

An Evolution-Based Home Furniture Layout Assistant For Non-Designers

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BIOGRAPHY

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INTRODUCTION

Among all types of building construction activities, home renovation happens most frequently. Remodeling of rooms is the major part of home renovation. Furniture layout arrangement is the main activity of remodeling a room. This is usually performed by homeowners of those most are non-designers.

Modular furniture systems have been widely used in offices and high style modern homes. Unlike traditional furniture, modular furniture is easily rearranged to fit into various spatial configurations. Therefore, modular furniture is a better design solution for sustainability. Generally speaking, most homeowners are pressed in interior design. They image the formulary specifications of hard variety even though the modular furniture is flexible. In fact, doing little change among modular will cause new a creative result. Homeowners could be inspired to explore the possible rearrangements of modular furniture to fit their new rooms.

Aiming at the above -mentioned issue, this research hopes to make use of the computer's rapid computations and vast memory to help homeowners designing their furniture arrangements. This design tool should contain enough design knowledge to assist homeowners to explore modular furniture arrangements with reasonable functional considerations. It should also allow homeowners to investigate furniture arrangement under various room configurations so as to be a decision support before homeowners begin the actual home renovation.

Evolution-Based Space Layout Planning

Furniture arrangement is a kind of space layout planning problems. Jo and Gero (1998) point out conventional layout planning approaches (such as grammatical or generative approach) require intensive computational power. Gero and colleagues have demonstrated evolutionary methods to solve layout problems for office buildings, schools and hospitals (Gero and Kazakov, 1997; 1998; Gero, 1998; Jo and Gero, 1998). Rosenman (1997) explores evolutionary models for non-routine design. Although, very few publications are found to directly address furniture or room layouts, we find the evidences provided by these previous works providing a good foundation for us to implement a home furniture layout tool using evolutionary approach.

Since the home furniture layout tool is for homeowners, certain design knowledge should be encapsulated within the system. Gero and Kazakov (1997) present a genetic engineering approach to store design information in the forms of sets of evolved genes as good designs that can be reused to evolve new designs. We adopt this approach as the basis of the layout tool. For dealing with complex design problem, we take multi-level evaluations illustrated in Rosenman (1997). A furniture layout is decomposed into several levels then depends on the different level to categorize the design element.

Interactive Design Evolution

The furniture layout tool allows homeowners to consider different room configurations. We consider the room configuration a key factor of fitness function to consider design genes and fitness. In essence, it allows homeowners, according to their needs (such as minimize costs or maximize compactness), to adjust and synthesize fitness function. As a result, the design evolution is guided by inputs from homeowners.

We are currently formulating the system architecture of the furniture layout tool. We hope to present a prototype implementation in the full paper.

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