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Nota di contenuto	Cover; Title Page; Copyright; Contents ; Introduction; Chapter 1. Microalgae; 1.1. Definition; 1.2. Characteristics; 1.3. Uses of microalgae; 1.3.1. Nutrition; 1.3.2. Pharmaceuticals; 1.3.3. Cosmetics; 1.3.4. Energy; 1.3.5. Environmental field; 1.4. Microalgae cultivation systems; 1.4.1. Open systems; 1.4.2. Closed systems: photobioreactors; 1.5. Factors affecting algae cultivation; 1.5.1. Light; 1.5.2. Temperature; 1.5.3. pH; 1.5.4. Nutrients; 1.5.5. Medium salinity; 1.5.6. Agitation; 1.5.7. Gas-liquid mass transfer; 1.6. Conclusion; Chapter 2. Co2 Biofixation 2.1. Selection of microalgae species2.1.1. Photosynthetic activity; 2.1.2. CO2 concentrating mechanism "CCM"; 2.1.3. Choice of the microalgae species; 2.2. Optimization of the photobioreactor design; 2.3. Conclusion; Chapter 3. Bioprocess Modeling; 3.1. Operating modes; 3.1.1. Batch mode; 3.1.2. Fed-batch mode; 3.1.3. Continuous mode; 3.2. Growth rate modeling; 3.2.1. General models; 3.2.2. Droop's model; 3.2.3. Models dealing with light effect; 3.2.4. Model dealing with carbon effect; 3.2.5. Models of the simultaneous influence of several parameters; 3.2.6. Choice of growth rate model 3.3. Mass balance models3.4. 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 culture4.7. 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 disadvantages5.6.4. 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 globa l warming and significant greenhouse gas emissions, several ideas have been studied to reduce these emissions or to suggest solut ions for pollutant remov al. 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 micro-organisms are able to offset high levels of CO2 thanks to photosynthesis. Microalgae are also used in various fields (food industr