

## **Design and calibration of pinch force measurement using strain gauge for post-stroke patients**

### **ABSTRACT**

Two fingers strength is an indicative measurement of pinch impairment. Conventionally, Fugl Meyer Upper Extremity Assessment (FMA-UE) is the primary standard to measure pinch strength of post-stroke survivors. In literature, the evaluation method performed by the therapist is subjective and exposed to inter-rater and intra-rater reliabilities. Recently, force-sensing resistors were implemented to measure two fingers force, but these sensors are subjected to nonlinearity, high hysteresis, and voltage drift. This paper presents a design of pinch force measurement based on the strain gauge. The pinch sensor was calibrated within a range of between 0 N to 50 N over a pinching length of 20 mm with a linearity error of 0.0123% and hysteresis of 0.513% during the loading and unloading process. The voltage drift has an average of 0.24% over 20 minutes. The pinch force measurement system reveals an objective pinch force measurements in evaluating the rehabilitation progress of post-stroke patients.

**Keyword:** Post-stroke rehabilitation; Fugl Meyer; Pinch force; Objective assessment; Strain gauge; Arduino Due