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LOW-COST, BLUETOOTH SURFACE ELECTROMYOGRAPHY FRONT-END

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The long-term goal of this project is to increase the availability of surface electromyographic (sEMG) data by developing a low-cost, wireless EMG-acquisition device.

Currently available sEMG acquisition devices are expensive and bulky, making clinical translation and product commercialization difficult. Advances in Bluetooth and microcontrollers, coupled with new analog-digital converters, allow the development of small, low-cost, wireless sEMG acquisition devices. The objective of this research is to design, implement and validate an inexpensive system to acquire and wirelessly transmit sEMG data.

The prototype system is composed of an inexpensive microcontroller (Arduino Due), Bluetooth module (HM-10), and an eight-channel analog-to-digital converter (Texas Instruments ADS 1298). Preliminary tests show that the system can acquire sEMG at 1 kHz with a signal-to-noise ratio of 3 (comparable to market devices). Processed sEMG (e.g., rectified data over a 300-ms window) can be sent to a smartphone in real-time (500 Hz). Future work involves reducing the size and cost. Preliminary results suggest that the finalized system can be 1200 mm² and around \$55. This research will help translate and commercialize sEMG applications, ranging from myoelectric prosthetic control to gesture-controlled smart-home devices.