Find the Sign: Signing as Input for Sign Language Dictionary Search Using Pose Estimation

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Most sign language dictionaries allow the users to search for a sign through a written gloss, a unique identifier that by definition refers to a sign. In some cases, the lexica support formal parameter search for a target sign, for instance, its handshape, movement and location. The Flemish Sign Language (VGT) (Van Herreweeghe, Slembrouck, and Vermeerbergen 2004) the Swedish Sign Language (Institutionen for Lingvistik 2009) and the Danish Sign Language (Center for Tegnsprog 2008) dictionaries are some examples. In these, after the input, the user is offered a set of signs that match the selected properties which can be then viewed individually.

Even though sign search functionality based on a sign parameter value is a convenient attribute of sign language lexica, dictionary compilers still have to link these values to the videos. Even then, only the signs that fully match the searched query are retrieved, and there is no concept of an ordered set of results that partially match the query.

In the demonstration, we will present the main features of the "Find the sign" tool for video-based sign search functionality using the Ghanaian Sign Language dictionary as a case study. We will first show how we are able to acquire the position of the dominant hand by using PoseNet (Tensorflow/Tfjs-Models), a pose estimation framework that runs in real-time (Figure 1). Subsequently, we will illustrate how Dynamic Time Warping (DTW) can be used to quantify the variation of the trajectory of the dominant hand of the user with all the paths in the video-based lexicon. Finally, we will show that such a pipeline is able to predict the matching sign with 87% accuracy at the Top-10 ranking level (Figure 2).
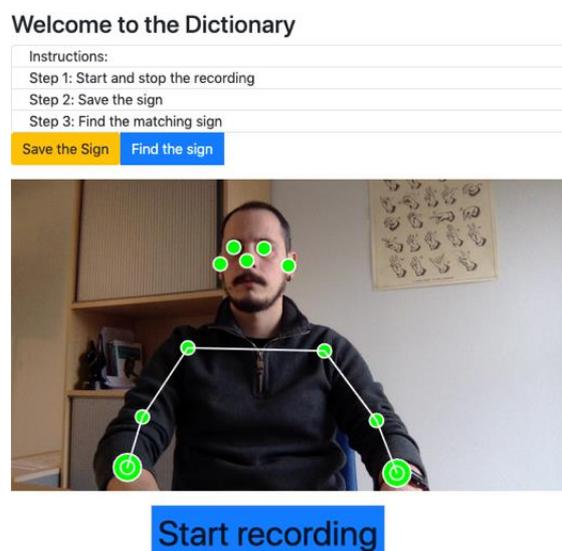

Figure 1: Real-time pose estimation in order to acquire the dominant hand trajectory.

Figure 2: Sign matching after utilizing Dynamic Time Warping.

The tool has been created as a python module as well as a web application using the Django web framework which makes it easily re-usable in any kind of sign language. Since there is no training involved whatsoever, our tool can be used also for gestural purposes by simply replacing the videos in the appropriate directory.

References

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