# Comparison of six electromyography acquisition setups on hand movement classification tasks

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Compares aquisition setup (brands of sEMG electrode inclusind delsys, total number of electrodes and their positions) for the aquisition of more than 50 hand movement for the same classification tasks

Need for benchmarke database

Classification problem (between small number of presets gestures)

**Ninapro data acquisition protocol:** <https://www.nature.com/articles/sdata201453>

* Used to place the electrodes
* Identify the main activity spots by palpation on the forearm
* Right hand for right handed (left for left handed)
* Exercices A B and C

Signal processing done before analysis

Effect of the experimental conditions on the signal amplitude

* They conclude that the experimental condition did not affacts the amplitudes of the signal significantly

# Simultaneous Hand Gesture Classification and Finger Angle Estimation via a Novel Dual-Output Deep Learning Model

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When handling actual tasks by hand, multiple fingers often work in concert. The Taiwanese Sign Language includes 50 fundamental gestures [24], and many of them are the linkage of multiple fingers. Most studies about interlocking multiple fingers used static positions. However, we studied the dynamic process of finger movement. The dynamic recognition process of multiple fingers is complicated because the flexion angles of different fingers are different, and it involves a lot of research on hand anatomy. Multi-finger movements include thumb opposition, multi-finger flexion/extension, multi-finger adduction/abduction, etc. These multi-finger movements can be decomposed into multiple single-finger movements. Analyzing single-finger movements is the basis of multi-finger movements. At present, most studies on finger movement are based on single finger movement [15,25]. Therefore, we chose 5 single fingers as the gesture set to identify the moving fingers and estimate the finger joint angle

**Only single finger movements**

* + 1. Experiment Protocol Ten subjects (8 male, 2 female, age: 22–26 year, height: 166–184 cm, weight: 57–76 kg, wrist circumference: 15.3–16.9 cm) participated in the experiment. All subjects gave their informed consent in accordance with the Declaration of Helsinki before they participated in the study. During each trial, subjects flexed/extended one finger at the MCP joint repeatedly at their self-selected frequency. The minimum and maximum angles of thumb were required to be 0◦ and 55◦ , and of other 4 fingers were required to be 0◦ and 90◦ . Some subjects could not bend their fingers to 90◦ [26]. Therefore, the actual maximum and minimum angles were decided by the subjects themselves. Fingers were flexed in the order of thumb, index finger, middle finger, ring finger, and pinky finger, and the data were encoded into 5 categories and recorded. We used a data glove (5DT Data Glove 14 Ultra, South Africa, Gauteng, Pretoria), which is widely used and regarded as the gold standard for measurement in the estimation of finger joint angles, to record the real finger angle relative to the ground at the same time [14]. Each finger was flexed/extended for 25 s, there were 5 fingers per trial (Figure 2), and the sampling frequency was 40 Hz, so 25 × 5 × 40 = 1000 samples were collected per trial. Each subject performed 10 trials [27], so 10 × 10 = 100 trials were performed. Thus, there was a total of 1000 × 100 = 100, 000 samples.

# Identification of forearm skin zones with similar muscle activation patterns during activities of daily living

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Conclusion: The number of sEMG sensors could be reduced from 30 to 7 without losing any relevant information, using them as representative spots of the muscular activity of the forearm in simulated ADL. This may help to assess muscle function in rehabilitation while also simplifying the complexity of prosthesis control.