# Inference Structures of Gene Regulatory Networks

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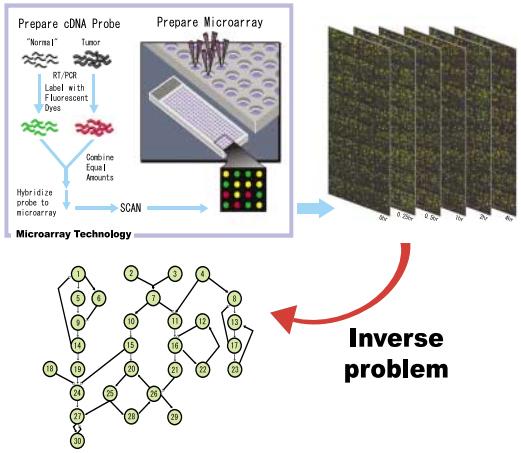
We have developed an efficient algorithm base on the genetic algorithm (GA) for optimization of a nonlinear system where the details of gene regulatory networks. Estimation of the interaction mechanisms among system components by using experimentally observed dynamic responses (time-courses) of some of the system components is generally referred to as "inverse problem". The S-system, which belongs to power-law formalism, is one of the best representations to solve such an inverse problem; the S-system is rich enough in structure to capture all relevant dynamics. In our research, for the purpose of solving the inverse problem, we introduce the genetic algorithm and propose an efficient procedure for the estimation of large number of parameters in the S-system formalism.




1. Measure gene expression levels with DNA microarray technology in time. 2. Our algorithm optimizes mathematical network models to fit to observed expression data.

# Development of a Fully Real-Time Functional MRI Analysis System

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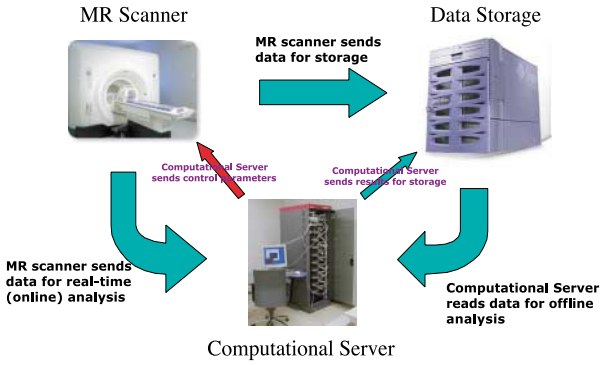
A system for the real-time analysis of functional magnetic resonance imaging (fMRI) time series is developed. The system is composed of an MR scanner subsystem for data acquisition and paradigm control, a computational server (a PC cluster) for real-time fMRI data analysis, and a storage device for storing data. The system exploits the advantages of parallel computing, coupled with an efficient general linear model (GLM) coefficient estimation algorithm, to overcome several issues constraining the analysis of the whole-brain fMRI data in real time. The highly parallel, voxel-wise processing of fMRI data motivated the use of a cluster of personal computers for parallel computation. Aside from gaining a significant increase in computational speed, PC clusters provide a versatile way to handle the computational requirements of the system. The use of GLM in the supporting software allows substantial parametric analysis to be performed.




Schematic diagram of the real-time functional magnetic resonance imaging system composing of an MR scanner, a data storage device, and a computational server.