

Air Writing Detection and Recognition

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Abstract: *Air Writing, a groundbreaking concept, revolutionizes the act of writing by allowing users to create characters or words in free space through hand or finger movements and coloured light. Unlike traditional pen-and-paper methods, this approach replaces pen-up and pen-down motions with colour shifts or light toggling to indicate the beginning and end of characters or words. The Air Handwriting Recognition project combines computer vision object tracking with handwriting recognition using machine learning techniques. Using a computer's webcam, the system tracks the characters users write in the air, following a user-selected colour with the aid of a mask. These tracked movements are then transcribed onto a virtual canvas, mimicking a plain whiteboard. The resulting canvas image serves as input for the recognition model, employing machine learning to interpret air-written words and characters. The integration of colour-based tracking and advanced recognition algorithms ensures the avoidance of plagiarism, making Air Handwriting Recognition a cutting-edge solution for hands-free writing in the digital realm.. A brief history of CNN and other approaches to characters detection and recognition are discussed in this paper*

Keywords: Air Writing, Handwriting Recognition, Machine Learning Techniques, Computer Vision Object Tracking, Convolutional Neural Network (CNN)

REFERENCES

- [1] G. Tauschek, "Reading machine," U.S. Patent 2 026 329, Dec. 1935. [23] P. W. Handel, "Statistical machine," US. Patent 1915 993, June 1933.
- [2] Amma C, Georgi M, Schultz T. Airwriting: Hands-free mobile text input by spotting and continuous recognition of 3D-space handwriting with inertial sensors. In 2012 16th International Symposium on Wearable Computers 2012 Jun 18 (pp. 52-59). IEEE.
- [3] Shalini M, Indira B. Automatic Character Recognition of Indian Languages—A brief Survey. International Journal of Innovative Science, Engineering & Technology. 2014 Apr;1(2):131-8.
- [4] Hsieh CH, Lo YS, Chen JY, Tang SK. Air-writing recognition based on deep convolutional neural networks. IEEE Access. 2021 Oct 21;9:142827-36.
- [5] Ahmed S, Kim W, Park J, Cho SH. Radar-Based Air-Writing Gesture Recognition Using a Novel Multistream CNN Approach. IEEE Internet of Things Journal. 2022 Jul 8;9(23):23869-80.
- [6] Wang C, Liu J, Chen Y, Liu H, Xie L, Wang W, He B, Lu S. Multi-touch in the air: Device-free finger tracking and gesture recognition via cots rfid. In IEEE INFOCOM 2018-IEEE conference on computer communications 2018 Apr 16 (pp. 1691-1699). IEEE.
- [7] Anjaneyulu P, Jampaiah Y, Karthik R, Vijetha T. Air writing recognition modeling and recognition of characters, words and connecting motions. In 2017 International Conference on Intelligent Sustainable Systems (ICISS) 2017 Dec 7 (pp. 1112-1115). IEEE.
- [8] Kumar P, Saini R, Behera SK, Dogra DP, Roy PP. Real-time recognition of sign language gestures and air-writing using leap motion. In 2017 Fifteenth IAPR international conference on machine vision applications (MVA) 2017 May 8 (pp. 157-160). IEEE.
- [9] Tsai TH, Hsieh JW, Chen HC, Huang SC. Reverse time ordered stroke context for air-writing recognition. In 2017 10th International Conference on Ubi-media Computing and Workshops (Ubi-Media) 2017 Aug 1 (pp. 1-6). IEEE.

- [10] Tan X, Tong J, Matsumaru T, Dutta V, He X. An End-to-End Air Writing Recognition Method Based on Transformer. IEEE Access. 2023 Oct 4.
- [11] Zhang H, Chen L, Zhang Y, Hu R, He C, Tan Y, Zhang J. A wearable real-time character recognition system based on edge computing-enabled deep learning for air-writing. Journal of Sensors. 2022 May 4;2022.
- [12] Ye Z, Zhang X, Jin L, Feng Z, Xu S. Finger-writing-in-the-air system using Kinect sensor. In2013 IEEE international conference on multimedia and expo workshops (ICMEW) 2013 Jul 15 (pp. 1-4). IEEE.