

**A PROJECT REPORT  
ON  
“AUTOMATIC GENERATION OF TEXTUAL  
DESCRIPTION FROM ARCHITECTURAL  
FLOOR PLANS”**

**Submitted to  
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**BY**

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# **Chapter 1**

## **Abstract**

The project is divided into two parts. In first part, texts and graphics separation aim at segmenting the document into two layers: a layer that contain text and a layer containing graphical objects. In this project, we remove all the graphics components by Analysis of Connected Components method proposed by Fletcher and Kasturi. Then the text components are recognised by the OCR and finally Edit-distance is used to reduce the error in text components.

In second part of the project, generated text is used for detail description of floor plan. In which we separated the useful texts require in detail description of floor plan and rest of the text is removed. Finally the text is analysed and textual description of Architectural Floor Plans is generated.

## **Chapter 2**

### **Problem Statement**

A software which will analyze the Architectural Floor Plans and its detail textual description is automatically generated. As input we require an image of Architectural Floor Plan and the output is a detail textual description of floor plan. For example, for a 2 BHK floor plan the output is "There are 2 Bedrooms, 1 Hall, 1 Kitchen ...".

## **Chapter 3**

### **Introduction**

#### **3.1 Overview**

Text/graphics segmentation is a useful pre-processing step in the image analysis chain. The aim of this process is to extract two separate layers, one containing just graphical information, the other just containing textual information. Textual information in technical drawings is important for further analysis, especially when semantics of room should be detected. For other steps in the analysis, e.g., the structural analysis of graphical elements, text might lead to false interpretations. Thus text/graphics segmentation is a useful pre-processing step in the document analysis chain. The aim of text/graphics segmentation is to generate a textual description of floor plan with the help of the layer containing textual information, respectively.

#### **3.2 Analysis of Text**

After getting text from the the floor plan. Each word is analysed and its error is reduced by using Edit-distance, and all the unwanted words are removed from the generated text. The remaining text are highlighted on the original image. Now these words are again analysed and sorted according to their location in the floor plan. Finally the detailed textual description is generated.

## Chapter 4

### Literature Survey

#### 4.1 Brief Literature Survey

S. No.	Title	Author	Journal/ Conference	Year
1.	A complete system for the analysis of architectural drawings	Dosch et. al.	International Journal on Document Analysis and Recognition	2000
2.	Text/graphics segmentation in architectural floor plans	Ahmed S. et. al.	International Conference on Document Analysis and Recognition	2011
3.	Text/graphics separation revisited	K. Tombre et. al.	Document Analysis Systems V, ser. Lecture Notes in Computer Science	2002

## Chapter 5

### Methodology

#### 5.1 Recognition of Text from Floor Plan

##### 5.1.1 Activity Diagram

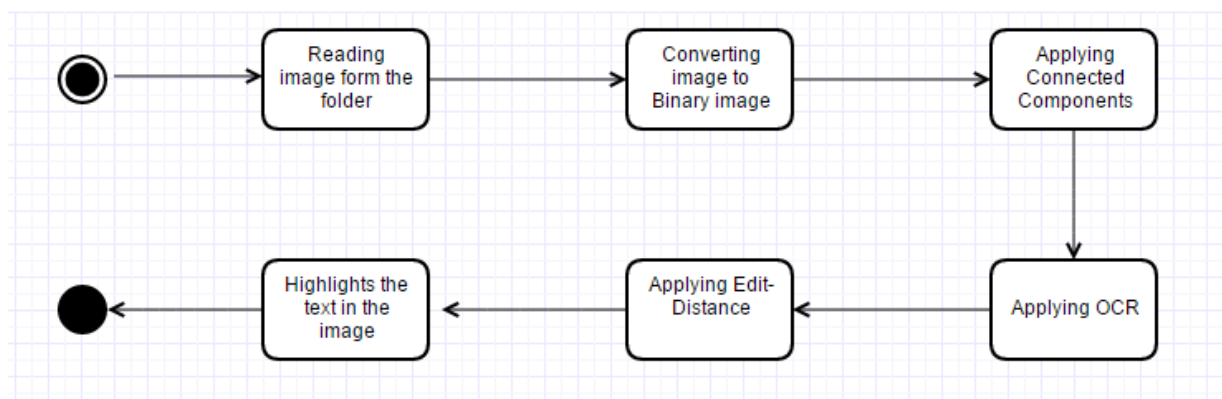


Figure 5.1: Recognition of Text from floor plan

##### 5.1.2 Steps Followed

1. Reading image from the folder, disk, etc.
2. Converting input image to binary image.
3. Applying connected component algorithm to detect all the connected components in the image.
4. Removing all the connected components having area greater than a fixed value.
5. Now, OCR(Optical Character Recognition) is applied on the image to generate text.
6. Then Edit-distance algorithm is applied to obtain error free and noise free text.
7. Generating an intermediate image with highlighting text using bounding boxes.



## 5.2 Analysis of Text

### 5.2.1 Activity Diagram

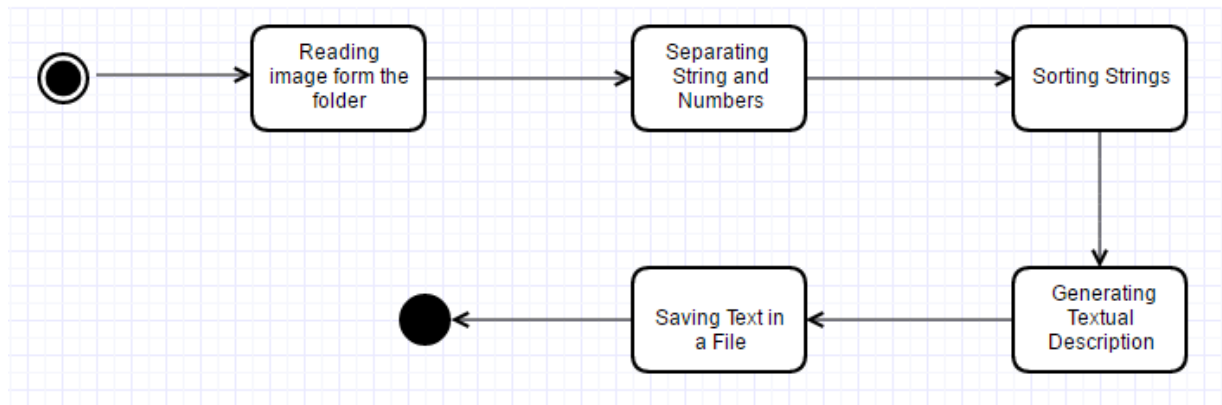


Figure 5.2: Analyse of Text

### 5.2.2 Steps Followed

1. All the text are saved with their coordinates, width, length.
2. Now the string and the numbers are separated from the text.
3. Strings are sorted according to their coordinates.
4. The textual description is generated after analysing the strings.
5. All the detailed textual description is saved into a text file.

## Chapter 6

### Experiments and Results

This project is implemented using Matlab and have tested with various Architectural Floor Plans images. Some of the results are also displayed below.

Figure 6.1 is original image on which we apply Connected Component Algorithm. Figure 6.2 contains the image after removing all the graphical components. Then the OCR algorithm is applied which detected all the text in the image (Figure 6.2) and highlighted the detected text in bounding boxes in Figure 6.3. Finally, after analysing the extracted text, a textual description is generated which will be shown in the Figure 6.4.

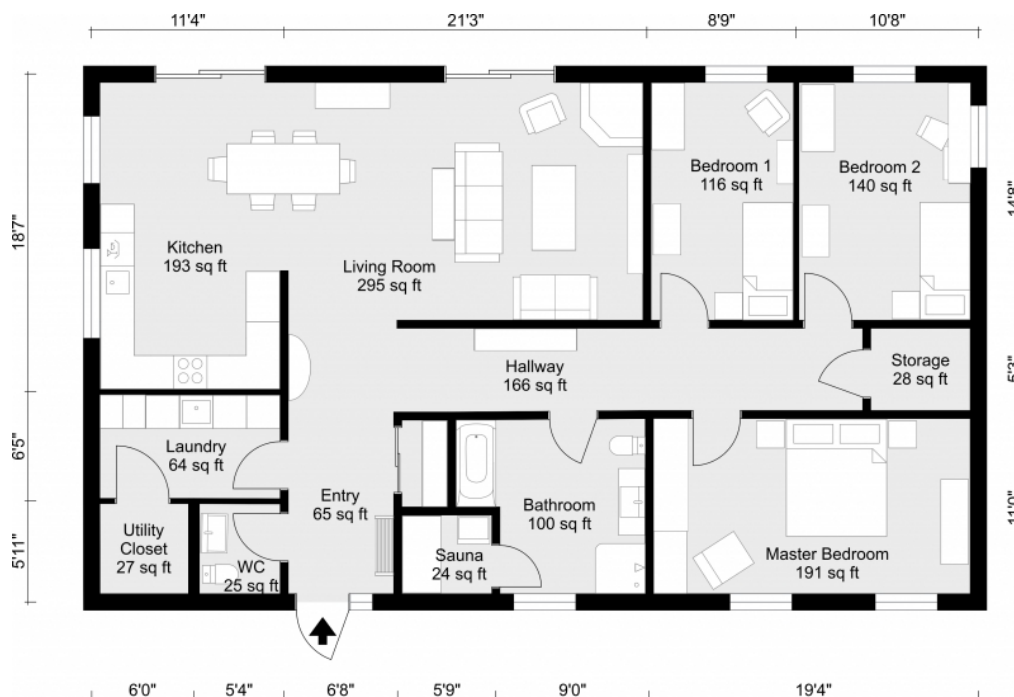


Figure 6.1: Original Image

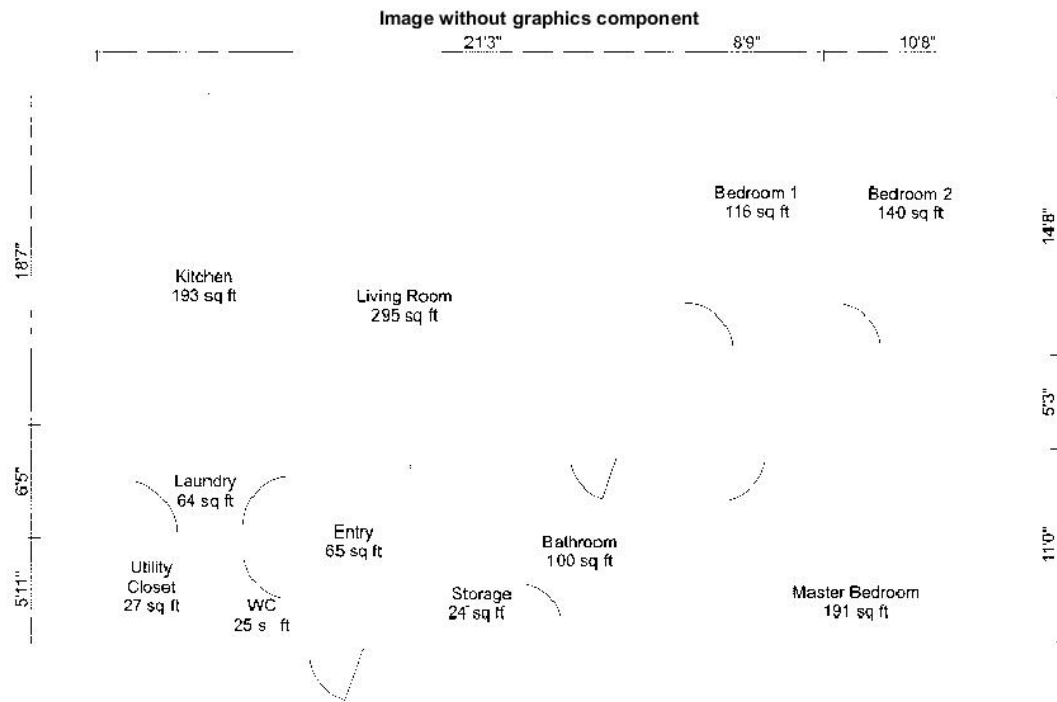


Figure 6.2: After Removing all Graphics Components

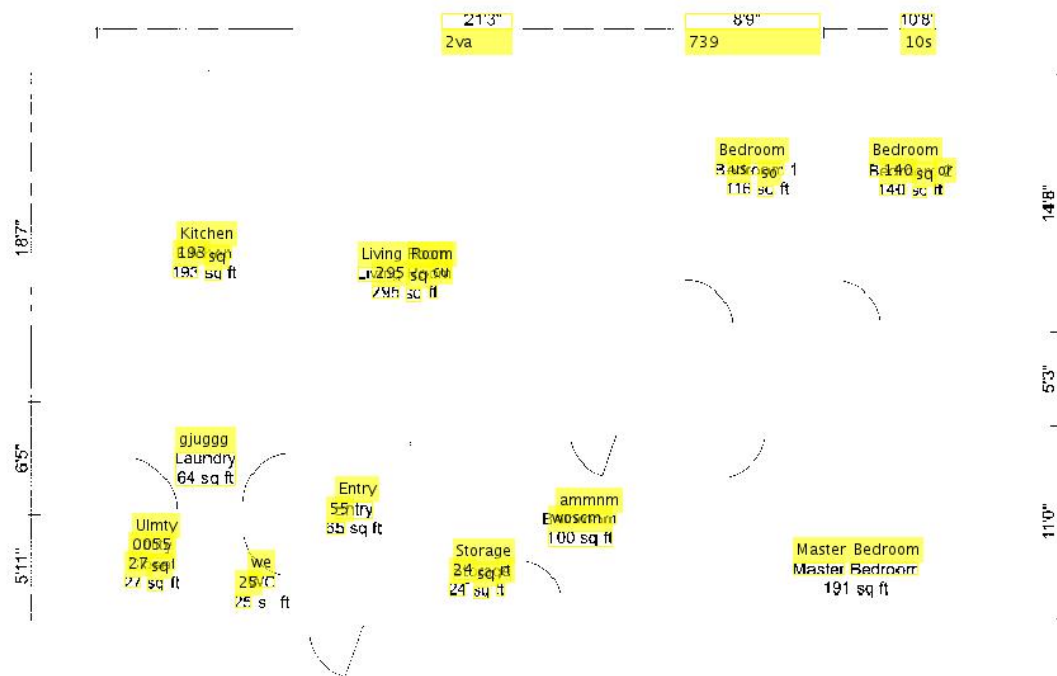


Figure 6.3: Highlighted Text

In this architectural floor plans, there are three BEDROOMS, one ENTRY, one KITCHEN, one LIVING ROOM, one STORAGE. KITCHEN is the upper left most room in the floor plan. LIVING ROOM is the right adjacent room of KITCHEN. BEDROOM is the right adjacent room of LIVING ROOM. BEDROOM is the right adjacent room of BEDROOM. BEDROOM is also an upper right most room of the floor plan. ENTRY is the right left most room in the floor plan. STORAGE is the right adjacent room of ENTRY. BEDROOM is the right adjacent room of STORAGE. BEDROOM is also an lower right most room of the floor plan. The area of BEDROOM is 140 square unit. The area of KITCHEN is 193 square unit. The area of LIVING ROOM is 295 square unit. The area of STORAGE is 24 square unit.

Figure 6.4: Textual Description

Figure 6.5 is original image on which we apply Connected Component Algorithm. Figure 6.6 contains an image after removing all the graphical components. Then the OCR algorithm is applied which detected all the text in the image (Figure 6.6) and highlighted the detected text in bounding boxes in Figure 6.7. Finally, after analysing the extracted text, a textual description is generated which will be shown in the Figure 6.8.



Figure 6.5: Original Image

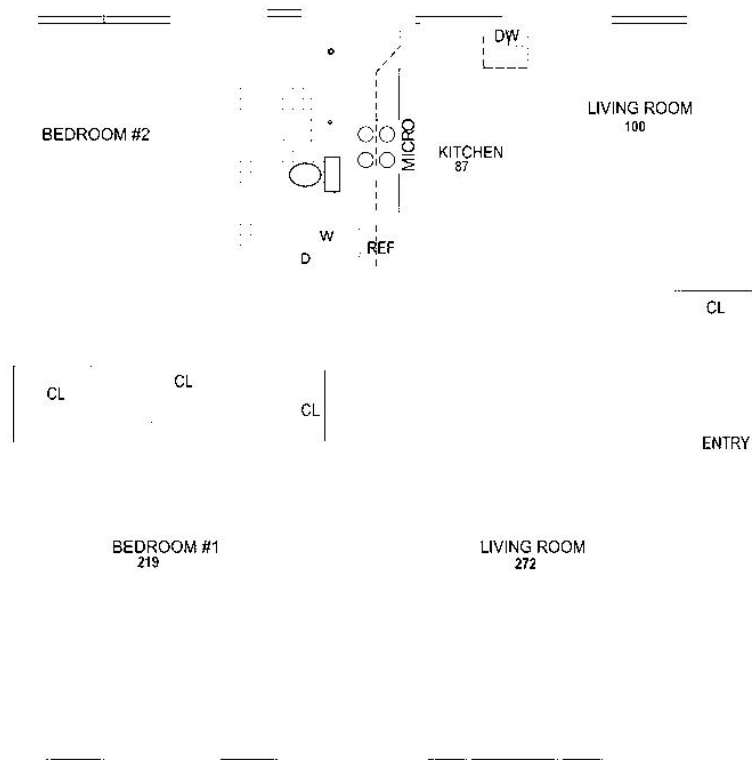


Figure 6.6: After Removing all Graphics Components

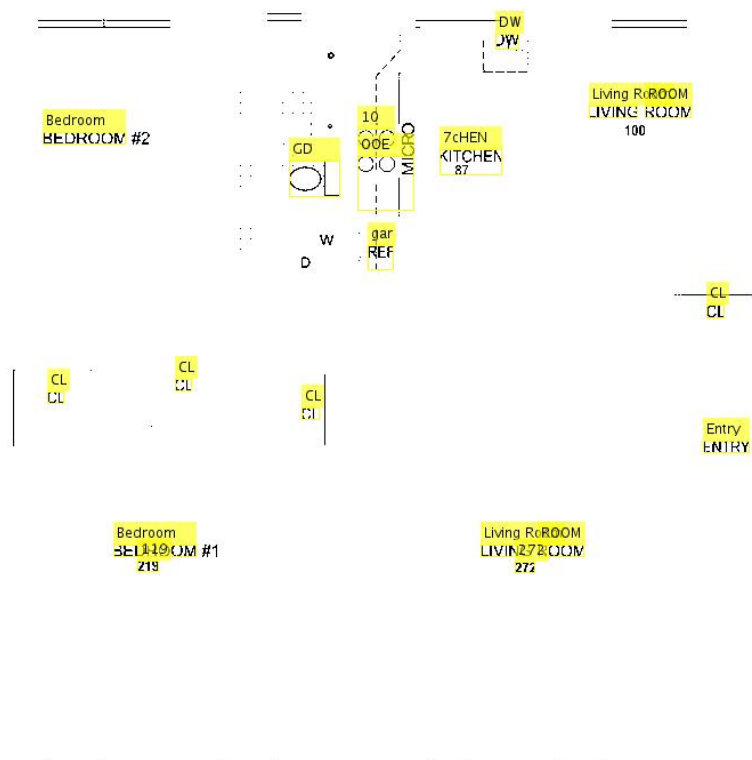


Figure 6.7: Highlighted Text

In this architectural floor plans, there are two BEDROOMS, one ENTRY, two LIVING ROOMS. BEDROOM is the upper left most room in the floor plan. LIVING ROOM is the right adjacent room of BEDROOM. LIVING ROOM is also an upper right most room of the floor plan. BEDROOM is the lower left most room in the floor plan. LIVING ROOM is the right adjacent room of BEDROOM. ENTRY is the right adjacent room of LIVING ROOM. ENTRY is also an lower right most room of the floor plan. The area of BEDROOM is 119 square unit. The area of LIVING ROOM is 272 square unit.

**Figure 6.8: Textual Description**

# Chapter 7

## Conclusions

In this project we have proposed a method for brief textual description of Architectural Floor Plan. We conducted our project on the floor plans which are publicly available. The overall performance of the our project is quite encouraging.

Currently, our project is not proposed for the complexed images such as the image contain lots of graphical components. The font style of the text in the image is Standard and not hand written, and all the text in the image is horizontal. The text is not too much overlapped with graphical components. Currently, error rate of detecting text is higher.

### 7.1 Future Scope

- This project can be further analysed the connected components algorithm so that all the overlapping text components are not removed.
- One can modified OCR algorithm, so that OCR will detect the text at any anglea and would be more accurate.
- Complex floor plan images require more analysis for text generated by OCR.
- One will take separate project to detect and recognised all font style and hand written text.

## References

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