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Design and implementation of a voice-controlled prosthetic hand

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Abstract: Current hand prostheses are mostly driven by electromyography (EMG) signal, and existing experiments have proved that multichannel EMG signal controls are not suitable due to early fatigue problems and high effort requirements to perform even simple activities. Therefore, in this study we present a new voice-controlled active hand prosthesis to perform several basic tasks. We first designed a novel multifingered prosthetic hand with the ability of picking up and releasing objects. The prosthetic hand employs 3 DC motors and gears to transfer motion to the linked iparts of the fingers. We used flexible thin-film resistive force sensors at the fingertips of the prosthetic hand to adjust the grip force at the fingers. The second part of the study involves the use of speech recognition to control the prosthetic hand. The control circuit that we designed consisted of an HM2007 speech recognition IC and a PIC microcontroller to drive the DC motors moving the fingers. We implemented both the prosthetic hand and its speech recognition-based control electronics. As of now, we have programmed the control hardware to recognize simple pick up and release operations and have successfully tested them. In a future study, we will include more voice commands for the operation of the hand, such as a realistic handshake, and improve the cosmetics of the hand in order to make it look more natural.

Key Words: Prosthetic hand, robotic hand, speech recognition