly interface.

The device features multiple modes for practicing, sending Morse code messages using a touch paddle and CW keyer and a bluetooth keyboard. Moreover, it is adapted to send Morse code messages over Wi-Fi (ESP-NOW communication).

While our robot has no clear design yet, this project served as a good example of a great robot design.

Robot 2

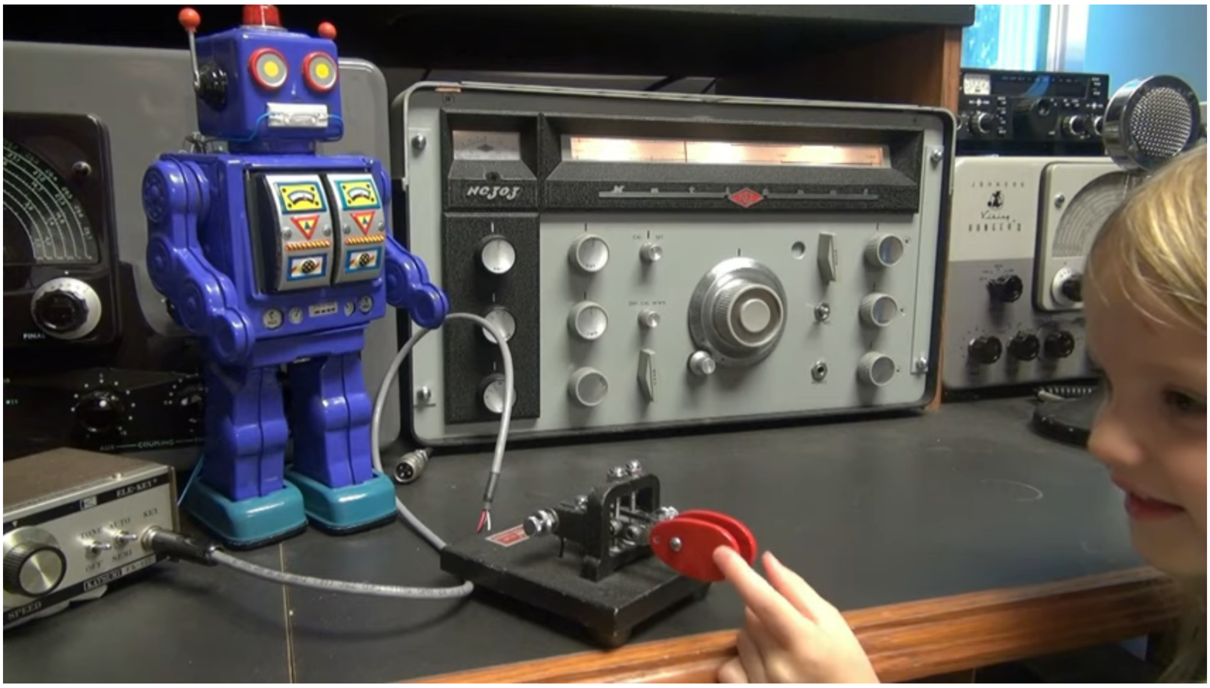
Morse Code Robot | STEM Electronics for Kids | DIY Electronic Toy



This robot introduces kids to the basics of electronics and communication through Morse code. It introduces the concept of Human-Robot Interactions to them. This robot typically allows them to assemble and program the robot to transmit and receive Morse code messages. It's an educational tool that promotes learning in a fun and engaging way, making it a valuable resource for young learners interested in this field. The user just has to tap the button for a split amount of time to indicate a dot, and hold it for a longer time to indicate a dash. A manual that comes with the robot explains what each sequence of dots and dashes means in the ABC alphabet.

Robot 3

BarneyBot | Barney Robot to learn Morse code



This robot named “BarneyBot” introduces children to Morse code by giving them instructions on how to type in their names for example. The little girl in the video tries it and follows the dot and dashes instructions given by Barney and spells out her name correctly in the end. It’s a practical example of robots built for teaching people Morse code in an interactive and entertaining way.

Conclusion

We are still unsure of the sensors that our robot will have, but this paper gives us some insight on how we could design a model that uses computer vision to recognize Morse code. The article also mentions the possibility of using computer vision to recognize other actions, but we believe that we could implement it in our robot without the need of cameras.