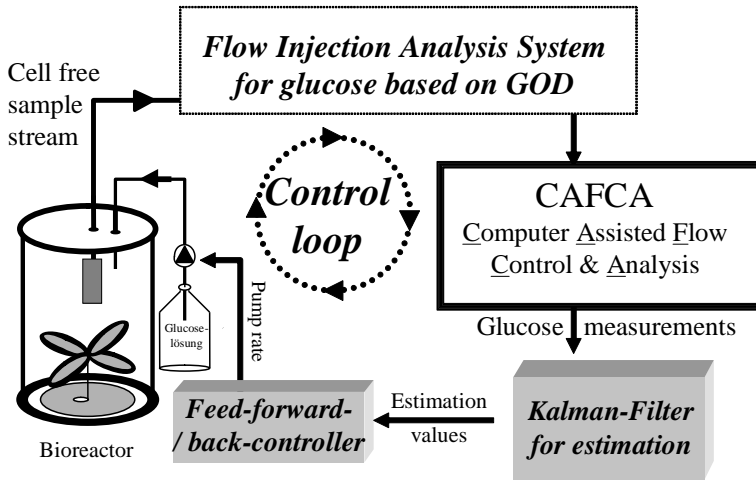


1. The Control Loop with Kalman Filter

Saccharomyces cerevisiae cultivation



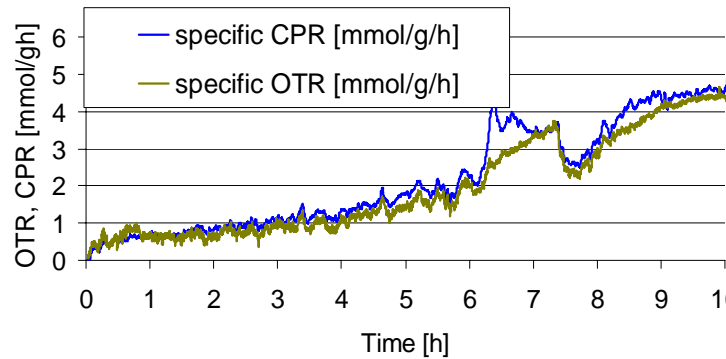
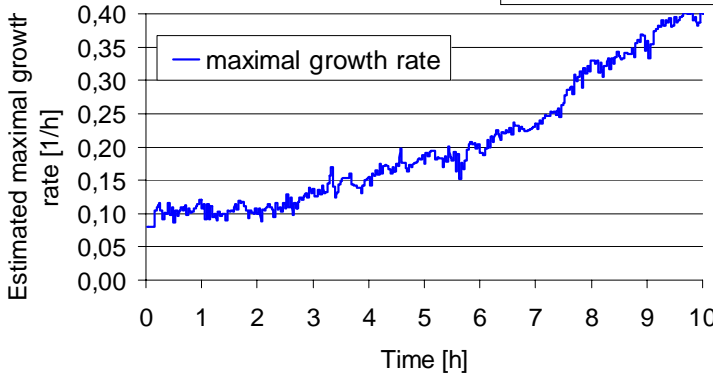
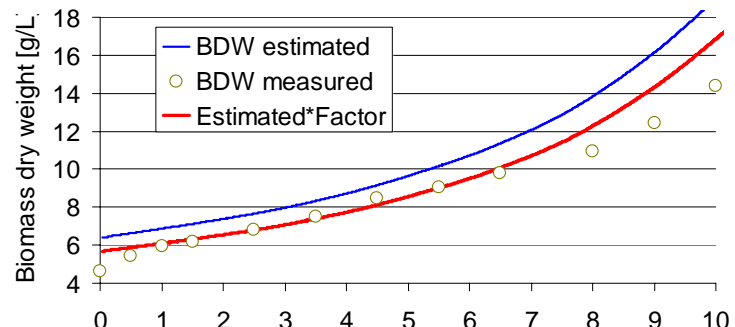
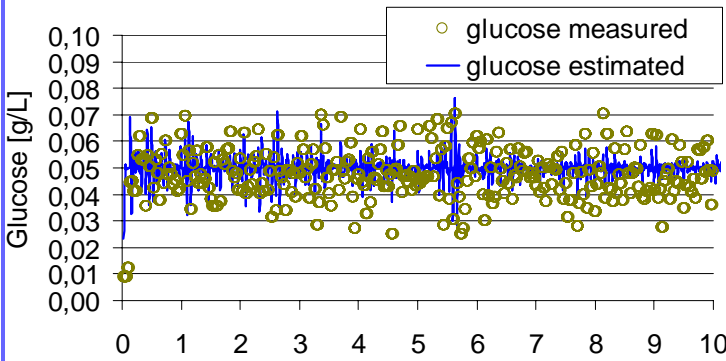
The model

$$\begin{bmatrix} \frac{d X(t)}{d t} \\ \frac{d S(t)}{d t} \\ \frac{d \mu_{\max}(t)}{d t} \\ \frac{d V(t)}{d t} \end{bmatrix} = \begin{bmatrix} \frac{\mu_{\max} S(t)}{K_m + S(t)} X(t) - \frac{\dot{V}_f(t)}{V(t)} X(t) \\ -\frac{\mu_{\max} S(t)}{K_m + S(t)} \frac{X(t)}{Y} + \frac{\dot{V}_f(t)}{V(t)} (S_0 - S(t)) \\ 0 \\ \dot{V}_f(t) - \dot{V}_{sam} \end{bmatrix} + \begin{bmatrix} u_X \\ u_S \\ u_\mu \\ u_V \end{bmatrix}$$

$$\frac{d P(t)}{d t} = F(t)P(t) + P(t)F^T(t) + Q$$

$$\dot{V}_f(t_i) = \hat{V}(t) \frac{\hat{\mu}_{\max}(t_i) \hat{S}(t_i) \hat{X}(t_i)}{Y_{X/S} [K_m + \hat{S}(t_i)] [S_0 - \hat{S}(t_i)]} + \dot{V}_{PI}(t_i)$$

2. The Results



3. Conclusions Mean measured glucose concentration 0.0506 g/L
 Standard deviation 0.009 g/L
 Maximal growth rate is not constant (0.1 h⁻¹ – 0.4 h⁻¹) } Control was successful!
 Monod model seems to be invalid!

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