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3.3. Mass balance models; 3.4. Model parameter identification; 3.5. Example: *Chlorella vulgaris* culture; 3.5.1. Experimental set-up; 3.5.2. Modeling; 3.5.3. Parametric identification; 3.6. Conclusion; Chapter 4. Estimation of Biomass Concentration; 4.1. Generalities on estimation; 4.2. State of the art; 4.3. Kalman filter; 4.3.1. Principle; 4.3.2. Discrete Kalman filter; 4.3.3. Discrete extended Kalman filter; 4.3.4. Kalman filter settings; 4.3.5. Example; 4.4. Asymptotic observer; 4.4.1. Principle; 4.4.2. Example; 4.5. Interval observer; 4.5.1. Principle; 4.5.2. Example
4.6. Experimental validation on *Chlorella vulgaris* culture; 4.7. Conclusion; Chapter 5. Bioprocess Control; 5.1. Determination of optimal operating conditions; 5.1.1. Optimal operating conditions; 5.1.2. Optimal set-point; 5.2. Generalities on control; 5.3. State of the art; 5.4. Generic Model Control; 5.4.1. Principle; 5.4.2. Advantages and disadvantages; 5.4.3. Example; 5.5. Input/output linearizing control; 5.5.1. Principle; 5.5.2. Advantages and disadvantages; 5.5.3. Example; 5.6. Nonlinear model predictive control; 5.6.1. Principle; 5.6.2. Nonlinear Model Predictive Control
5.6.3. Advantages and disadvantages; 5.6.4. Example; 5.7. Application to *Chlorella vulgaris* cultures; 5.7.1. GMC law performance; 5.7.2. Performance of the predictive control law; 5.8. Conclusion; Conclusion; Bibliography; Index

Sommario/riassunto

Due to the consequences of global warming and significant greenhouse gas emissions, several ideas have been studied to reduce these emissions or to suggest solutions for pollutant removal. The most promising ideas are reduced consumption, waste recovery and waste treatment by biological systems. In this latter category, studies have demonstrated that the use of microalgae is a very promising solution for the biofixation of carbon dioxide. In fact, these microorganisms are able to offset high levels of CO₂ thanks to photosynthesis. Microalgae are also used in various fields (food industr
