Synthesis of a Model Predictive Controller for Artificial Pancreas

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Abstract : Introduction: Type 1 diabetes occurs when beta cells are destroyed by the body's own immune system. Treatment of type 1 diabetes mellitus could be greatly improved by applying a closed-loop control strategy to insulin delivery, also known as an Artificial Pancreas (AP). Method: In this paper, we present a new formulation of the cost function for a Model Predictive Control (MPC) utilizing a technic which accelerates the speed of control of the AP and tackles the nonlinearity of the control problem via asymmetric objective functions. Finding: The finding of this work consists in a new Model Predictive Control algorithm that leads to good performances like decreasing the time of hyperglycaemia and avoiding hypoglycaemia. Conclusion: These performances are validated under in silico trials.

Keywords : artificial pancreas, control algorithm, biomedical control, MPC, objective function, nonlinearity
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