Building Synthetic Graphical Documents for Performance Evaluation

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Abstract

In this paper we present a system that allows its use to build synthetic graphical documents for the performance evaluation of symbol recognition systems. The key contribution of this work is the building of whole document like drawings or maps. We exploit the layer property of graphical documents by putting symbol sets in different ways from a same background using positioning constraints. Experiments are presented to build two kinds of test document databases: bags of symbol and architectural drawings.

Keywords: Performance evaluation, symbol recognition, ground-truthing, synthetic document, constraint

In recent years there has been a noticeable shift of attention within the graphics recognition community to the topic of performance evaluation. Performance evaluation is divided into two main topics: ground-truthing and performance characterization. The first is concerned with the production of test document databases and their corresponding ground-truth [1], while the second deals with the matching of system results to that ground-truth [2]. In this paper we are more interested in ground-truthing. One way to do it is to create and use synthetic documents. The test documents are built by an automatic system which combines pre-defined models of document components in a pseudo-random way. Test documents and ground-truth can therefore be produced simultaneously. In addition, a large number of documents can be generated easily and with limited user involvement.

This topic is emerging and only the systems of [3] [2] [4] [5] [6] exist in the literature. These systems are mainly applied to the building of documents composed of segmented symbols. Our main contribution in this paper is to extend these systems to the building of whole documents. Indeed, real-life documents (like the engineering drawings, the architectural maps or the electrical diagrams) are composed of multiple objects constrained by spatial relations (connectivity, adjacency, neighbourhood …). To do it we have exploited the property of graphical documents that are composed of two layers: a linear and a symbolic one. We use then this property to build several document instances: *ie* symbol sets positioned in different ways from a same background as shown in the Figure 1. Like this, the building process of whole document is made easier and can be considered as a positioning problem of symbols on a document background.

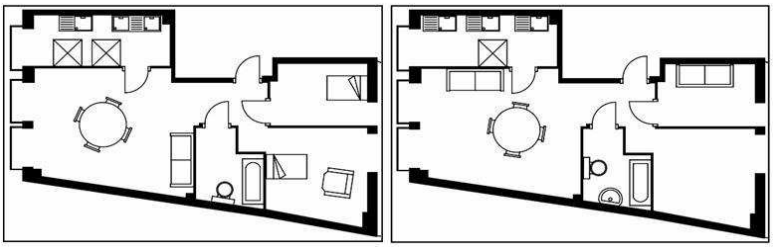

Figure 1 Two document instances

Our approach raises on the use of constraint in order to coerce the positioning of symbols. The main architecture of our system is presented in the Figure 2. This uses as entry data a background image, a database of symbol models and a file containing the positioning constraints. These positioning constraints are edited by a human operator from the used background image and the models of symbol to associate. Based on these entries two main processes are exploited by our system to produce the document instances: a symbol factory and positioning. The first one selects and loads the symbols from the model database. The positioning step solves the constraints to determine the symbol location. Finally, a building manager supervises the whole process by checking the positioning and stopping the building when a satisfaction level of constraints has been reached.

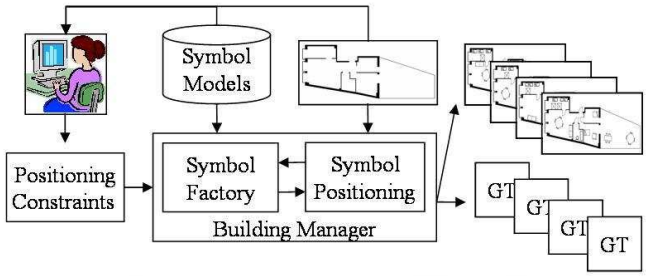

Figure 2 Our system

We present initial experiments and results of our system. The main objective of these experiments is to constitute databases of test document, with their corresponding ground-truth, for the third edition of the Symbol Recognition Contest attended during the 2007 Workshop on Graphics Recognition (GREC'07). To do it we have exploited the symbol model library constituted during the last edition of the Contest[1]. Based on this library we have edited several constraint sets in order to build test document databases of two types: bags of symbol and architectural drawings. The Figures 1 and 3 gives examples of document we produce.

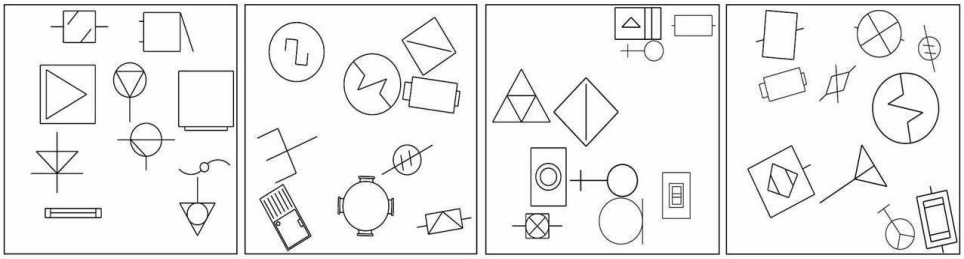

Figure 3. Examples of bag of symbol
(a) none transformation (b) rotated (c) scaled (d) rotated & scaled

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