

Floor Plan Generation and Auto Completion Based on Recurrent Neural Networks

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Abstract—During early design phases, the architect’s task is to develop a floor plan layout from a high level description. This process is usually conducted manually nowadays in an iterative manner. In order to assist the architect with repetitive tasks during the individual design steps, we trained a recurrent neural network to mimic the architect’s behavior. Our approach is based on sequences that recreate the user’s behavior and that we generated from simple floor plans. By utilizing a dedicated inferencing mechanism, we are able to implement the generation of different design steps and tasks using a single LSTM model. We compare two different types of sequencing approaches by calculating their errors on a test set for a selected design step and evaluating the results qualitatively. While the current performance still needs to be improved for productive use, our dedicated inference mechanism shows a functional behavior.

Index Terms—Archistant, Archistant WebUI, LSTM, Early Design Phases, Architectural Support

I. INTRODUCTION

During early design phases, an architect is given a high level description of a building from a costumer (e.g. "Apartment with two sleeping rooms and a 200 square feet living room"). The architect’s task is to develop a floor plan layout.

II. RELATED WORK

A. The Long-Short Term Memory

Long-Short Term Memories [1] are a class of recurrent artificial neural networks.

B. Floor Plans as Graphs

Floor plans can be described in a graph-based manner [3]: each room is represented by a node in the graph, each connection between two rooms (wall, door, entrance or passage) is represented as an edge.

III. PROPOSED MECHANISM OF AUTOCOMPLETION OF FLOOR PLANS USING LSTM

A floor plan is described by three blocks (each consisting of tags of the same kind): 1. the room function declarations, 2. room connections and 3. the room geometry layouts.

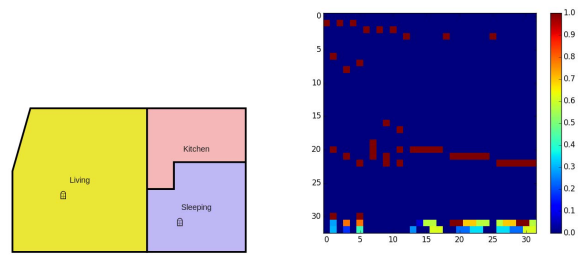


Fig. 1. Left: Rendered Image of a Sample Floor. Window symbols indicate access to natural light. Right: Feature Vector Sequence Encoding of the Same Floor Plan.

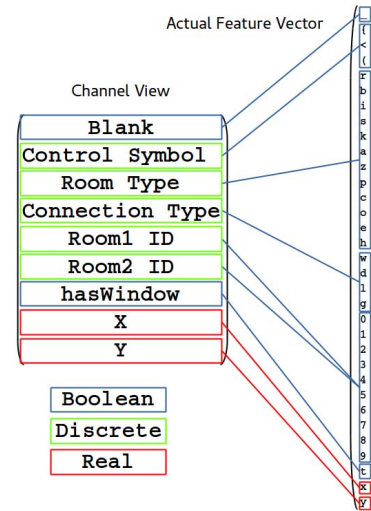


Fig. 2. Structure of the Feature Vector.

A. The Feature Vector

A floor plan has to be described by a sequence of feature vectors for LSTM processing (see fig. 1).

The feature vector (which is used both as the model’s input and output) can be considered as structured into several channels (see fig. 2). The components, which encodes a point’s

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