**RELATED WORK**

We first review the interaction techniques of surface EMG (sEMG). Then we explore individual interaction techniques developed for neck input devices. We further summarize various device-device that demonstrate examples of using multiple devices to create new interaction possibilities.

**Interaction Techniques for Surface EMG (sEMG)**

sEMG sensing has explored in previous research for sensing muscle emotion through facial muscle activity[1], and forearm muscle activity[2]. The sEMG sensing via facial muscle can distinguish the emotional state with minor movements or even no visible representation, since EMG signal is sensitive enough. The sEMG sensing via forearm muscle activity explores gesture of five fingers. The work can distinguish different position and pressure, as well as tapping and lifting of fingers.

**Interaction Techniques for Neck-worn Device**

The building of muscle-computer interfaces using neck motions are explored through the feasibility of building the motion system [3], and sensing surface EMG by measuring tongue muscle activity [4]. Also a wearable neck-cuff system can monitor real-sleep. [5] The first work built a real-time surface EMG sensing system, and investigates the feasibility based on recognize the motion of neck and shoulder. The surface EMG sensing via tongue muscle activity can differentiate six tongue gestures, left, right, up, down, protrude and rest with measuring muscle movements of lower face and neck. This work developed a non-invasive, wearable neck-cuff system to monitoring the quality of sleep. It can detect the obstruction sleep disorder.

**Device-to-Device Interaction**

The work is a wearable master device for disabled who has spinal injury who can only move neck and shoulders.[6] The system allows the disabled to control the wheelchairs. It used a 2-DOF input device for tracking the movement of shoulder, and past the input into the wheelchairs.

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