TremorChecker: An Affordable and Convenient Contactless Early Screener for Parkinson's Disease Based on E-field Sensing

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Parkinson's disease (PD) is the most common degenerative disease of central nervous system among elderly people, with an estimate of over 8.5 million patients in 2019. But currently, only 40% of PD patients in China are diagnosed timely in the early stage of their disease, due to the current limitation of expensive pricing and difficult operation present in current PD diagnosis methods. Aiming at this problem, this paper designs a device that utilizes quasi-static electrical field sensing and tremor analysis methods to perform early screening of PD without physical contact to the users: TremorChecker. Using the COMSOL® simulation software, the author first verified the feasibility of detecting finger tremor through the deviation in electric potential in an electrostatic field introduced by disruption of human fingers. In reference to the simulation model, TremorChecker is developed and then put into a controlled experiment with PD patient and an open screening experiment in residential community to find the accuracy of TremorChecker in detecting PD. With its ability to perform tremor analysis and early screen PD without physical contact, TremorChecker is found to be more feasible, affordable, and convenient in performing large-scale early screening of PD compared to traditional methods, filling a gap in current territory.

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