

Data Submission System for Cyanobacterial DNA Chip Consortium

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1 Introduction

DNA microarray is an extremely useful tool for functional genomics by surveying genome-wide gene expression changes in cells under different conditions. The application area of this technique is rapidly expanding, and its power can be increased when data from multiple experiments are integrated (e.g. by cluster analysis [1]). However, for biological interpretation of such analysis, it is necessary to store sufficient information about experimental conditions with each expression profile data.

Cyanobacterial DNA chip consortium, established under Genome Frontier Project, consists of Japanese cyanobacterial researchers with a wide range of interests. In each member's laboratory, experiments are underway using the same chip (CyanoCHIP, Takara Shuzo) on which segments of almost all ORFs identified in *Synechocystis* sp. PCC6803 genome are spotted, but using various materials subjected to changes in different environmental conditions such as temperature, light intensity or CO₂ concentration.

Here, we introduce the data submission system for this consortium. The system accepts and manages data about experimental conditions and relates them to the submitted expression data file produced from the image analysis software.

2 System

Since the aim of this system is focused on managing the relationships between submitted data files and experimental conditions, its data model is rather simple (Figure 1). The database essentially consists of three tables: material condition table, experiment table, and data table. Material condition table stores experimental conditions of each sample, including strain, medium type, light intensity, temperature and so on. Experiment table stores a set of material conditions used for each hybridization experiment. In addition to the experimental conditions of two samples hybridized with an array, we

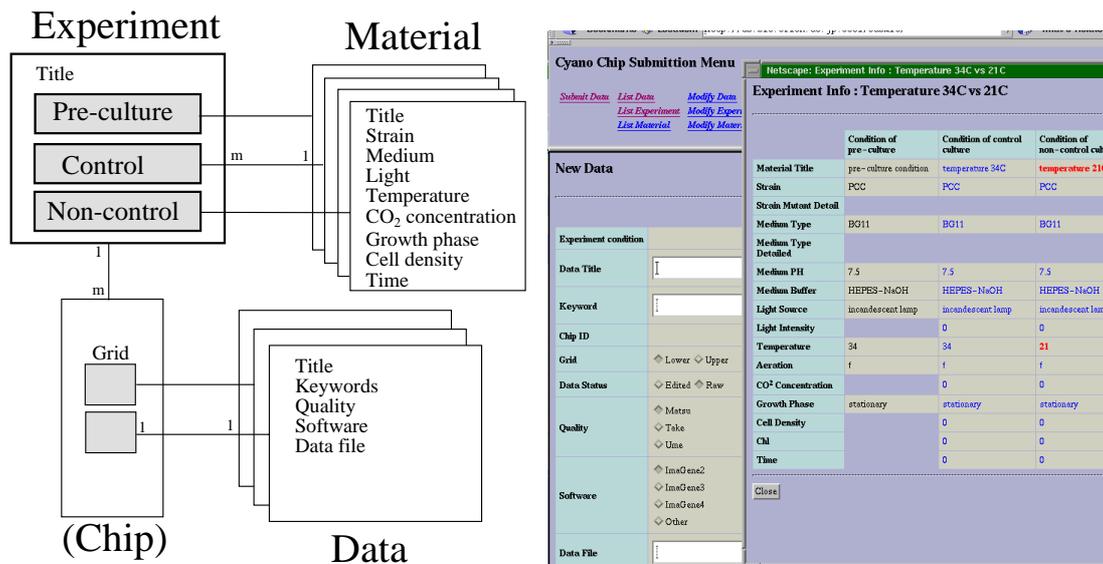


Figure 1: (Left) Schematic illustration of the data model. (Right) WWW interface. Data submission form and comparative display of three experimental conditions are shown.

also store pre-culture condition of them that may be different from experimental conditions. Expression profile itself and related data are stored in data table. On a CyanoCHIP, two expression profile data are obtained from one hybridization experiment at a time, since two duplicated sets of ORFs are mounted on each chip (Figure 1).

In this development, our attention was mainly directed to user interface design so that the experimentalists can submit their data in intuitive manner. When submission, users are requested to specify an experimental condition set. If data to be submitted is, for example, taken from the second duplicated grid of the same chip already registered, users can specify the experiment by merely selecting from the registered entries. Otherwise, users must create a new entry of experiment. Since there are usually very small differences between three material conditions for an experiment, the system enables users to input these conditions one after another by modifying previously entered one. Users can also specify each material condition by selecting from the registered ones, when, for example, fixed ones are used for pre-culture and control conditions, as is usual with a series of experiments.

Submitted data are sent to Kyoto University and will be further processed into appropriate form for data analysis.

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