基於計算智慧之基因網路建模暨機電系統控制

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摘 要

第一部分 基因網路建模 基於計算智慧方法去建構真核細胞週期（Eukaryotic cell cycle）和酵母菌細胞週期（Yeast cell cycle）之數學模型S-system，並進行基因調控網路之分析。首先利用不同時間點的資料來建構高度非線性冪次微分方程以描述基因調控網路，並採取全域最佳化方法－混合差值演算法（hybrid differential evolution）來實現高度非線性微分方程之基因網路建模。建構完成的基因調控網路將提供給生物研究者參考之用，真核細胞週期和酵母菌細胞週期中基因與基因之間的合成和分解其活化和抑制作用的關係，將對生物研究有莫大的助益。 第二部分 機電系統控制 針對非線性的倒單擺系統設計一智能之模糊控制器，首先分析倒單擺的物理系統和數學模型，並將其轉換成T-S 模糊模型，為了實現這複雜物理系統之位置和角度的控制，將設計一強健的最佳模糊控制器。經過設計出來的控制器，經由電腦模擬的結果顯示，所設計的控制器能在非常短的時間讓系統達到穩定。

關鍵詞 : 細胞週期 ; 混合差值演算法 ; T-S 模糊模型 ; 倒單擺

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