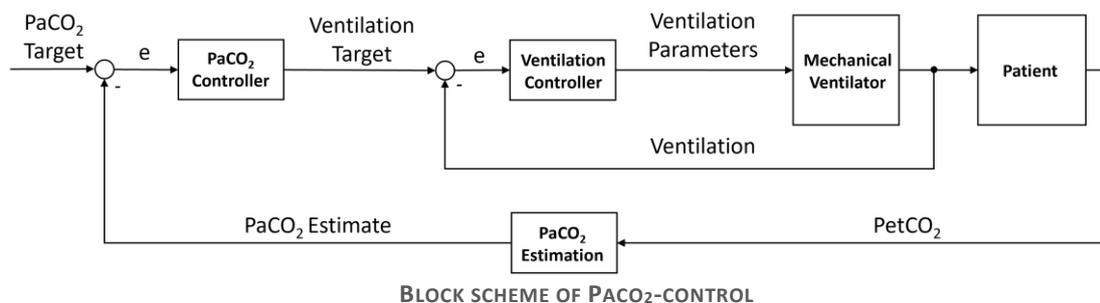


Bachelor Thesis/Master Thesis

Robust Control of Arterial CO₂-Partial Pressure in Mechanical Ventilation of Neonates

Motivation

Newborns, especially premature infants, are prone to respiratory system complications and often require respiratory support. At the same time, these sensitive patients are at risk of suffering brain damage from artificial respiration, if the arterial partial pressure of CO₂, PaCO₂, exceeds the safe range. Therefore, a ventilator for newborns with automatic PaCO₂ control is developed in the project NANNI at the biomedical engineering group of i11. One challenge of this control task is the variability of parameters between different patients. To address this, the existing cascaded control algorithm is to be improved with robust techniques, which allow for explicit consideration of uncertainties during controller design.



Tasks

The objective of this work is to enhance controller performance under inter-patient variabilities by applying robust control design methods. Your roadmap could include the following subtasks:

- ▶ Research on state of the art robust control techniques
- ▶ Determine the uncertainty bounds of the relevant parameters
- ▶ Select a suitable robust control method
- ▶ Design the controller in MATLAB SIMULINK
- ▶ Evaluate controller performance

Prerequisites

- ▶ Ongoing master's studies in Automation Engineering, Computer Science, or similar
- ▶ Independent working style and good analytical skills
- ▶ Affinity to mathematics and control engineering
- ▶ Interest and ideally prior knowledge in robust control and mechanical ventilation

Our Offer

- ▶ Insights into interdisciplinary research at the interface of engineering, computer science, and medicine
- ▶ Once possible - pleasant working atmosphere on-site, fully automatic coffee machine, and regular social events in the biomedical engineering group
- ▶ Start immediately, or by appointment

Contact

Do not hesitate to get in touch with me if you are interested in the project or the research topic in general.

Please include in your application: CV, grade transcript, relevant certificates (optional)

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