Touchless Hand Gesture Recognition ATM Based on Deep Learning Methodology

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1. Title

Touchless hand gesture recognition ATM based on deep learning methodology

2. Research Area

IMAGE PROCESSING

Deep learning for image processing is becoming much more crucial in the healthcare industry. The image processing of hand gestures is done in this study by doing a technical analysis of all the hand gesture images using a deep learning neural network. The input is a front depth sign picture and a front depth colour gesture image of the hand, and the usable information is returned as the reaction in the ATM for check account balances, withdraw or deposit money, and print a statement of transactions. In this research paper, Deep learning neural networks are used to classify hand signs or gestures. Hand gestures are a natural approach for humans to engage with special-purpose computers and electronic devices to do several tasks. To discover the hand gesture that is captured dynamically, deep learning is employed, which is an efficient image processing method.

3. Research Question

"To what extend building a precise touchless hand gesture ATM can be achieved using deep learning methodology to avoid the outbreak of influenza virus due to contacting the surfaces of the ATM contaminated by the virus?".

This research mainly focuses on improving the precision and the tracking position accuracy of the hand gesture recognition model and implementing it in ATMs to create a contactless experience. The prototype of the ATM will be shown as a web application.

4. Value

Coronavirus illness (COVID-19) is currently one of the most contagious diseases of the twenty-first century. Unlike any other disease, COVID-19 is more dangerous and has many risk factors associated with it. That said, if the virus continues to exist amongst us, it is only proper to steer clear of sick individuals and most frequently touched surfaces, which could carry the infections. It is evident that there is a high probability of people are worried about using the automated teller machines (ATM) right now for fear of contracting COVID-19.

The purpose of this project is to shorten the processing time of ATMs and lowering the risk of infection transmission by building a contactless hand gesture control mechanism in ATM computers. In a recent survey, the World health organization says that the probability of transmission of covid virus or other influenza viruses through ATM surface is high. The virus stays in the ATM screen or keys surface for up to 72 hours. This influenza virus is spreading rapidly because contacting surfaces contaminated by the virus. By implementing contactless ATMs, the possibility of disease transmission due to the contact of ATMs can be eradicated. This ensures the safety of the people who uses the ATM and low risk for getting an infection. In addition to that, it also is a great supporting device for disabled persons.

5. Justification

In this research paper, the author used a two-stage deep convolution neural network (CNN) For accurate colour-based hand gesture recognition. In the recognition stage, they implemented a two-stream CNN architecture with a colour image, and its pseudo depth image is proposed to improve the colour image-based recognition performance. (J. Liu et al. 2019).

A neural network learning-based model is described in this work to enhance the accuracy of EMG-based hand gesture detection. The author used Five convolution layers in a parallel design. When utilizing a convolution neural network, the findings show a small improvement. (K. Xing et al. 2018). The author used flex sensors and Force Sensing Resistors to determine the stretching of fingers and gesture information in this research paper. An Arduino Micro transmits the detected data to the

computer. The author achieved an overall efficiency of the hand gesture recognition for a single subject by using the Support Vector Machine and the Dynamic Time Wrapping (X. Chu et al. 2021).

5.1 Feasibility

Deep neural networks were successfully employed to recognize and classify hand gestures in the studies mentioned above. There was quite a range of approaches that are implemented in these publications. For this study, we will utilize TensorFlow to increase the number of steps in the neural network, allowing the model to perform better in terms of hand gesture recognition and tracking position accuracy.

5.2 Measurable and Significance

In this study, the model's precision will be improved, and the tracking position accuracy will be greater when compared to existent comparable techniques and the above research. In contemplation of this research, the hand gesture recognition ATM will be implemented as a web application. The web application is just the prototype for the hand gesture recognizing ATM.

5.3 Ethical

In this research, the dataset for every isometric and isotonic hand gesture configuration is captured using multi-threaded camera capture using OpenCV which is an open-source computer vision library.

Reference

K. Xing et al., "Hand Gesture Recognition Based on Deep Learning Method," 2018 IEEE Third International Conference on Data Science in Cyberspace (DSC), 2018, pp. 542-546, doi: 10.1109/DSC.2018.00087.

J. Liu, K. Furusawa, T. Tateyama, Y. Iwamoto, and Y. Chen, "An Improved Hand Gesture Recognition with Two-Stage Convolution Neural Networks Using a Hand Color Image and its Pseudo-Depth Image," 2019 IEEE International Conference on Image Processing (ICIP), 2019, pp. 375-379, doi: 10.1109/ICIP.2019.8802970.

X. Chu, J. Liu, and S. Shimamoto, "A Sensor-Based Hand Gesture Recognition System for Japanese Sign Language," 2021 IEEE 3rd Global Conference on Life Sciences and Technologies (LifeTech), 2021, pp. 311-312, doi: 10.1109/LifeTech52111.2021.9391981.