Role of Visual Stimuli in Final Seconds of Decision-making

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Abstract:

The average Click-Through Rate (CTR) of banner advertisements online dropped 100x, from 44% in 1994 to 0.46% in 2018. The time people spend to evaluate online visual content was found to be <2 seconds. The time constraint and declining CTR highlight the need for effective visual communication[2] for "call-to-action" through digital media. The proposed framework considers the product tile[3] as a visual "stimulus" at the point of purchase, in e-commerce, for habitually bought, (low-risk, low-involvement) products. This framework converges key neurological processes involved in comprehension, time-taken to comprehend, and finally, the composition of an optimal visual stimulus for the final second. The Final Second of Decision Making (FSDM) framework unravels that the final 920ms of a purchase decision are critical to the decision and involve key nonconscious decisional processes. The FSDM framework proposes three crucial elements of the product, that marketeers can focus on, in the composition of an effective visual ad to improve CTRs: (i) core category need, for creating an initial approach, (ii) past experienced, instant, and expected utility for developing liking, and (iii) incentive salience, with emotional benefits and perception of reward, for enhancing nonconscious, motivational 'wanting' that finally leads to action.

Keywords: final second; decision making; approach; liking; wanting.

Introduction

Multiple pieces of research in sports, such as cricket, tennis, and baseball, elaborate the decision-making in players' brains before hitting the ball (Land & Tatler, 2009). For example, in cricket, a study of neurological visual reaction time by Peter McLeod and his colleagues (1987), identified that even a skilled batsman plans his shot 200ms before the ball reaches him. Any changes in the ball's flight in these final 200ms are, essentially, ignored and the batsman just assumes a defensive position. This insight of the 200ms explains the success of the slow ball. In a slow ball, the batsman is deceived by an unexpected turn after the ball hits the ground (Regan, 1992). This is an example of how sports benefitted by unraveling brain processes in the final seconds of decision-making.

Studying the final seconds of decision-making also has significance, overall, in developing better strategies in the digital world. On Netflix, users spend ~1.8 seconds while considering each title (Nelson, 2016). Similarly, on Facebook, people spend ~1.7 seconds with a piece of content on their news feed (Facebook IQ, 2016). According to 2018 data of Google's Ad Network, the average CTR of banner ads plummeted to just 0.46% from 44% in 1994 (Hwang, 2020). These numbers emphasize the need to understand how the brain processes a visual stimulus to drive a call-to-action within the duration of ~2 seconds. We propose the Final Second of Decision Making (FSDM) framework consisting of (i) step-by-step neurological responses elicited by the visual stimulus, (ii) the timing of these responses in the brain, and (iii) the composition of the stimulus required for that response. The FSDM framework proposes a solution for e-commerce brands of low-risk, low-involvement categories, attempting to increase their conversion rates. Here, the visual stimulus at focus is the product tile.

Final Seconds of Decision Making

The product tile can be considered the final mile of persuasion in the purchase decision journey. It is an underutilized medium consisting of the product against a white background. Figure 1 shows the FSDM framework that can bring persuasion to the product tile.

This framework breaks the processing of a visual stimulus into stages and discusses interventions to enhance the responses. A visual stimulus can be non-consciously perceived in as little as 30-100ms (Trafton, 2014) through the retinal ganglion cell axons projecting to the superior colliculus. Responses to emotional visual stimuli can travel in less than one-tenth of a second from the superior colliculus in the brain stem to the frontal cortex. A reflex is generated via the premotor neurons in the frontal cortex for motor control of the muscles of the eyeballs, to generate micro-saccades and/or produce head movements. Emotion is consciously experienced at this point. Parallelly, the visual stimulus, processed through the LGN, begins as a raw response in the occipital cortex. Only through sensory integration and feedback does the response evolve into a state of focus, in about 100-200ms (Desimone & Duncan, 1995). The temporal cortices play a role in recognizing high-level object descriptions, faces and objects.

After about 350ms, the complete meaning of the stimulus has been evaluated by the brain and is brought to full emotional, conscious awareness in the PFC (Carter, 2019). A conscious response is then triggered in the body. The authors postulate this as the automatic *approach-or-avoid* response. Hence, establishing the *category need* of the product in the first 350ms of a visual stimulus may be relevant. The importance given to category needs can also be witnessed in the animal kingdom through their mating game (Miller, 2001). For instance, peahens look at the peacock tail and female bower birds look at the bower built by the male as one

[2] Prompting an immediate response (e.g., buy now or click here).
[3] The display image of a product on an e-commerce platform.

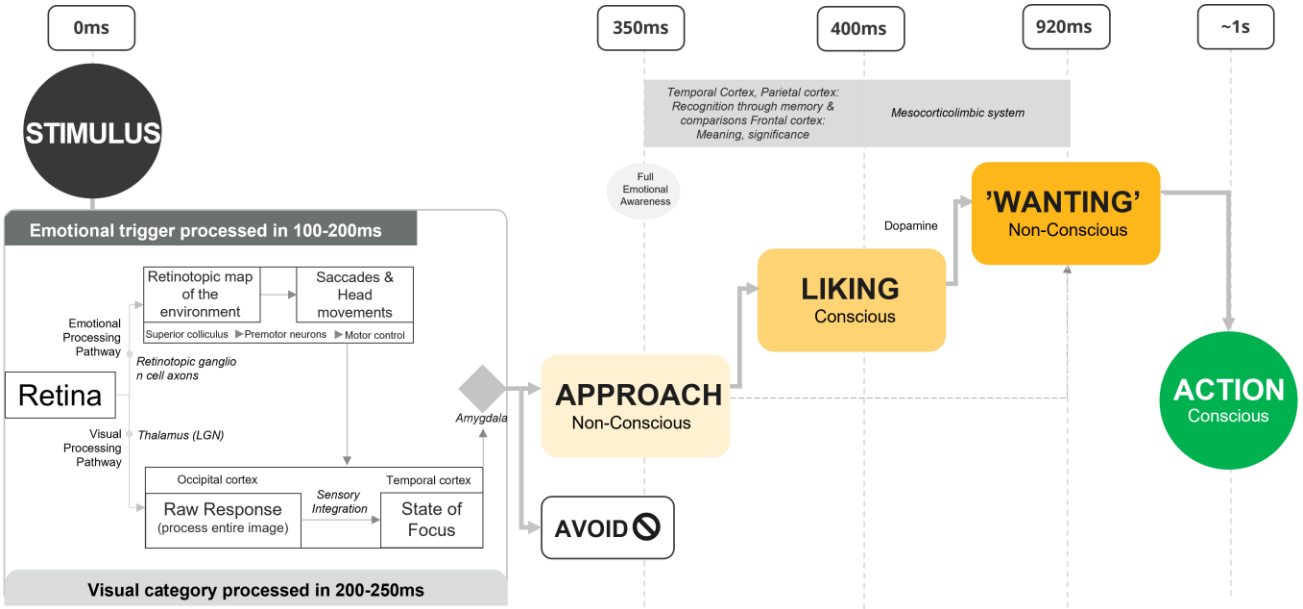

Figure 1: Neurophysiological flow and steps in interpretation of visual stimulus in a normal person

single indicator of gene fitness. This shows how a category need is fulfilled by displaying one significant feature.

Post the reflexive approach-or-avoid response, the brain must begin the process of meticulously analyzing the object that caused the reaction. The raw response after initial visual processing through the visual cortices is sent to temporal and parietal cortices. The temporal and parietal cortices recognize a visible object through memory and comparisons, while the frontal cortices associate meaning and significance. For a product tile, *past-experienced utility* and the *core category benefit* are reinforced through memory associations and context instantiation. This takes about 400 ms as shown by various ERP studies using N400 (Kutas & Federmeier, 2011) where semantic processing in the brain leads to forming a consideration set of 3-4 brands in that category. In humans, hedonic evaluation of instant experienced utility is what (Berridge K. C., 1999) calls ‘liking’.

Hypothalamic stimulation via dopaminergic neurons ascribes motivational effects and *incentive salience* to objects and actions (McClure, Daw, & Montague, 2003). Brain structures most strongly linked to incentive salience are the neostriatum, nucleus accumbens, amygdala and frontal cortex (Berridge, 1999). For example, monetary reward cues and vivid imagery creating an emotional high are ascribed to incentive salience and may have motivational effects. Thus, we propose that dopamine is responsible for converting an object that is ‘liked’ into ‘wanted’. This decision gets completed in 920ms given a high salience choice scenario (Braeutigam, 2001). Finally, once a stimulus is ‘liked’ and ‘wanted’, an action is triggered through motivated behavior (Berridge K. C., 1999).

Discussion

We take a multidisciplinary approach to understanding the final seconds of decision-making. We encompass learnings from cognitive neuroscience, sports**,** and persuasion in the animal kingdom through the mating game. We find that understanding the final seconds of decision-making is crucial to solving the problem of low CTRs on digital platforms. Also, because major portion of funds for hosting free online services on these digital platforms comes from advertising.

We find coherence in our model from other studies of the visual stimulus too. The Vienna Integrated Model of Art Perception (VIMAP) presents that the brain forms a 'gist' of the rudimentary visual features as early as 100ms, via bottom-up processing (Pelowski, 2017). Consistent with our model, a non-conscious approach-avoidance decision takes place at 300-400ms, signaled in the activation of the frontal brain regions. Brielmann & Dayan (2021) broke down the aesthetic value of a visual stimulus into fluency and learning. This idea corroborates with the FSDM framework, it proposes constructing a visual stimulus processed within 1 second. Furthermore, Ramachandran's (1999) research describes how anticipation in a visual stimulus creates engagement. Anticipation may code for the pursuit of reward in non-conscious ‘wanting’ that leads to action. Future directions for the authors include empirical experimentation to collate the neurological phenomena and (digital) human behavior.

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