Wenzhou-Kean University
CPS 4951 (SENIOR CAPSTONE)

Term Project Proposal: Pen Grip Pose Detection based on MideaPipe

Keming Xing **1162866**
Yuchao Xi **1162956**
Hantao Xie **1162962**
Fucheng Xie **1162814**
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PROJECT GOAL AND SCOPE

The main goal of the project is to develop a system for detecting and analyzing handwriting gestures using MediaPipe, an open source framework for building machine learning solutions. The scope of the project includes:

- Implementing hand detection and tracking using MediaPipe's Hand Tracking solution to locate and track the position and movement of the hand.
- Developing a model for recognizing different handwriting postures, such as pen grip variations and hand orientations.
- Integrating real-time feedback to provide users with guidance on improving their handwriting posture.
- Creating a user-friendly interface for visualizing and analyzing handwriting posture data.

The project aims to assist individuals, especially child and professionals who frequently write or draw, in improving their handwriting techniques by providing actionable insights into their posture and grip.
(There are other models available, and mediapipe is not the only one)

BACKGROUND/LIT REVIEW

Handwriting posture plays a crucial role in the legibility, speed, and comfort of writing. Improper posture can lead to discomfort, fatigue, and even long-term health issues such as repetitive strain injuries(Blackburn, 2001). Various studies have been conducted in the field of handwriting analysis and ergonomics to understand the impact of posture on writing performance and to develop techniques for improving posture.

CASE STUDY

Nagaraju (2022) used the MediaPipe framework to develop a digital handwriting recognition system that can detect hand gestures and analyze writing gestures. This provides the technical basis for this study.
Zhang et al. (2020) developed a real-time hand tracking system using the MediaPipe hand tracking module. The system can locate and track hand position and movement. This provides a methodological basis for this study.
Tao et al. (2018) developed an American Sign Language alphabet recognition system using convolutional neural networks and multiview data augmentation. Their research demonstrated hand gesture tracking and recognition capabilities using MediaPipe and machine learning algorithms. This provides an algorithmic basis for this study.

TAKE-HOME DELIVERABLE

Upon completion of the project, the following deliverables will be provided:

- A fully functional handwriting posture detection system implemented using MediaPipe.
- Documentation and user guides explaining the system's functionality, usage instructions, and integration guidelines.
- A research report summarizing the methodology, results, and findings of the project, including insights from the literature review and case study.
- Source code and model weights for the developed system, released under an open-source license to encourage further research and development in the field.
- The take-home deliverables will enable stakeholders, including researchers, educators, and developers, to understand, utilize, and build upon the outcomes of the project.

REFERENCES
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[3] Zhang, F., Bazarevsky, V., Vakunov, A., Tkachenka, A., Sung, G., Chang, C.-L., & Grundmann, M. (2020, June 18). MediaPipe hands: On-device real-time hand tracking. arXiv.org. https://arxiv.org/abs/2006.10214
[4] Tao, W., Leu, M. C., & Yin, Z. (2018). American sign language alphabet recognition using convolutional neural networks with Multiview Augmentation and inference fusion. Engineering Applications of Artificial Intelligence, 76, 202–213. https://doi.org/10.1016/j.engappai.2018.09.006.

Appendix

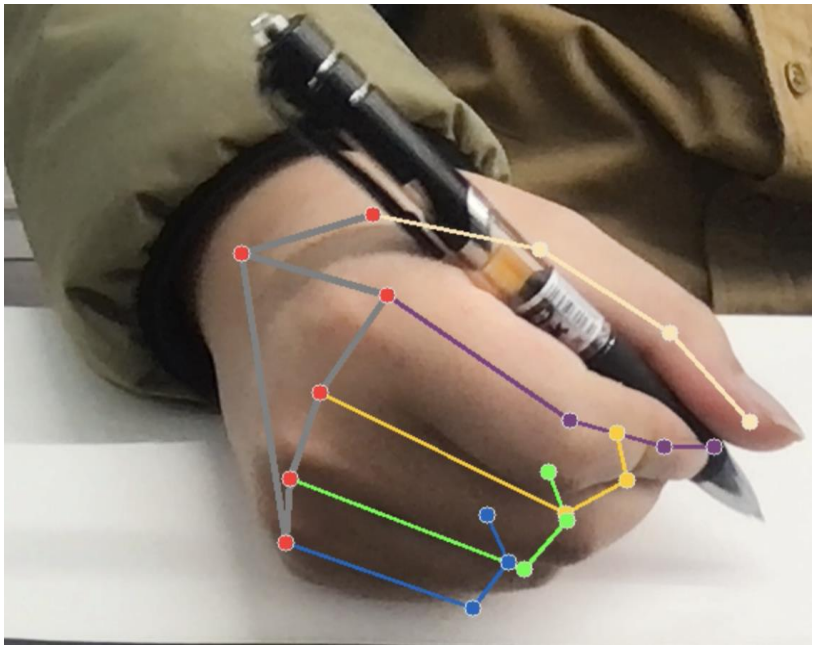

Fig.1. Example of Mediapipe hand node detection