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Paper Title:	Model-based control of bioactuators with feedback loop
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Abstract

For the industrial application of bioactuators, it is desirable to develop a method to precisely control skeletal muscles. In this study, a control method based on a muscle contraction model was proposed. This control method allows the skeletal muscles to exert an arbitrary contraction force, unlike conventional control that only switches between tension and relaxation. First, a method was developed to determine the voltage at which the skeletal muscles can exert an arbitrary contraction force based on the model by means of an optimization calculation. In addition to the model-based control, a feedback control system was also developed to reduce the errors. To evaluate the performance of the proposed method, the bioactuator made of skeletal muscle of toad was fabricated and validation experiments were conducted. The control voltage, that was calculated based on the contraction model, was applied to the bioactuator and the contraction force was controlled. As a result, the output of the actuator was able to follow the complex reference force. The results demonstrate the feasibility of precise control of the bioactuator.