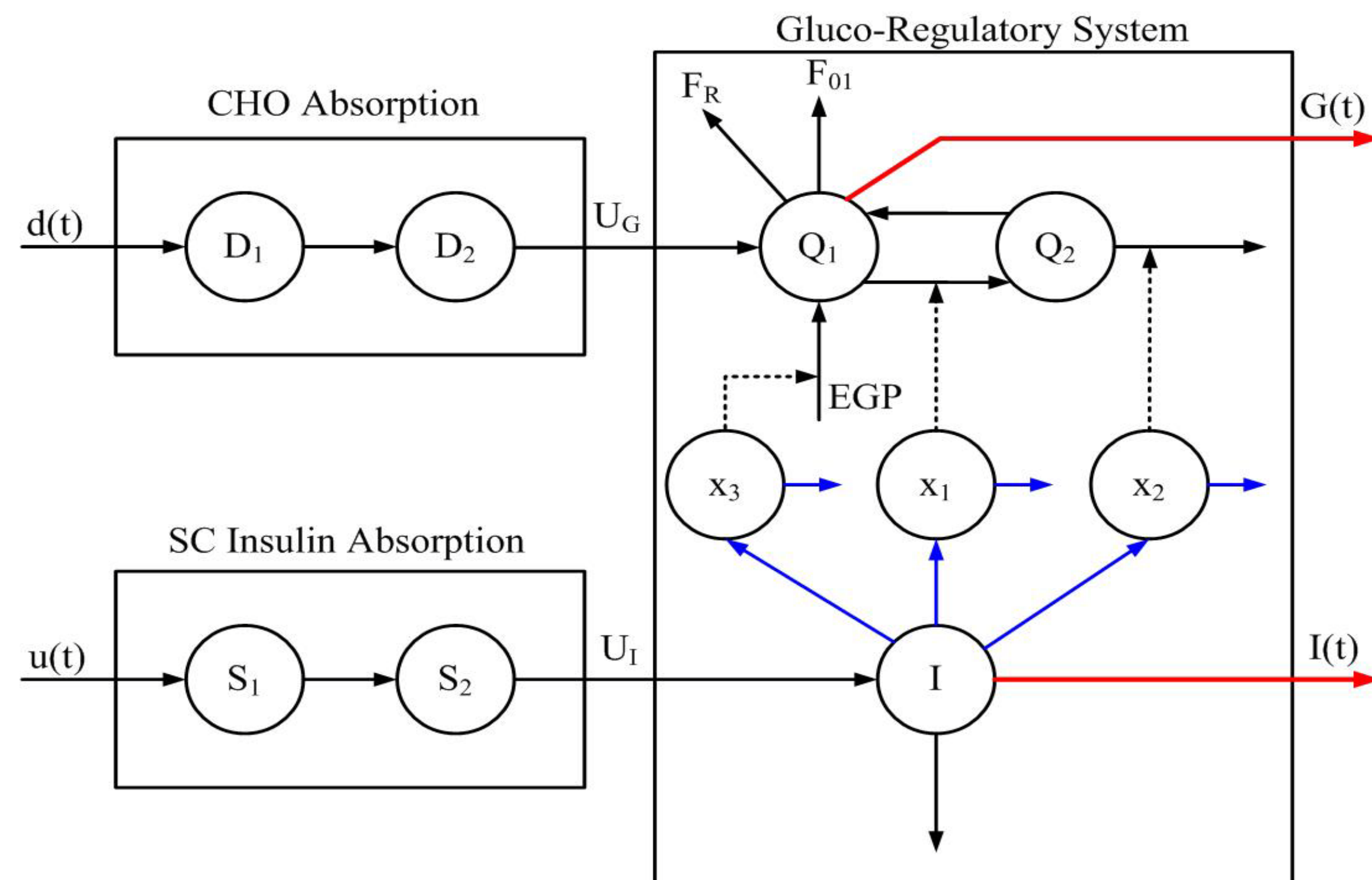
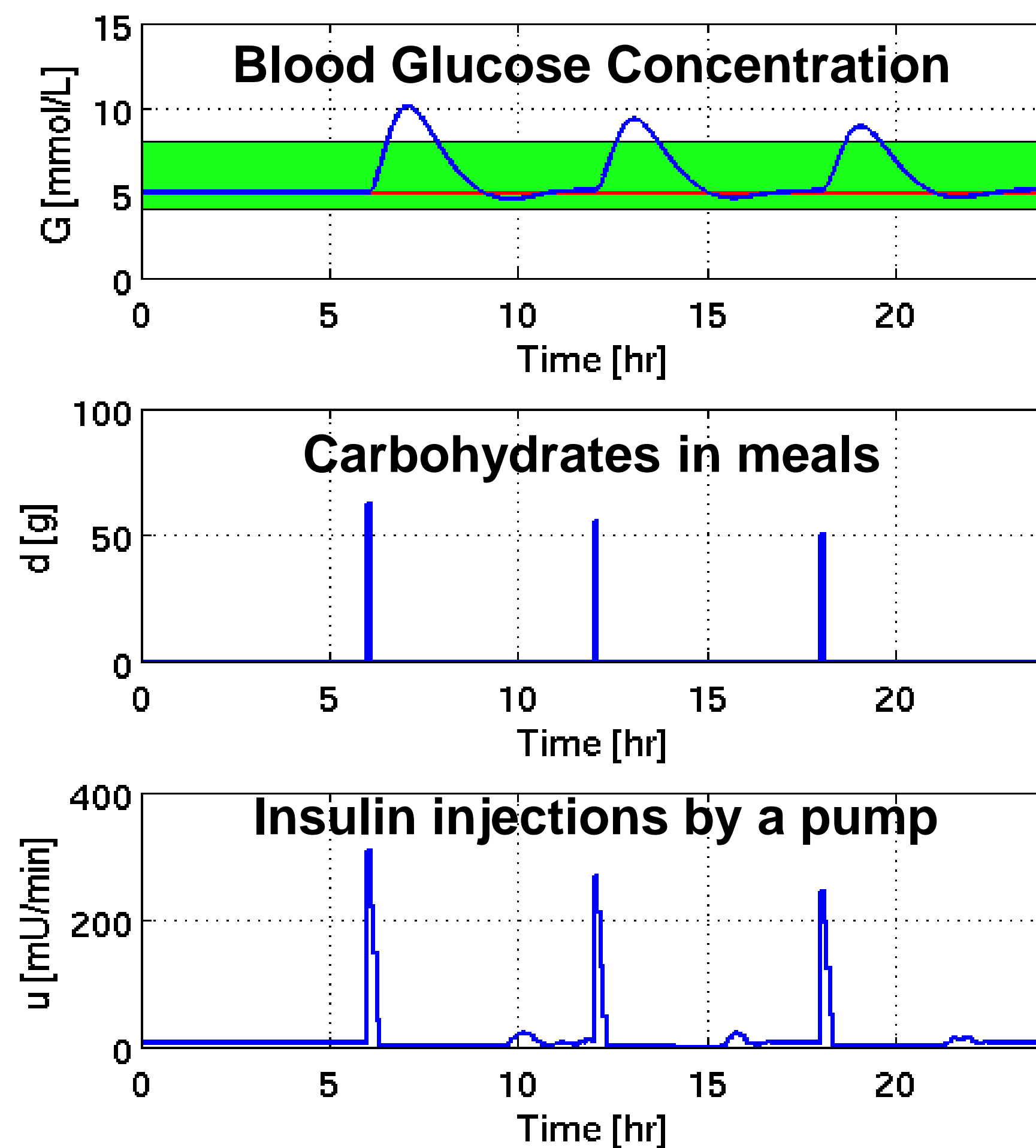


# Diabetes and Computational Engineering

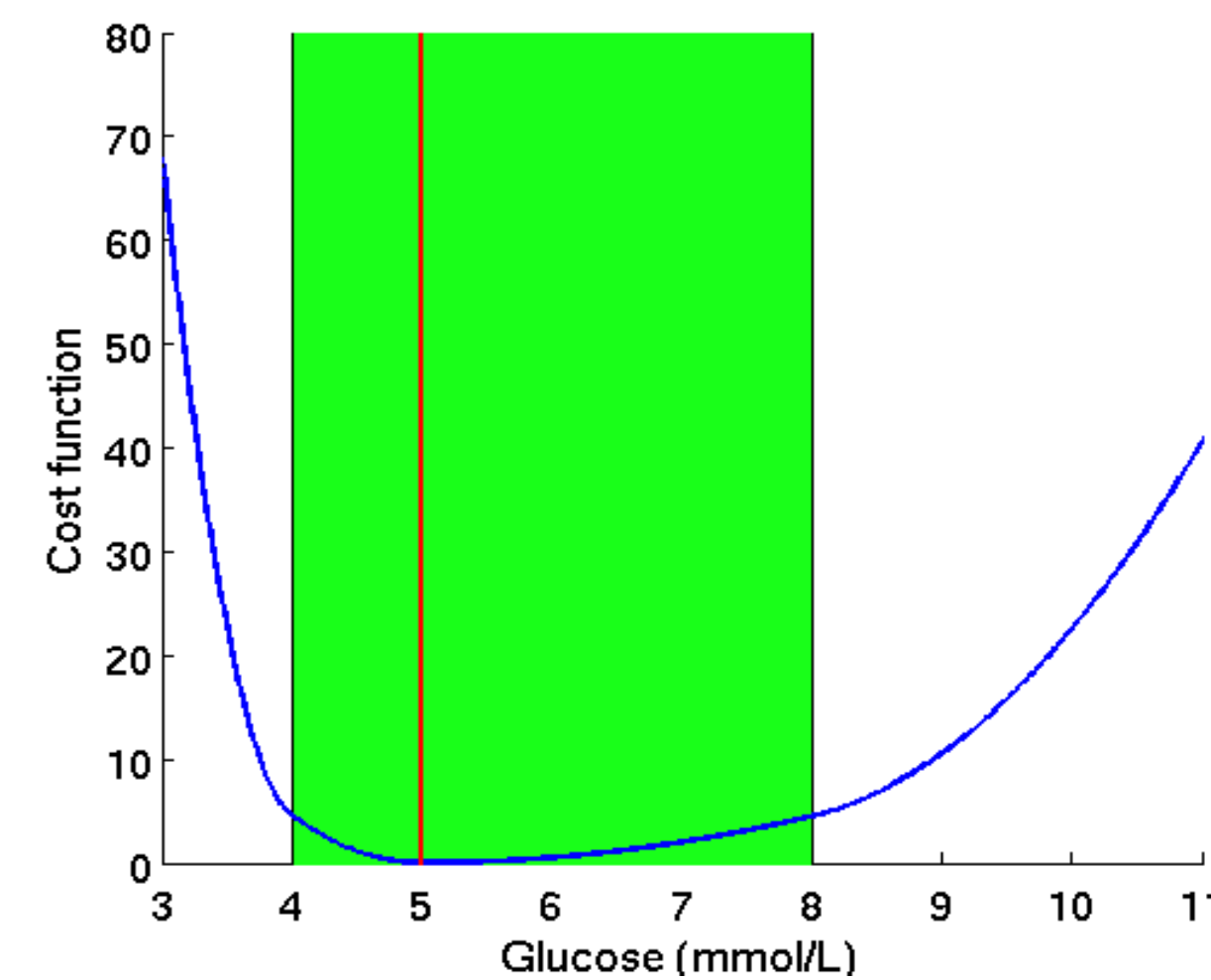
## Mathematical & Statistical Modeling



## Simulation



## Optimization & Model Predictive Control



$$\min \phi = \int_{t_k}^{t_k+T} g(x(t), u(t)) dt$$

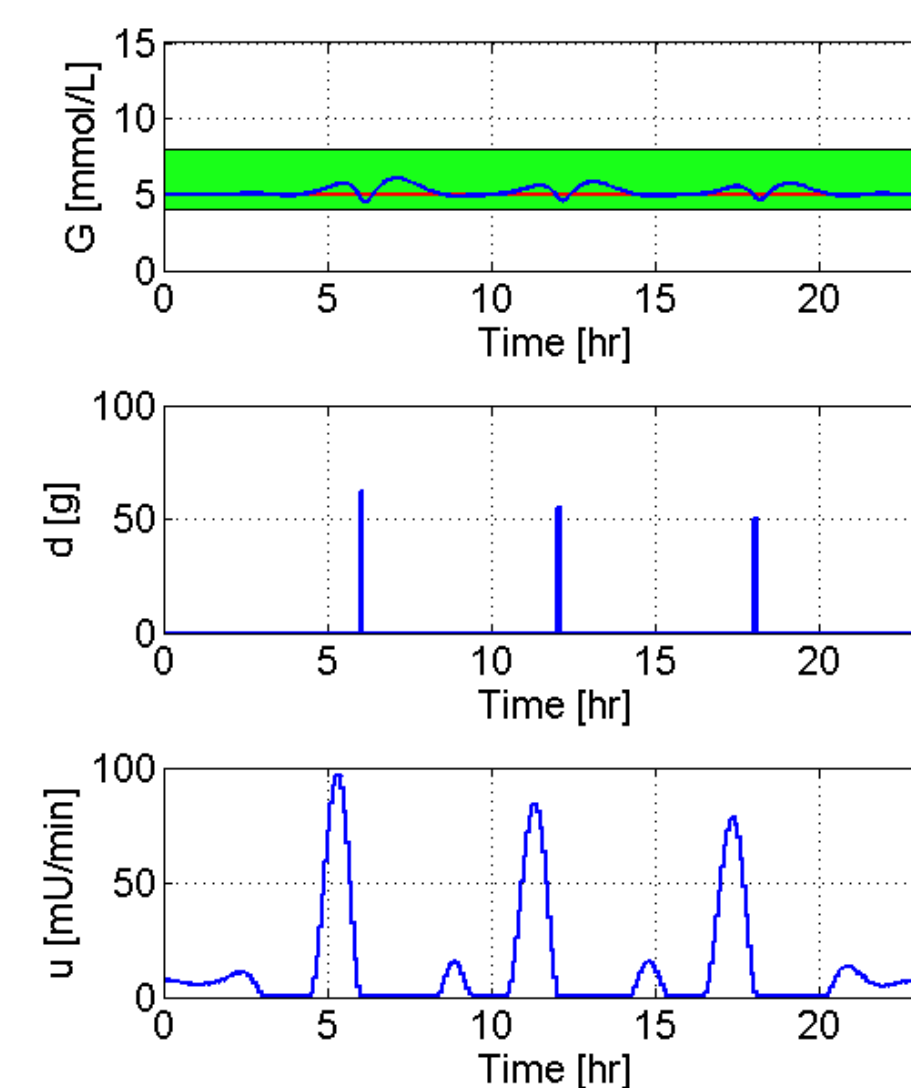
$$s.t. \quad x(t_k) = \hat{x}_{k|k}$$

$$\dot{x}(t) = f(x(t), u(t), d(t)) \quad t \in [t_k, t_k + T]$$

$$c(x(t), u(t)) \geq 0 \quad t \in [t_k, t_k + T]$$

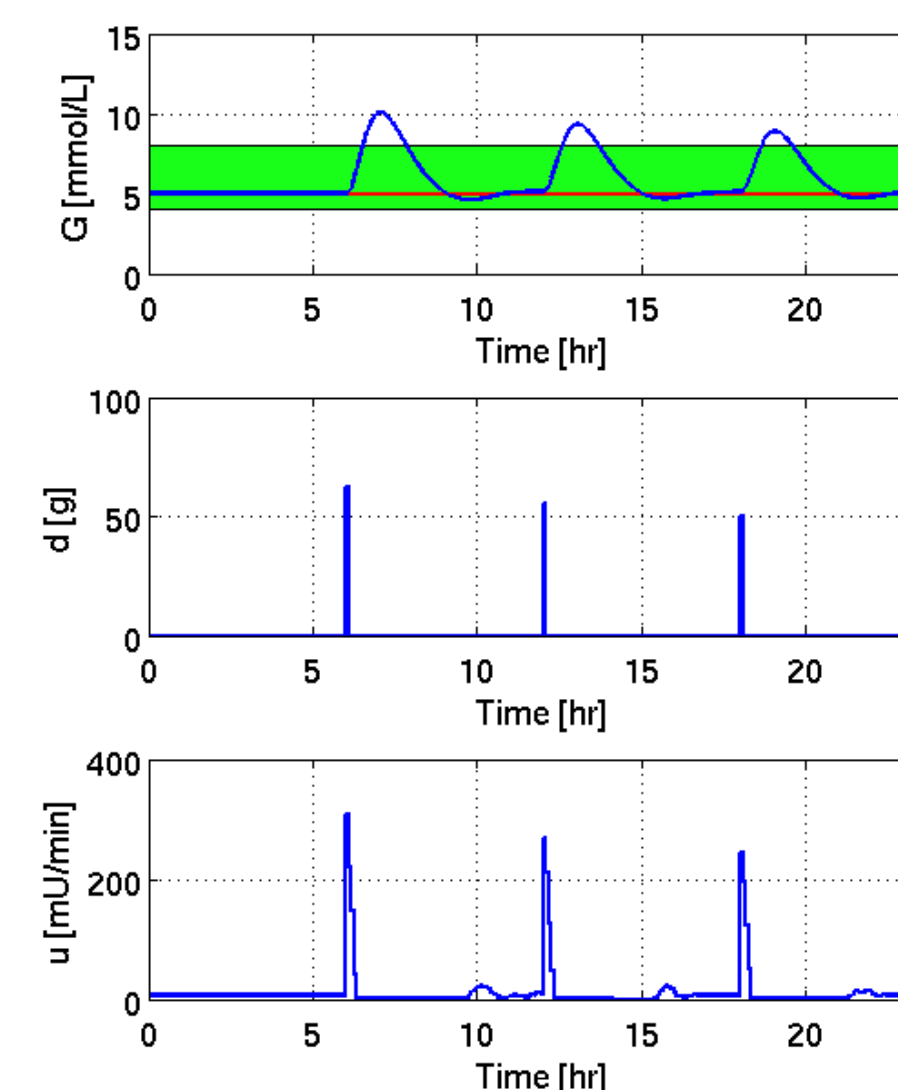
### NMPC

#### Pre-meal Insulin Allowed

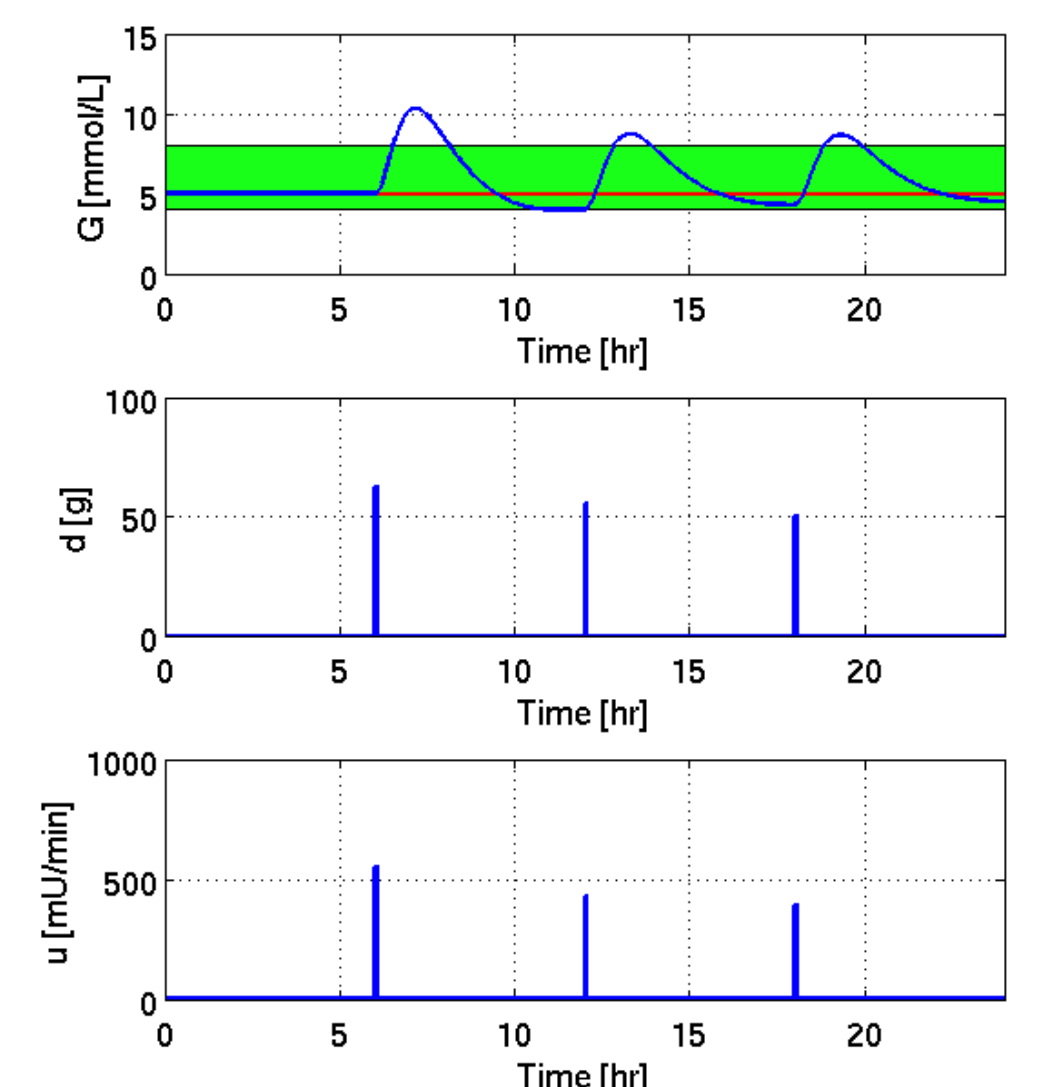


### NMPC

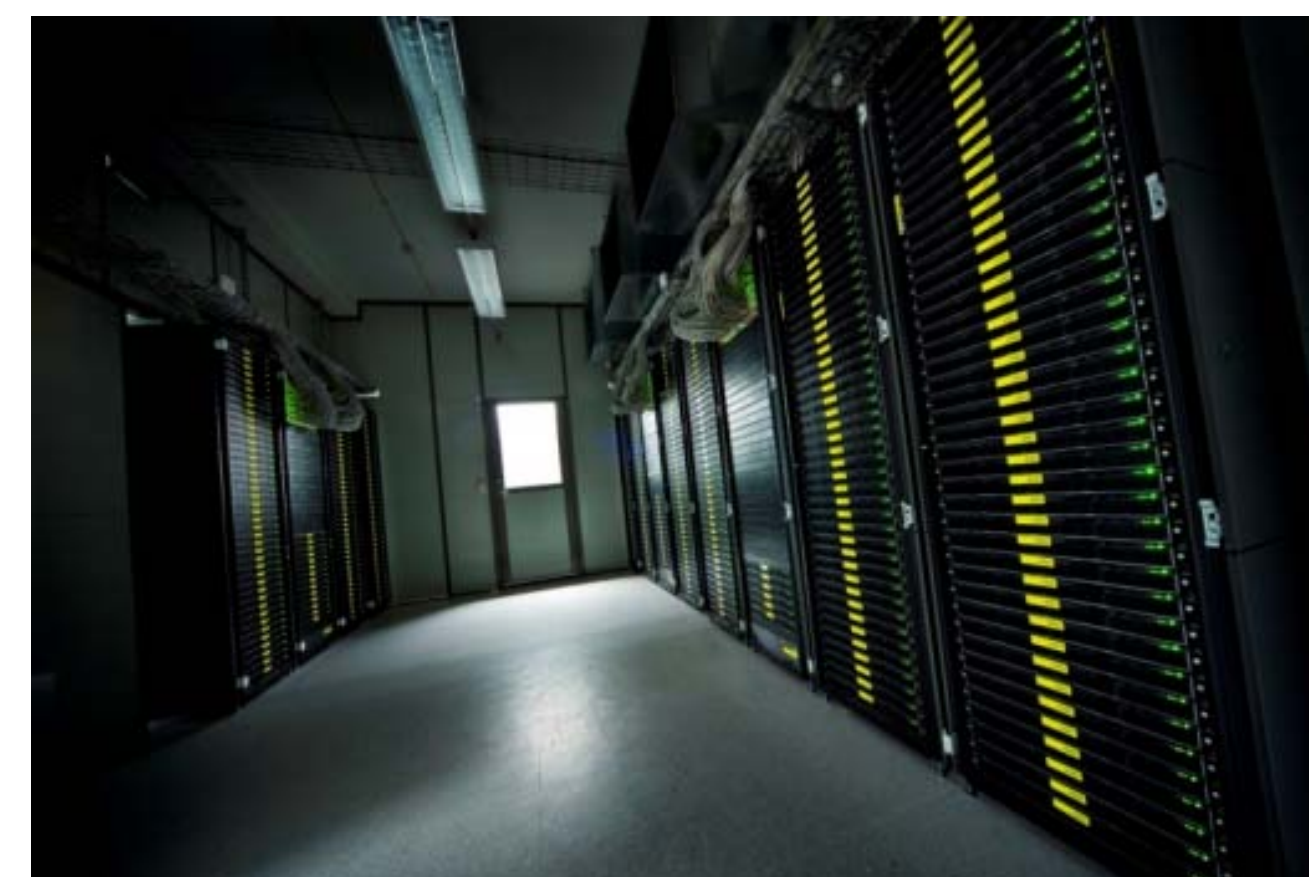
#### No Pre-meal Insulin



### MDI InsulinTreatment - Injection with a pen



## Implementation on Different Computing Platforms



Cluster of high performance computers



Laptops &  
Workstations



Mobile computing  
devices