TalkiEVBot - An Educational Support Robot for Children With Speech Disorders

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Speech disorders such as stuttering, articulation errors, and atypical vocal patterns affect millions of children worldwide, limiting communication and confidence. Traditional therapy, while essential, often lacks interactivity, visual feedback, and consistent access-especially in resource-limited settings. This project presents TalkiEVBot-an anatomically inspired Robot that merges AI with a servo-driven facial system to assist children with speech disorders. Designed as a friend, companion, TalkiEVBot can communicate, detect, correct, and physically model speech - especially Vietnamese pronunciation - alongside emotional expressions in real time. The system integrates offline speech recognition, mechanical articulation, emotion rendering, and feedback. A quantized Whisper ONNX model performs local voice-to-text conversion. Speech irregularities are identified through a hybrid pipeline combining rule-based logic and AI-enhanced analysis. Two PCA9685 16-channel PWM drivers control 24 servo motors simulating facial muscles in the jaw, lips, tongue, eyebrows, and neck-producing accurate mouth shapes and expressions based on anatomical studies and basic robotic frame designs. Python-based software manages servo control, facial presets, lesson plans, and user interactions. Originally developed for Vietnamese-speaking children, TalkiEVBot has been expanded to support English vowels to reach more children globally. From 2,250 utterances by children aged 7-12, the system achieved an approximate 92% correction rate. Post-use evaluations showed improved fluency, articulation, and vocal quality, along with strong user engagement. TalkiEVBot exemplifies a promising, interactive, affordable and scalable solution for delivering speech therapy to children across the globe.

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