eTouch Project: An Affordable Braille e-Reader with the Cloud-Based Digital Library for the Blind

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According to the World Health Organization, over 285 million people are visually impaired, and high rates of illiteracy among them are mainly a result of an unaffordable technology for reading. Braille displays are used to translate digital text to the refreshable tactile Braille. To raise touchable dots, current models use expensive specialized piezoelectric crystals, averaging in $72 per one Braille letter, thus making the final product unavailable for most of the world's customers. To find an alternative technology that preserves efficiency but significantly reduces hardware cost, we built prototypes of Braille displays using magnetic relays and stepper motors, and completed qualitative comparative analysis based on the user-predetermined factors such as speed, stability, stress resistance, power usage, and noise levels. Our first magnetic-relays-based model decreased the hardware cost by a factor of 10 (6$ per Braille letter) and proved stability but lacked consistency. After an additional stage of research, our second model was built using stepper motors, which showed stability, speed, and consistency comparable to piezoelectric crystals yet dropped the hardware cost to $.60 per one Braille letter. To facilitate the integration of our device in the industry, we developed the IoT software system powered by Arduino, Android, and Google Assistant technologies. Using DialogFlow, a natural language processing technology, we built a prototype digital cloud-based library for the blind that communicates with the user's phone application and the device's microprocessor. With advanced resources, stepper-motor-powered Braille displays have the potential to redefine the industry, generating new opportunities for the blind in literacy and education.

Awards Won:
Third Award of $1,000