

Table 1. Comparative information extraction methods from engineering drawing tables.

Author	Method/Approach	Problem(s)
L. Najman et al (2001)	Detects the existence of any rectangular which contains several dots. Recognize based on the starting registration point by referring to bottom-right corner point.	Focus on title block extraction only.
J.F. Arias et. al (1997)	Extracting the straight lines of the petite regions in the drawings by using the FAST method. The box with the biggest region that fulfilled certain criteria of the width-to-height ratio will be chosen as the title field.	Case-based problem. Not suitable to implement on other type of engineering drawing. Focus on title block extraction only.
L. Najman et al (2001)	Based on a signal measurement which is being calculated on the title block.	There is a case rejected, especially because of the difficulty with the frames and the region of the title block, which part of it is being erased or perpendicular.
T. Lu et. al (1997)	Extracting structured knowledge from an engineering drawing table by implement Global Line Vectorization algorithm.	Could not detect parallel and perpendicular lines which might contain errors.
Y. Cao et al. (2005)	Analyzing the layout of a square region from a drawing frame and the information related to the version then is extract with the help of keywords defined in the database.	Time consuming Need to scan the whole drawing where there are a lot of rectangular needs to be analyzed. Not suitable for engineering drawings with different layout plan because predefined patterns should be prepared and implanted into the system.
T. S. Mahmood (1999)	Implement technique of 2D pattern localization in unsegmented images called location hashing.	Unable to locate title block which has different layout plan as it requires a learning step to establish a model for each structure to locate.
M. Ondrejcek et al. (2009)	The title block is identified manually on the engineering drawings and contains a cropped title block. The cropped title block is identified according to the type and is compared to the existing template.	Using template in determining the type of a title block. If it is found out that the title block is not suitable to the template, the title block could not be identified and the information extracting process failed to execute. Focus on title block extraction only.

5. RESULT & DISCUSSION

As mentioned before, there is a possibility of the existence of more than one table in engineering drawing. A typical bill of material is shown in Figure 2 and revision block in Figure 3. Looking at the majority of the existing information extraction technique and algorithm for table in engineering drawing, we can observe three things. First, most published works reported for engineering drawings with different layout plan of drawing frames, predefined patterns should be prepared and implanted into the system before information extraction take place. Therefore, the method unable to extract information if the layout is not same with predefined layout in the database.

Second, most current information extraction methods assume that the table in engineering drawing is perfectly structured and the lines are well connected between them. Third, there is no available method that can solve problem if there have an error found in the table where the table lines are not interconnected with each other.

In determining the existence of tables, algorithms that detect rectangular assume that horizontal and vertical lines are perpendicular [9]. Perpendicular and parallel lines that make

intersections are connected and the degree is always 90 degrees. However, most of the commonly used algorithms in table recognition in engineering drawing are unable to make a correction if the intersections which supposedly connected are not connected. This raises issues and brings challenges to the information extraction of table in engineering drawing.

6. SUMMARY

This paper describes review on recent research in extraction of engineering drawing tables. Along the way of this reviewing process, the weakness and downside of previous researches has been identified. This paper began with brief scenario in information extraction on engineering drawing and ends with analysis and discussion.

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