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Creating model-driven algal cultures in autonomously experimenting appliances

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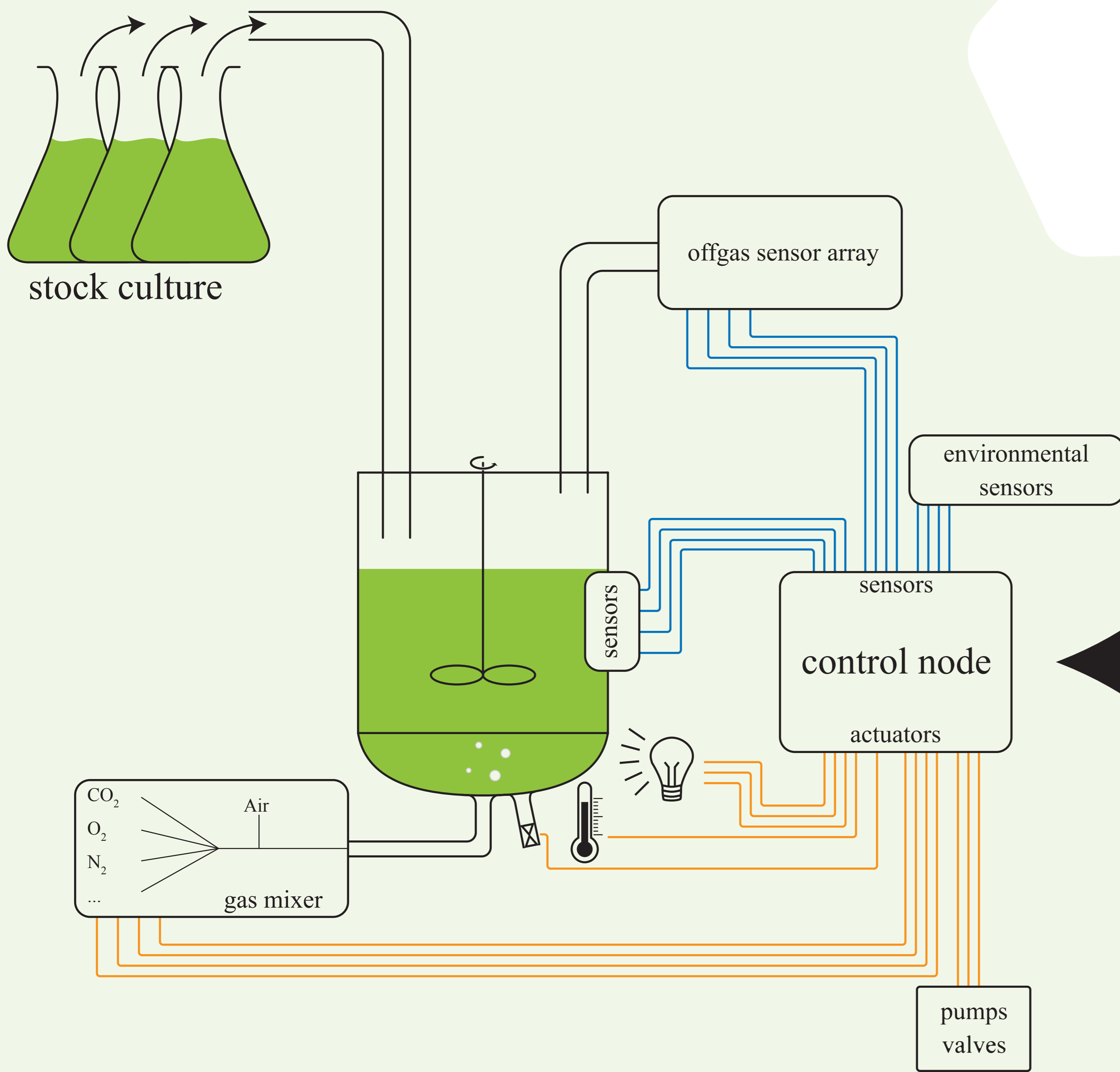


Motivation

Off-the-shelf photobioreactors are suitable for answering a defined set of research questions. Thus, finding a solution that is easily adaptable to a broad range of experiments was not possible. Designing a customisable, modular photobioreactor appliance includes mandatory development of control software. Therefore, we evaluate the possibilities of experiment automation.

Hardware

Software



Maintenance

Provides all functions that are independent of actual sensory output, e.g. cleaning routines and sensor calibration.

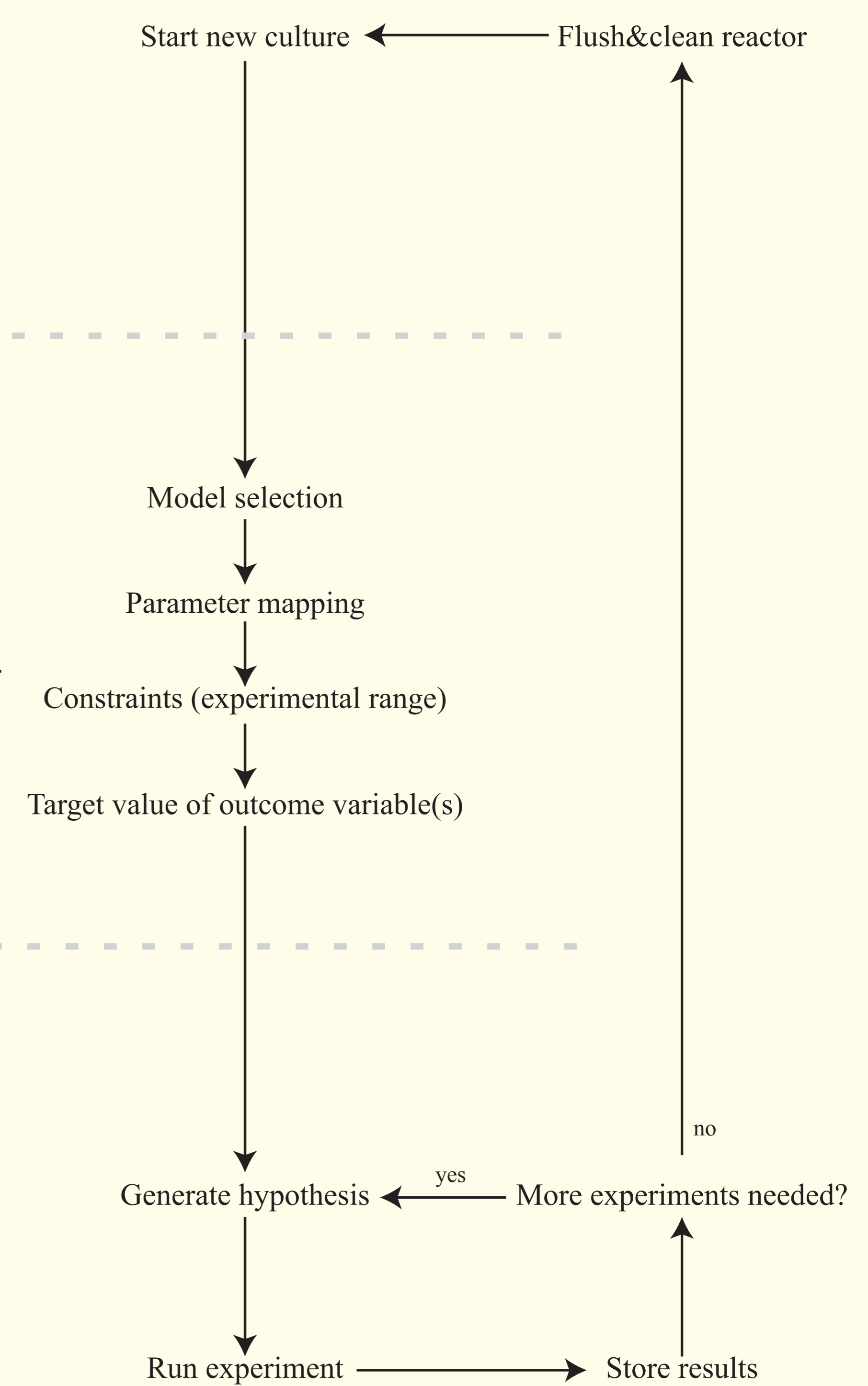
Middleware

Provides communication interface between hardware and software. Sensor feedback is broadcast to experiment backend.

Experiment backend

Controls experimental protocols based on chosen outcome variable. Evaluates sensory output and adapts control if necessary.

Example workflow



Data-driven models:

- simulate parameter shifts
- simulate knockout effects
- find bottlenecks
- understand mechanistics

complementing

Model-driven cultures:

- systematic parameter testing
- bottom-up approaches (mutagenesis, constraint driven evolution)
- idempotent state of cultures
- inverse methods to automatically build models through machine learning

Imprint:

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