Stay Tuned: An Automatic Tuning Device for Violins

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Learning to play a violin is hard, and tuning the instrument can be a significant barrier for violin students. Having an instrument in tune during practices is crucial for correctly developing the audio and muscle memory of playing, yet it may take a lot of time, effort, and education before a player can master tuning. Consequently, most new violin students rely on expensive private tutors to tune the instrument regularly for them, and many students are forced to abandon the instrument because of this significant expense. This project solves this problem with an innovation that enables even the most inexperienced violin learners to automatically tune violins quickly and accurately. A microphone is used to collect the violin sound, and an original frequency identification method based on the Fast Fourier Transform and the Euclidean algorithm is employed to identify the actual frequency of the violin. A mechanical device built with 3D-printed components and servo motors then turns the violin's pegs to automatically tune the instrument. The control algorithms contain a software-based closed-loop control for feedback and self-learning algorithms for customizing the control parameters for different violins and conditions. Tests show that the prototype can comfortably fit the requirements on accuracy and time for violin beginners. The system is currently based on Raspberry Pi, but an app version with more functions is already in development to significantly reduce the cost of production in order to make it more accessible if put on the market. I believe my project is a good first step in making musical education more accessible for underprivileged communities, as it can potentially reduce the demand for expensive private tutoring.

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