

Interpretation of Graphical Contents in Document Images: An Overview of Techniques

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Abstract

Graphics recognition and interpretation is an important topic in document image analysis since graphics elements pervade textual material, with diagrams illustrating concepts from the text, company logos heading business letters, and lines separating fields in tables and sections of text. In some special application domains graphical components dominate the document; these include engineering diagrams, maps, business charts, etc. The goal of graphics recognition research is to extract information to semantically describe the contents within images of document pages.

A common sequence of steps taken in document image analysis for graphics interpretation is similar to that for text. Preprocessing, segmentation, and feature extraction methods are first applied. An initial segmentation step that is generally applied to a mixed text/graphics image is that of text and graphics separation. Once text is segmented, typical features extracted from a graphics image are straight lines, curves, and filled regions.

After feature extraction, pattern recognition techniques to determine the similarity of an extracted feature to a known feature using geometric, statistical, or syntactic means are applied. After this mid-level processing, these features are assembled into entities with some meaning – or semantics – that is dependent upon the domain of the particular application. The semantic interpretation of a graphics element may be different depending on domain; for instance a line may be a road on a map, or an electrical connection of a circuit diagram.

We first describe a generic graphics recognition system for interpreting flow charts, block diagrams, etc. We then consider two special application domains: conversion of mechanical part drawings into a CAD format and generation of a database from a telephone company's drawings and tables. Experimental results obtained using real drawings will be used throughout to illustrate the capabilities and limitations of the methods.