PlantFeel: A Real-Time System to Translate Plant Bioelectrical Signals Into Visual Emotional Feedback

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Current plant monitoring systems often rely on reactive visual inspections or invasive analysis, detecting issues only after physiological damage has occurred. To address this, we present a non-invasive, real-time framework to detect early physiological stress in six Epipremnum aureum specimens, as bio-potential fluctuations provide unique waveform signatures long before physical symptoms emerge. To capture this data, we engineered an integrated system using an Arduino-based unit and an AD8232 analog front-end for high-sensitivity acquisition. After applying digital filters to eliminate environmental noise, we stream the processed data through a Web Serial API to an interactive dashboard featuring a dynamic digital twin. We evaluated the system under baseline, mechanical, salinity, and drought conditions to prove its sensitivity. Specifically, signal volatility (Std Dv) surged from a mechanical baseline of 7.25 and a healthy average of 44.33 to 73.69 under salinity stress and 72.73 during drought, marking a significant physiological shift. This framework is ideal for live applications in greenhouse and hydroponic environments, where sentinel plants act as early-warning nodes, enabling automated responses that advance sustainable agriculture.

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