



# A NEW APPROACH IN ZONE MODEL PREDICTIVE CONTROL FOR TYPE 1 DIABETES TO BE TESTED IN COLOMBIA

Pablo S. Rivadeneira<sup>1</sup>, Michelle A. Caicedo<sup>1</sup>, Juan E. Sereno<sup>1</sup>

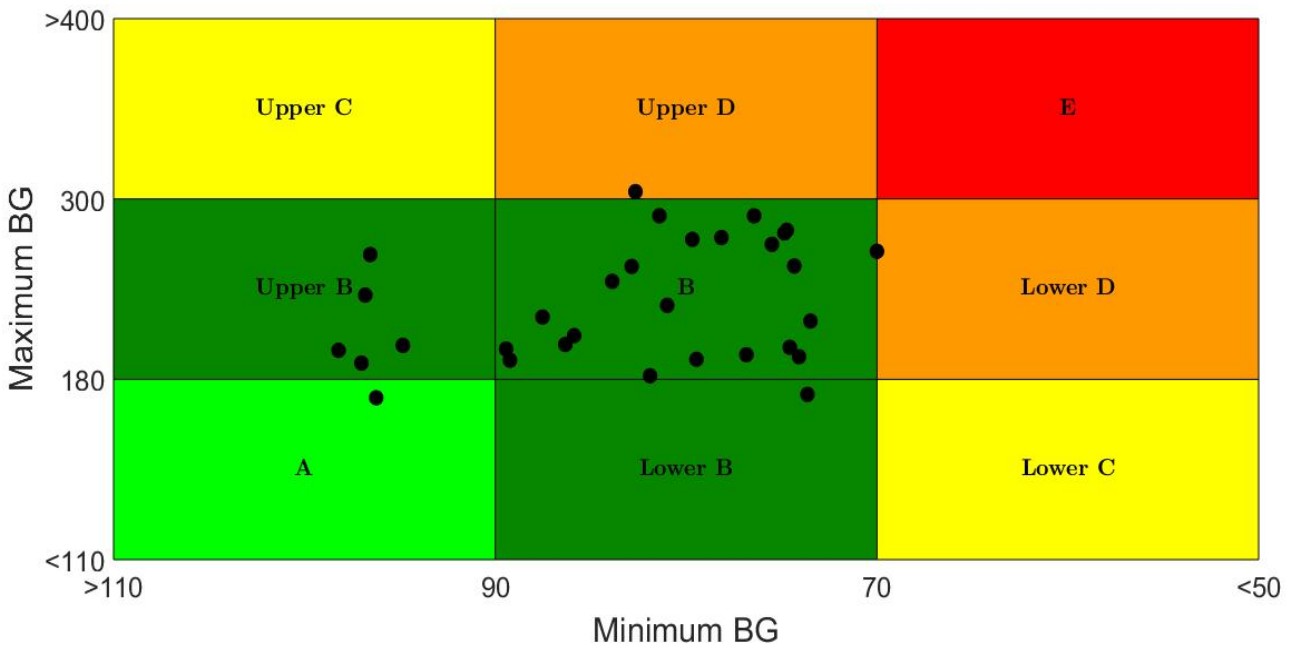
<sup>1</sup> Universidad Nacional de Colombia, Facultad de Minas, Grupo GITA

## ABSTRACT

Nowadays, model predictive control (MPC) has been the most developed strategy for the artificial pancreas. However, the proposed strategies are developed based on linearizations without physiological meaning and do not guarantee the achievement of glucose targets. Here, a zone MPC (ZMPC) using a slack variable is proposed based on a simple model but with physiological interpretation.

## RESULTS

Fig. 1 shows the performance of the proposed ZMPC. 88.74 % of CGM sensor readings remain inside [70 - 180] mg/dl, against the 77.7 % reported in [1]. The proposed strategy has 1 case of hypoglycemia and 1 of hyperglycemia, while zero cases of hypoglycemia and 7 cases of hyperglycemia are reported in [1].



## METHODS

The ZMPC is evaluated using the 33 virtual patients from the UVA/Padova simulator. The virtual protocol considers a simulation of 2 days and 3 meals per day without meal announcement. The protocol starts at midnight with a 140 mg/dl glucose value. 50 g, 80 g, and 60 g meals are given at 7 h, 14 h and 20 h, respectively and repeated the next day. The total simulation time is 55 h. The performance is compared to previous results through statistical and control variability grid analysis.

## CONCLUSIONS

The strategy results show better performance in comparison to others registered in literature. This ZMPC algorithm will be under clinical evaluation in 2018. This trial will be the first in Colombia.

## REFERENCES

[1] K. van Heusden and et al., Control-relevant models for glucose control using a priori patient characteristics, IEEE transactions on biomedical engineering, 59(7): 1839-1849, 2012