

## A Recent Development in Image Analysis of Electrophoresis Gels

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### Abstract

*Electrophoresis is an electrochemical separation process in which molecules, such as protein or RNA/DNA fragments, are made to migrate through a specific substrate, such as a polyacrylamide gel, under the influence of an electric current. The technique has a wide range of applications, in DNA sequencing and in studying variation in the identity and amount of proteins obtained from different sources. Techniques of image analysis and pattern recognition can be used to extract qualitative as well as quantitative information from the images, and spare human beings from voluminous, tedious image interpretation. More importantly, computerized data handling and interpretation provide accuracy and rapid speed without human errors. Here, we report the application of a newly developed system to the analysis of biological specimens that have undergone gel electrophoresis. The result of this application shows the capability to identify unique banding patterns of cDNA profiles, which paves the way for future full-scale investigation in the use of pattern recognition principles in biomedical information handling and interpretation.*

### I. Introduction

Electrophoresis is an electrochemical separation process in which biological molecules, such as protein or RNA/DNA fragments, are made to migrate through a

specific substrate, usually a polyacrylamide gel, under the influence of an electric current. The technique can be used to separate mixtures of molecules on the basis of their molecular size, by making use of their electric charge differences. This difference, under the electric field charge, causes individual biological materials of the same size to migrate to discrete positions within the bed of polyacrylamide medium. Collection of these multiple positions in a linear fashion presents the separation of mixed biological materials into specific electrophoresis profiles. It has wide application in DNA sequencing, and in studying variation in the qualitative and quantitative separation of proteins or nucleic acids obtained from different sources. Scientists use electrophoresis to derive information about the substances under study, such as comparing the composition of samples, or quantifying the amount and properties of the different constituents present in a collection of samples. Electrophoresis has many variants, including one or two-dimensional electrophoresis, electrofocusing, isotachopheresis and several forms of immunoelectrophoresis<sup>[1]</sup>. It is almost 200 years since Ferdinand Frederic Reuss first observed through a microscope in 1807 the migration of colloid particles in an electric field, which might be regarded as the first electrophoretic separation. Although many clever developments and applications have appeared, it is only in the last 25 years that the technique has become widely used. There are a vast number of variations in electrophoretic techniques and in principle almost any problem that involves either mixtures of biological

