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The SignAge Corpus: Recording older signers with low cost motion capture devices

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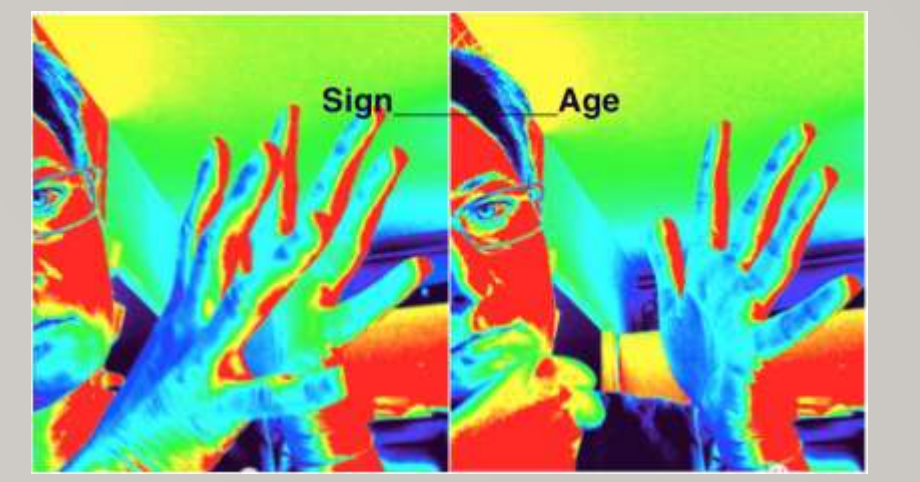
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I. Introduction

Low cost motion capture (mocap) devices

For almost ten years, the marketing of low cost motion capture devices such as the Microsoft Kinect sensor has enabled numerous studies in real-life settings (Mousavi Hondori & Khademi, 2014; Webster & Celik, 2014; Springer & Yoge Seligmann, 2016). Whereas most of this work with older people is studying gait and fall risks (see Rougier, Auvinet, Rousseau, Mignotte, & Meunier, 2011 for example), we propose to focus on the building of the SignAge corpus dedicated to the study of signing in older deaf participants with low cost motion capture devices.

Impact on sign language studies

Up to now, a (preferably multi-)camera setup was considered a basic requirement in sign language studies, sometimes completed with much more intrusive or expensive equipment such as data gloves, optical motion capture systems (Channon, 2015, p. 132–133). But latest technology advancements allow us to quantify 3D-motions and their time derivatives at a reasonable price. Our newly built SignAge corpus of interactions between older deaf signers in LSF takes advantage of such advancements.

2. Building the SignAge corpus

2 digital camcorders, 2 Noitom Perception Neuron body straps, 1 Kinect

Data flows	Equipment
Video	2 digital camcorders (as in Bolly & Boutet, 2016)
Mocap 1	2 Noitom Perception Neuron body straps with 25 IMU
Mocap 2	Kinect v2 depth sensor

5 data flows

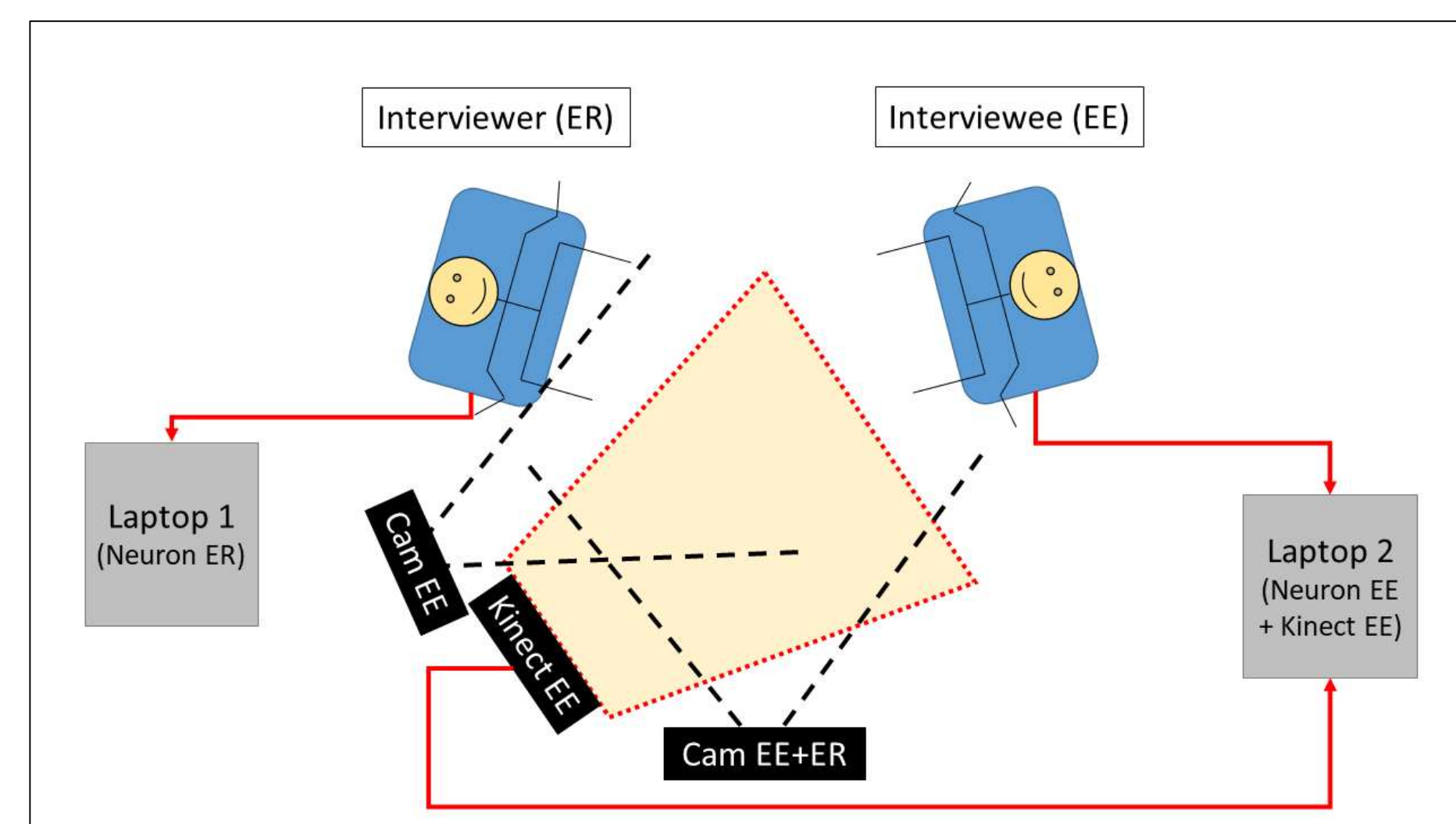
2 video streams at 25 fps
2 mocap streams (Neuron) at 60 fps
1 mocap stream (Kinect) at 30 fps

2 acquisition softwares

Mocap 1: Axis Neuron
Mocap 2: Brekel Pro Body v2

A collection combining video (2D) and biomechanical (3D) data

Setup Cameras, Kinect and Neuron





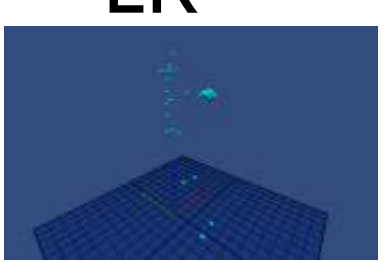
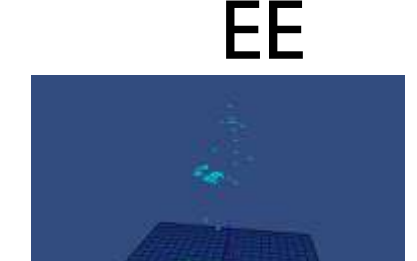
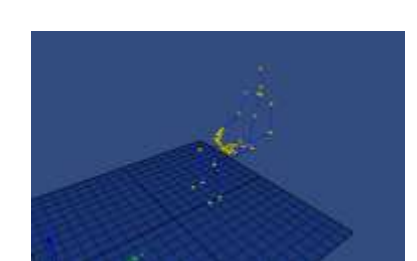
Equipment and participants layout during the data gathering

The SignAge team in situ



Real-world setup viewing

3. Data workflow

Flow	(1) Acquire	(2) Reformat and clean	(3) View	(4) Sync	(5) Annotate and analyse	(6) Assess quality		
						Time/Space		
Video	ER+EE 	.mts (HQ) .mp4 (LQ)	ELAN	Based on start and end claps for both ER and EE	ELAN	✓	✓	
Video	EE 	.mts (HQ) .mp4 (LQ)	ELAN		ELAN	✓	✓	
Mocap Neuron	ER 	Axis Neuron, Python b3d .bvh → .c3d	Motion Inspector		Matlab MoCap Toolbox QoM, Pos, Vel, Acc	✓	✓	
Mocap Neuron	EE 	Axis Neuron, Python b3d .bvh → .c3d	Motion Inspector		Matlab MoCap Toolbox QoM, Pos, Vel, Acc	✓	✓	
Kinect	EE 	Brekel Pro Body v2 .bvh → .c3d	Motion Inspector		60.6 Hz	Drift	✓	✓
					Matlab MoCap Toolbox QoM, Pos, Vel, Acc	Unreliable	✓	

Summary of the steps necessary to analyse the 5 data streams
Hypotheses: Correlation age ↔ Articulatory segment involved (ER: Interviewer, EE: Interviewee)

4. Conclusions

+ Low cost, portability, ease to get accustomed to wearing the body straps
– Limits in space resolution (Neuron) and time resolution (Kinect) → need more data to confirm Kinect and Neuron might still be an interesting choice to get usable additional 3D data in aging studies

In progress:

- ◆ Short term: Compare accuracy of Neuron mocap data with simultaneously recorded OptiTrack Prime 13 mocap data
- ◆ Longer term: Develop annotation support tools; use OpenPose detection library

6. Acknowledgements

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- Webster, D., & Celik, O. (2014). Systematic review of Kinect applications in elderly care and stroke rehabilitation. *Journal of NeuroEngineering and Rehabilitation*, 11, 108.

Websites (equipment, softwares and corpus)

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- Microsoft Kinect: <https://en.wikipedia.org/wiki/Kinect>
- OptiTrack Prime 13: <http://www.optitrack.com/products/prime-13/>
- Axis Neuron: <https://neuronmocap.com/content/axis-neuron-software>
- Brekel Pro Body v2: <https://brekel.com/brekel-pro-body-v2/>
- Motion Inspector: <http://actionlab.fr/ressources-logicielles/motion-inspector/>
- MATLAB: <https://www.mathworks.com/products/matlab.html>
- MoCap Toolbox: <http://tinyurl.com/mocaptoolbox>
- ELAN: <https://tla.mpi.nl/tools/tla-tools/elan/>
- CorpAGEst: <https://corpigest.wordpress.com/>