

## Chapter 3

# Understanding Spatial and Non-Spatial Cues in Representing Categorical Information

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### ABSTRACT

*The continuously increasing amount of digital information available to computer users has led to the wide use of notification systems. Although these systems could support the management of information, they could also be an interruption to primary work. To minimize this interruption, a number of approaches, which notify the different categorical information, have been introduced. In this work, we focused on understanding the effectiveness of different types of visual cues to effectively represent categorical notification. Five basic visual parameters of motion, colour, shape, motion and spatial were chosen to represent sets of two categories, four categories, six categories and eight categories of information. The effectiveness of these visual cues in assisting users' ability to decode the categorical cues was examined through a series of experimental studies. Findings suggest the superiority of using colour, shape, and spatial cues to represent categorical information. Post experiment questionnaire reveals possible reasons for their efficiency. Spatial memory supports spatial cues while linguistic influence supports the shape/colour cues. The unsuitability of size parameter is possibly due to not being able to measure the cues against something during the encoding process. This makes it difficult to determine how each cue differs from the rest of the cues in the parameter, especially when number of categories increase. As for the motion parameter, encoding the cues took far longer response times, although time taken is consistent across number of categories. The different effects of these basic visual cues suggest the importance of careful design selection to ensure successful visualization.*

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## INTRODUCTION

Notification systems have been widely used in recent years in order to provide the necessary awareness for users. This includes informing on the activities of other users, shared documents that have been created, new emails that have been received and many more. In other words, notification systems could be used to provide various types of information sources by a variety of user interface designs. The most common selections to represent these notifications are visual, auditory and combination of both dimensions.

The effects of visual designs on user's attention have been investigated by many (Hoffman, 2008; Khan, 2005). In these studies, design properties such as colours, luminance, shapes and so forth were investigated to understand which design is most suitable to direct user's attention towards targeted items. Others might be more interested in the effect of design towards user's ability to carry out dual activities, of both primary task and keeping aware of information from notification systems (Maglio, 2000; McCrickard, Catrambone, Chewar, & Stasko, 2003). In those studies, authors investigated the effects of several types of moving texts that delivers information. The direction of the texts as well as the frequency of the movement was among the parameters of interests.

In this study, we are interested to find the effects of different visual properties on user's ability to recognize the meanings they represent. We believe that this study would be useful in designing categorical notification systems. Categorical notification system means that there exist several categories within the system in order to provide users with more information of the new notification. For instance, in managing emails, users could categorize them into groups depending on sender. Thus, when a new email arrives, the notification system will automatically indicate which category that email is grouped into. This allows users to easily decide whether the notification should be attended to immediately or not. Thus, unwanted interruptions could be avoided.

## BACKGROUND

### 1. Notification Systems and Design Consideration

The fast and dynamic exchange of information in today's workplace means that users' management of that information is highly critical. Thus, notification systems have been widely used to provide appropriate support in that matter. Using various visualization approaches, these systems keep users aware of current happenings. Ideally, notification systems should be able to notify users the availability of new and valuable information in an efficient way and be attended to at least a certain degree (McCrickard, Czerwinski, & Bartram, 2003). It is essential that it is not disruptive to primary tasks, while being salient enough to grab user attention when it is highly needed.

Various visual designs have been proposed in order to create appropriate notification systems. Systems could represent various types of data, new email, availability of colleagues, stock prices and many more. These variations also mean that design selections could be data and domain specific. For instance, a majority of notification systems that alert users on new emails use 'badge' to represent information. A numerical number in a 'badge'-like visual icon indicates how many new pieces of information have arrived and also how many have not been attended to. Other examples include the use of different types of moving texts to represent stock prices, and different colours to represent the availability of colleagues.

The designs of notification systems are not limited to visual cues that represent information. Visual and auditory cues have also been evaluated to provide awareness on risky situations in dark rooms (Kanai, 2008). An auditory based prototype system named AudioAura has been developed to provide awareness on people's physical actions within a workplace, such as location of a fellow colleague (Baer, 1998). The design of those auditory cues manipulating different sound effects, music, voice, or a combination of those cues was

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