

Emotions in Sign Language within the BIGEKO project

Fabrizio Nunnari, Patrick Gebhard - German Research Center for Artificial Intelligence (DFKI)

Marco González, Pamela Perniss - University of Köln

Annalena Aicher, Elisabeth André - University of Augsburg

The BIGEKO project (<https://www.interaktive-technologien.de/projekte/bigeko>) aims at developing a bi-directional translation system between written German and DGS for applications in public services. Recognizing and expressing emotions in sign language (SL) is one of the key components of the project. The automated recognition of emotions of human signers and the animation of signing avatars that express emotions is challenging because the face and body of signers does not only communicate emotions, but at the same time convey meaning. Thus, existing work on recognizing and generating emotions is not directly applicable. Here, we describe two of the BIGEKO research lines.

Technologies and challenges for facial expressivity in SL. One of the most important and time-consuming problems in animating signing avatars is how to animate their face. “Hand-animation” is a digital artistic process, requiring specialized personnel. Employing face motion capture hardware requires both skilled operators and expensive equipment. To democratize the generation of new SL content, we are investigating on the use of open-source deep learning-based research software able to animate avatars faces from the analysis of plain RGB videos. Popular libraries like MediaPipe [MediaPipe] are trained on facial expressions of casual expression of emotions and fail to capture the full expressivity in SL videos. We are employing EMOCA (Danecek, 2022), which is, still with some limitations, better suited for emotional expressions. EMOCA described face motion in terms of proprietary *blend-shapes*. To map the EMOCA blend-shapes to the ones of an ad-hoc avatar, we are developing a blend-shape transfer method based on a semi-artistic approach based on manual editing UV maps [TransferShapeKeysViaUV].

DGS-Fabeln-1: a SL corpus for German fairy tales. Training machine learning models to recognize and synthesis emotions in SL requires training data. As of today, very limited material addresses explicitly the problem of emotions and SL. For example, the FePh dataset [Alaghband, 2021] is a selection of frames from the (un)popular RWTH-PHOENIX-2014-T dataset [Camgoz, 2018]: a dataset criticized by the linguistic research community for its low representativeness of the real SL of everyday use. To fill the gap between datasets tailored for machine learning tasks and datasets aiming at preserving DGS as a culture [Hanke, 2020], we created DGS-Fabeln-1 [Nunnari, 2024]: a corpus of seven fairy tales in DGS, intrinsically carrying emotional content, for a total of 1h 32 minutes of native DGS performed in front of an observer and recorded by 7 synchronized cameras at different angles (See Figure 1) plus one for the observer back-channeling.



Figure 1 - A frame from the DGS-Fabeln-1 dataset

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