ASL Radar Data Collection through ML Equipped Videogame

Megan Brown[1], Dr. Sevgi Gurbuz[1], Dr. Evie Malaia[2]

[1]UA Department of Electrical and Computer Engineering, [2]UA Department of Communicative Disorders

Introduction

- Dr. Gurbuz's team currently uses a simple graphical user interface (GUI) to teach middle school aged students machine learning (ML) concepts. The GUI allows the user to collect radar data of American Sign Language (ASL). The radar spectrogram of the user's sign is inputted into the ML model, which then compares the sign to existing cases. There are limitations to this method: a team member must oversee the data collection and teach the user how to use the GUI.
- **A new independent system could collect unlimited natural signing data on a scalable level.**

Aim

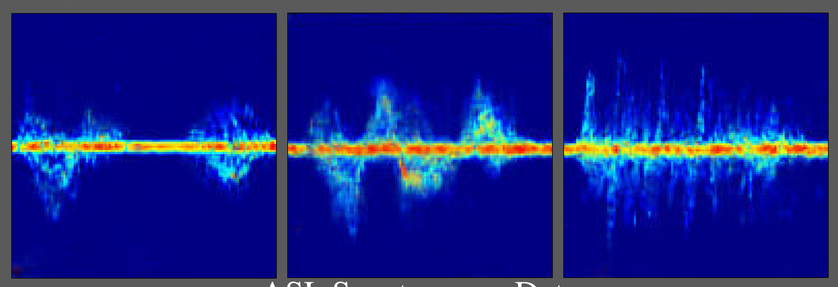
- Start construction of a program that can:
  - Collect ASL radar data samples
  - Teach users about ML
  - Be adapted to observed or unobserved data collection

Methods

- Interface: Unity Game Engine
- Radar connection: Unity to Python API, existing radar board GUI code
- ML connection: existing ML model code

Figure 1: Game start menu

Figure 2: Sign selection menu



ASL Spectrogram Data

"You" "Breath" "Walk"

Results

- Created game interface with radar/ML compatibility
- ML educational information in character dialogue

Conclusion

- Foundational game graphics – intuitive interface
- Limited functionality – radar/ML components not connected yet
- Structured with later improvement in mind

Impact

- Data collection without a team member present will allow recording of samples at significantly less cost
- Increase in access to ASL radar data will lead to advancements in ML ASL recognition model
- Improvements in data collection method could lead to ability to collect continuous signing data

Contact

- Megan Brown: mnbrown7@crimson.ua.edu

Acknowledgements:

- Many thanks to Emre Kurtoglu and Ladi Adeoluwa, and my mentors Dr. Gurbuz and Dr. Malaia.
- This material is based upon work supported by the National Science Foundation under Grant No. 1852161 and Grant No. 1932547.

References

- M.M. Rahman, et al. "Effect of Kinematics and Fluency in Adversarial Synthetic Data Generation for ASL Recognition with RF Sensors." 2022.
- E. Kurtoglu, et al. "ASL Trigger Recognition in Mixed Activity/Signing Sequences for RF Sensor-Based User Interfaces." 2021.