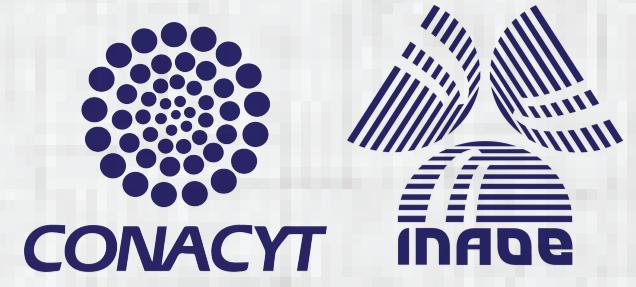


Fuzzy neurofeedback induces designed sensorimotor modulation.

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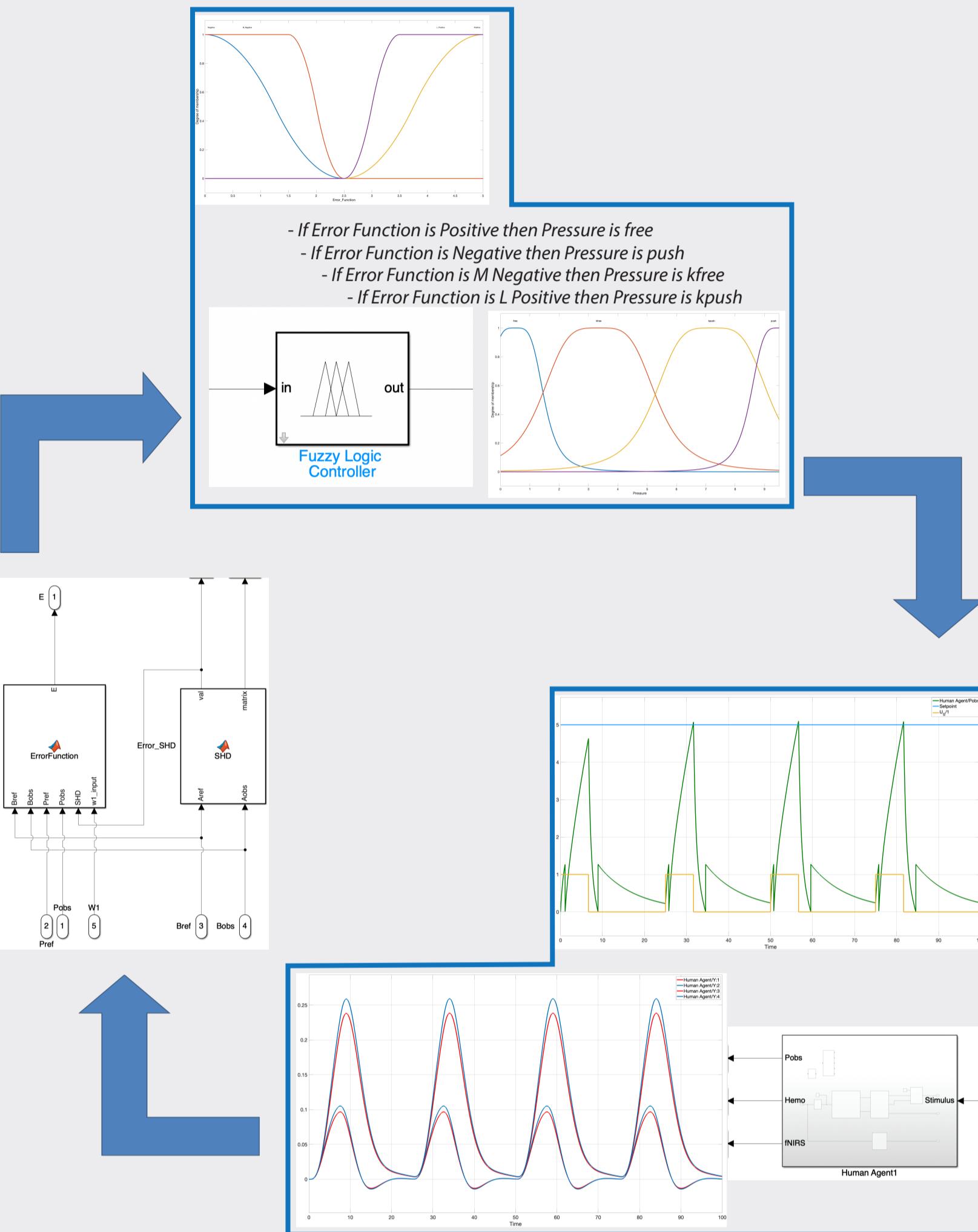


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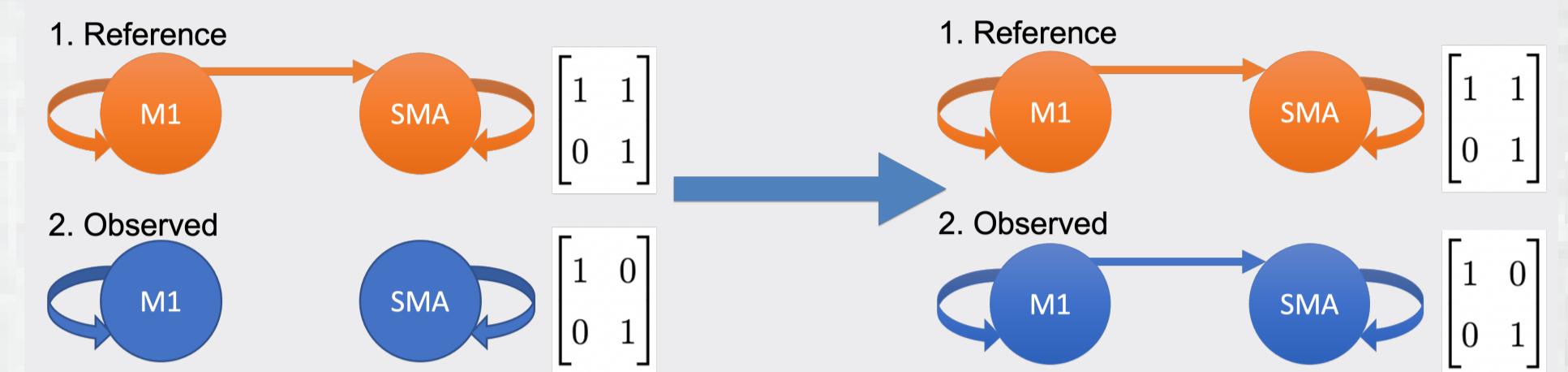
Abstract

Neurofeedback addresses a computational problem involving real-time intelligent adaptive control where the controller cannot directly manipulate nor observe the controlled process. This work proposes a new adaptive neurofeedback fuzzy control model to induce a designed sensorimotor modulation. Innovative, the control is guided by a multivariate error function that targets a functional reorganization of the plant structure (brain organization) encoded as a graph and the plant response (behavioral response). The model is tested on a synthetic human agent (plant) where the neurodynamic drive the hemodynamics as observed with fNIRS and the behavior output. The neurofeedback fuzzy control model successfully modulates brain connectivity to a targeted state with essential repercussions on neurorehabilitation.

Methods



Results



Conclusions

- Fuzzy control models can affect a not directly observable process through a direct process.
- Through fuzzy control, it is possible to modify the plant structure and, at the same time, adaptively modify the plant's behavior.
- Fuzzy control systems can create permanent changes in the plant structure, indicating a potential future for clinical application.

References

- [1] Tak, S. et al. (2015). Neuroimage, 111, 338-349.

Introduction

A fuzzy control model for neurofeedback can induce a desired brain connectivity pattern following a target functional reorganization for neurorehabilitation.

Adapts the motor pressure setpoint task based on fNIRS-based (Tak et al., 2015) brain observation and behavior observation.

Induce the modulation of the cortical motor activity regulating the patient's motor performance and enforcing the designed neuronal reorganization.

Block Diagram

