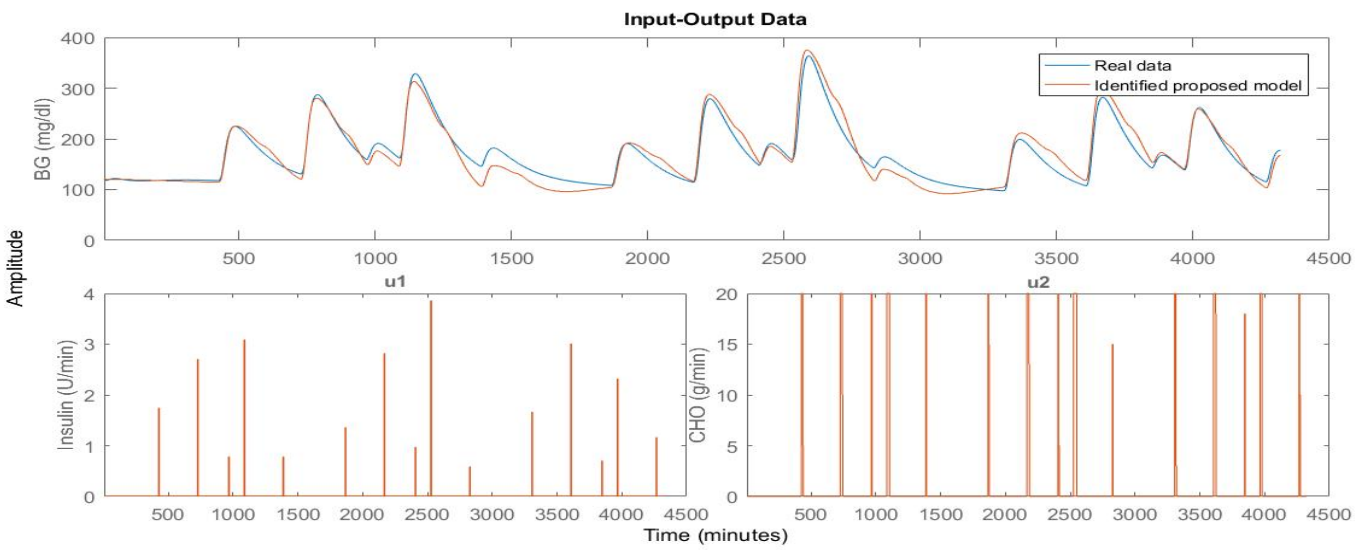
IDENTIFICATION OF A RELEVANT CONTROL GLUCOSE MODEL WITH PHYSIOLOGICAL MEANING FOR CLOSED-LOOP STRATEGIES IN ARTIFICIAL PANCREAS

Pablo S. Rivadeneira [1], Alejandro H. Gonzalez [2], José L. Godoy [2]

[1] Universidad Nacional de Colombia, Facultad de Minas
[2] INTEC-CONICET, Universidad Nacional del Litoral

ABSTRACT

Minimal models are being envisioned to aim in the design of control strategies in the so-called device “artificial pancreas” (AP). Black box minimal models have been made from experimental data, but these models are limited to represent the physiology of a patient. Some gray models based on some physiological knowledge and real data have been proposed, but based on the glucose clamp study and then its equilibriums are not realistic. Recently, a new model with realistic properties was developed in [1]. Based on this, a new model was proposed, and additional tools of the functional insulin therapy (FIT) as IOB and DIA were computed.



METHODS

An identification study with the four relevant models was performed [1, 2, 3] and the proposed here. The data used was the standard one for type 1 diabetic patients: CGM measurements, basal and bolus insulin, and count of carbohydrates, collected during 3 days from 60 real patients and 33 virtual ones from the UVA/Padova Simulator. The Gauss-Newton identification method was applied for the four models.

RESULTS

The best model-fit was achieved for the model proposed here. The mean of the model-fit was 50% for real patients and 70% for virtual patients.

CONCLUSIONS

The proposed model here allows to describe better the interaction blood glucose, insulin, and absorption of meals than the models already reported in the literature. Advantages of this model are the realistic equilibriums and the computation of the FIT tools.

REFERENCES

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