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A Force-controlled Three-finger Prosthetic Hand via Three-dimensional Printing

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Abstract. This paper presents development of a force-controlled 3d-printed prosthetic hand commanded by surface electromyography. The prosthetic hand used force control to pick up 600-cc water bottle without damages. Two experiments were carried out to determine the model of the system. The first one is to determine the relationship between the voltage of electromyography and the hand grip force. The second one is to determine the relationship between the current of DC motor and the water bottle grip force. A feedback control was used to control the gripping force. The prosthetic hand was tested for its gripping water bottles. Percentage of success in holding water bottle with closed bottle cap is 90% of all brands. With opened bottles, the prosthetic hand cannot hold bottles from one brand, which made of a soft plastic shell. The remaining brands of water bottle have a percentage of success above 90%.

Keywords: force-controlled, three-finger gripper, three-dimensional printer, surface electromyography