## Automatically design a button

***Abstract***

*Webpage design tool with user interaction has garnered great interest from both engineers and researchers in recent years. In fact, among the processes, button is one of the most difficult and tedious to design for novices due to their lack of expertise. In this paper, we propose a novel method to assist user to design a button with simple interactions. Our focus in this paper is not on the whole story of automatic design system for webpage, but rather on introducing a novel subsystem of designing buttons, which can be intergraded into other current system.*

***1. Introduction***

In recent years, many webpage design tools have been devoted to novices to accomplish webpage design in a fast and quality way; unfortunately, few have emphasized the button’s importance. In our knowledge, button is the most significant user control of a webpage, a lot of evidences show how different button’s placement, size and style will affect conservation rate. Many webpage design novices would agree that, had it not been for automatic design of a button, the process would be time consuming even tedious. Further more, the heuristic guidelines to design a button are various and unclear in cases, sometimes can be entirely opposed. To what extent can a novice be easy to address this tedious problem?

Here, we use learning methods to learn how to design a button. We consider the geometry relationship between button and the surrounding elements to predict the position and size. Next for the color, we update the state-of-art method to achieve the goal of filling color with the button. A novice can achieve button design by just a few click operations. Thus, our approach enables a fast and quality way to design buttons.

The main contribution of our work is in proposing the first method to assist the novice to design button in a fast and quality way. Further more, we demonstrate that this method can be intergraded into existing system easily.

***2. Related work***

**Shape placement**

[Paul Guerrero et al.2015] propose a method of shape placement for both 2D and 3D scene, by transforming the relations among elements into shape descriptor and use kernel regression with candidates selected by local maxima of density to rank and filter the candidate placements as output. We mainly study this method and reshape it to adapt to our problem.

**Layout**

Previous work on layout recognition of table-formed documents, e.g., [T Watanabe et al.‎1995] suggested a classification tree model for layout recognition of the table-formed documents. Also in other field like manga, auto structure of Comic layout also has been proposed in the literature, e.g., [Y Cao et al. ‎2012], using tree structure to represent comic layout. We will study these methods for our web page design representation.

[B Reinert et al.2013] developed a UI system to place items in a visual pleasing way so that the items will be placed in some patterns that meet the user’s intension. However, in this method, objects will be placed with equal distance margins, which is not suitable for webpage element.

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***3. Method***

**3.1 Webpage button database creation**

The first step in our process is to collect data for button design. Here we choose around 50 images from the Internet and use LABELME to annotate the elements manually. We observe that webpage elements can be classified into 7 types as following: Text, Input, Image, Background Image, Icon, Border and Button. When we are labeling an element, a rectangle with label will be use as a bounding box to depict that element. Next, we group annotated elements by different web pages and finally, we will start to learn how these examples design buttons.

**3.2 Generative model for button region**

Before we are actually designing a button, we first need to decide where a button should be place. Such rough region for whether a button is reasonably placed inside, we call button region. Next, we need to analysis the given webpage image, and choose a set of region to represent button regions. To achieve this we propose a method to generate a large set of region from the webpage image and use SVM to select “high” scored region become button region.

**Generating region**

First we will introduce the method to generate region from the given webpage image. Our observation is that a button can be contained within a larger region beside its near . For one webpage with n element inside, we define Pi, k  R2, where i  [1, n] and k  [1, 4], to represent the kth vertex of the ith element. As each element is represented by a bounding box, there are four vertexes for each.