

The Pre-attentive Processing Review of a Film Review Website

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Introduction to Pre-attentive Processing

Human beings, like all living organisms, react to sensory stimuli. Yet, surrounded with innumerable stimuli concurrently, a detection system is required to interpret the most vital data immediately. Thus, in order to survive, human developed the ability to recognize the sensory nuances in rapid procession; be it the slow movement of a snake on a tree, the minor rustle of a wild cat hidden in the silent bush, the subtle touch of a bug crawling on the skin, the kinky smell of a cover inside a bear cave, or the eccentric taste of a handful of almonds containing enough arsenic to kill a horse. These are examples of the sensory stimuli that require thin-slicing in action, where none of the connections are made in a conscious level, yet, in retrospect, all the anomalies make perfect sense later on (Gladwell, 2005). Some patterns are so subtle, they are referred to as intuitive patterns. Damasio (1997) found that intuition, the ability to recognize the key elements that indicate the dynamics of a situation, has a basis in biology, by comparing patients who were brain damaged to normal patients and found out that the system seemed to be activated long before they were consciously aware that they made a decision (Klein, 1999).

Due to the fact that the ability to process the vast amount of information flow in conscious state and in an efficient manner is non-existent, there is a need to interact with the outer world by detecting, filtering and prioritizing the sensory data preattentively. This pre-attentive process computes how different each object is from each of the other objects within a particular stimulus dimension, and the attention is automatically drawn to the location having the highest activation, implying that the object at that location is automatically selected irrespective of the intentions of the subject (Theeuwes, 1993).

Characteristics of Pre-attentive Processing and Gestalt Theory

When a stimuli is detected, the pre-attentive system starts processing the data by extracting the uncoupled and group the similar data. Features are initially encoded through a feed-forward pathway from V1 to higher visual areas in both ventral and dorsal pathways (Wolfe, 2003). It is widely assumed that this process of grouping objects take place early in visual processing and this grouping function is to solve the problem of “what goes with what” and the differentiation of figure from ground. This process takes place in 240 milliseconds or less as the eye movements take at least 200 milliseconds to initiate and 40 milliseconds for the eye to receive information about the data’s features such as size, motion and intensity. “Any perception that is possible within this time frame involves only the information available

in a single glimpse. Typically, tasks that can be performed on large multielement displays in are considered pre-attentive.” (Healey, 1996).

The pre-attentive processing is not only confined to cortical level but is known to occur as early as the thalamic level. The attention modulated neural activity in the Lateral Geniculate Nucleus (LGN) “enhances neural responses to attended stimuli, attenuated responses to ignored stimuli and increased baseline activity in the absence of visual stimulation. The LGN, traditionally viewed as the gateway to visual cortex, may also serve as a 'gatekeeper' in controlling attentional response gain.” (O’Connor, 2002).

The cortical architecture behind neural attention is considered as top-down processes interacting with bottom-up processes (Gustavo Deco and Edmund Rolls). They are schematized by how the dorsal and the ventral stream to the inferior temporal cortex interact in early visual areas such as V1 and V2, accounting for many aspects of visual attention (Pashler, 2013).

Perceptual grouping has typically been discussed in terms of the principles of grouping first described by the gestalt psychologists (Koehler, 1928; Wertheimer, 1923). German word for pattern -and arguably in relation with *gestaltung*, German word for design-, gestalt theory is founded by three German psychologists, Max Wertheimer, Kurt Koffka and Wolfgang Köhler who stated that an organized whole is not simply the sum of its parts, but a synergistic "whole effect," or *gestalt* (Behrens, 1998). Gestalt principles to seek the most appropriate conceptual ‘fit’ are important not only for survival, but lie at the very heart of design (Maeda, 2006).

Gestalt laws are the defining characteristics of pre-attentive processing of visual data. Other than the spatial proximity of objects, the most common seven gestalt laws may be defined as powerful cues of perceptual organization are; continuity, connectedness, closure, similarity, symmetry and common fate. Continuity states the tendency to construct visual entities that resemble continuity, connectedness expresses the relationship between connecting different graphical objects by lines, closure is about filling-in-the-blanks in the mind when a contour has gaps in it, similarity is related to how similar elements are grouped together, symmetry describes how some shapes are perceived easier because of their symmetrical appearance, and common fate is about flicker and direction of motion (Ware, 2004).

Gestalt laws are efficient in observing preattentive process but fail to explain the science behind the system. Therefore, there are several major theories on how preattentive processing takes place.

Theories and Contributing Factors

One of the most influential psychological models in terms of human visual attention is the Classic Feature Integration Theory, which suggests that search performance results from a two-stage process, preattentive and attentive. Pre-attentive stage is made up of maps, specialized for various features such as color, orientation, motion and spatial frequency. These maps are thought to correlate to neurons selective for a restricted range of values across each of these dimensions. Elements in this first stage operate in parallel processing which allow simultaneous processing across the display and unless the parallel processing does not isolate the target, elements in the second stage become activated, operating in serial processing and focusing on single items (Verghese, 2001). The attention must be directed serially to each stimulus in a display whenever conjunctions of more than one separable feature are needed to characterize or distinguish the possible objects presented (Treisman and Gelade, 1980). In other words, when a stimulus is perceived, features are registered early and automatically.

There are several other approaches that contribute to Treisman's theory. Bela Julesz introduced a new approach and originated Texton Theory, stating that the first features that have perceptual significance are textons, elements of texture perception. Texton Theory suggests that, preattentive processing takes place when differences between texture elements directly contribute to discrimination (Julesz, 1981).

Another component is directed attention, such as walking at a certain path or brushing away of a mosquito. Although they may be initiated with clear awareness when executed, they don't need to depend upon a supervisory attentional mechanism, which means that these actions may lack awareness as if done automatically (Norman, 1986).

Habituation, a form of learning after an organism stops responding to a stimulus after too many repeated exposures, is one of the factors to be considered when examining preattention process (Bouton, 2007). Saliency, the amplified state of a stimulus may be considered as another factor that may be considered in terms of pre-attentivity; because, although it is thought to determine attentional selection, its association with physical factors does not necessarily influence selection of a stimulus (Tsakanikos, 2004).

Rottentomates.com: A Website Review

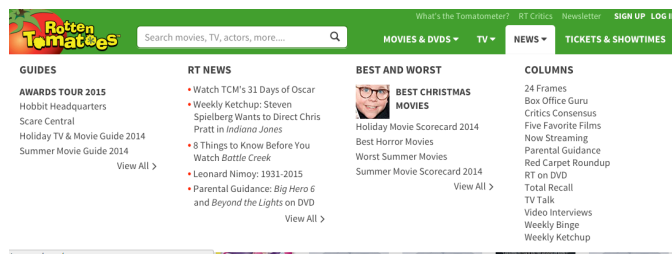
Derived its name from audiences throwing rotten tomatoes to the stage in order to punish a bad performance, Rotten Tomatoes is a website devoted mainly to film reviews and may be described as a review aggregator. Launched by Senh Duong (1998) and acquired by Warner Bros (2011), the website attracts 26M monthly unique visitors worldwide of which 14.4M are from US. When a movie is reviewed and approved by less than 60% reviewers, the move is defined rotten and symbolized with green splash effect; when approved by 60% and up, it is depicted with a fresh tomato symbol; if the movie is fresh and newly reviewed, a yellow ribbon surrounds the tomato symbol.

MOVIES OPENING THIS WEEK			NEW TELEVISION		
🍌 57%	Focus	FEB 27	🍌 100%	Better Call Saul: Season 1	
🍌 13%	The Lazarus Effect	FEB 27	🍌 91%	Fortitude: Season 1	
🍌 98%	'71	FEB 27	🍌 90%	Fresh Off the Boat: Season 1	
🍌 64%	Maps to the Stars	FEB 27	🍌 68%	The Slap: Season 1	
🍌 64%	The Salvation	FEB 27	🍌 63%	12 Monkeys: Season 1	
View All >			🍌 58%	Sons of Liberty: Season 1	
			🍌 50%	Schitt's Creek: Season One	
			🍌 48%	Allegiance: Season 1	
			🍌 100%	Grantchester: Season 1	
			🍌 35%	Backstrom: Season 1	
TOP BOX OFFICE			NEW TV EPISODES TONIGHT		
🍌 25%	Fifty Shades of Grey	\$22.3M	🍌 100%	Banshee: Season 3	
🍌 74%	Kingsman: The Secret Service	\$18.3M	🍌 63%	12 Monkeys: Season 1	
🍌 75%	The SpongeBob Movie: Sponge ...	\$16.6M	🍌 48%	Cristela: Season 1	
🍌 78%	McFarland USA	\$11.0M	🍌 63%	Glee: Season 6	
🍌 63%	The DUFF	\$10.8M	🍌 83%	Helix: Season 2	
🍌 73%	American Sniper	\$10.1M			
🍌 15%	Hot Tub Time Machine 2	\$6.0M			
🍌 23%	Jupiter Ascending	\$3.8M			
🍌 89%	The Imitation Game	\$2.5M			
🍌 98%	Paddington	\$2.4M			
View All >					

Fig. 1: “Fresh/Certified Fresh/Rotten” chart page

The contrasts between green, red and yellow on white background (Fig. 1) provide a clear sense of figure/ground. Grouping, a very critical element of pre-attentive processing is available through color similarity. A “fresh” movie can be separated from a “rotten” one almost intuitively. On the other hand, “certified fresh” movies are hard to separate from “fresh” movies as both features use red color and the attention has to be focused on the yellow ribbon to differentiate.

Another gestalt principle such as size and/or shape similarity could be used in order to notice the differences without a conscious attention. These three review symbols are grouped right in the middle of the page and in very close proximity, the user can sense that these symbols are related; it is another preattentive principle and it enables the user to notice the location of reviews on the page instantly.



Four menus (Fig. 2) on top of the page need thoughtful reduction. There is a considerable amount of links but they have no advantage in terms of pre-attentive processing as they share no distinctive patterns in terms of gestalt principles.

Fig. 2: Tabs

The menu titles are separated by bold fonts and help in visual organizing but the content links beneath them are not distinctive. Separation by borders and closure principle could be applied, grouping by color and varied type size may be considered.

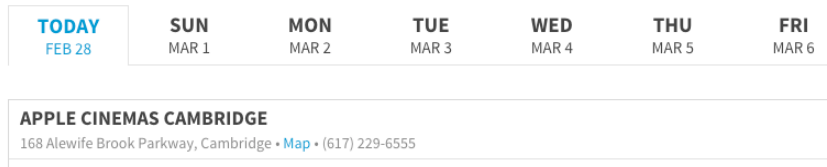


Fig 3. Movie date and location info

Although no frame or border is used between days of the week, they are clearly separated from each other.

This is a great example of a gestalt design principles in terms of pattern forming; the mind can essentially modularize the data and fill in the gaps. Besides, “the opportunity lost by increasing the amount of white space is gained back with enhanced attention on what remains” (Maeda, 2006).



Fig 4. News tabs

News tabs (Fig. 4) are easy to browse and grouped on the bottom right of the page, featuring shape and size similarity. The active tab is white and separated from the inactive gray tabs by color. However, using light gray colors on dark gray background makes it difficult for the eye to notice the buttons quickly so it may disable the pre-attentive processing of visual data.

Conclusion:

This website clearly represents why taking preattentive process into consideration is vital in design. Color and contrast is used effectively, yet, some of the pre-attentive features may need to be improved for a more meaningful sensory experience. Some gestalt principles are applied successfully in several pages. Color similarity is used effectively and helps grouping the data as well. On the other hand, irrelevant content grouped together becomes a concern as it lacks distinctive features in terms of shape and size similarity. Information should be grouped into separate regions for ease of acuity.

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