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Adaptive controls and anesthesiology: Is there a future?

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During a patient's surgery, an anesthesiologist has to periodically adjust controls on drug-delivery machines to keep a patient's consciousness at a desired level (a BIS value between 40 and 60). If this physician did not have to adjust these controls, he or she would be able to devote more time during the surgery on a patient's life functions instead of on the patient's level of consciousness. To help with this endeavor, I developed a simulation that uses algorithms developed by Professor Chellaboina and his coworkers to adjust a patient's BIS value to 50. To construct this model, I used a computer program called Simulink, a component of MATLAB, to make the necessary connections between functions so the algorithms could work. When this simulation was run, the BIS value did reach 50; however, this only occurred under ideal conditions: when a disturbance was not added to the model. When a disturbance was added to this simulation, unacceptable levels of oscillation occurred. I believe this disturbance is coming from the EEG device (used to calculate the BIS value) that is used to monitor a patient's level of consciousness. Before this model could be clinically used, either an improvement in the EEG device or a program that could counteract this disturbance would need to be developed. Effort will be made to derive preliminary control designs to account for this disturbance.