Self-abrading servo controlled electrode

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Minimising electrode contact impedance is crucial for accurate physiological measurements, particularly in electrical impedance tomography. Electrodes applied to skin require contact impedance (< 5 kΩ per electrode) necessary for quality data. Currently, these requirements are best met with EEG cup electrodes, applied by hand by a trained technician, and localised via photogrammetry. This process is time consuming, requires training personnel and impractical in acute situations. There is a need therefore, to automate this process without requiring specific skills or intervention from clinical staff. This requires knowledge and optimization of electrode skin contact impedance and pressure, and amount of abrasion. To characterize these values a large scale electrode prototype has been constructed of a single electrode "unit". With this prototype, contact impedance between a reference and actuated electrode can be decreased below a chosen threshold impedance of 5 kΩ within 10 seconds. Currently, experiments are being performed to find the specifications required before a miniature version can be designed. These specifications include minimum and maximum contact pressure, and number of rotations. The resultant specifications will determine the extent of the miniaturisation and the necessary complexity of the final design to be implemented clinically.