I Can Guess Your Age Based On How You Look At These Paintings

Turning scientific research into a BuzzFeed quiz

Playful and Creative Science final assignment by Anna Sivera van der Sluijs

Introduction

For the paper 'Looking at paintings in the Vincent Van Gogh Museum: Eye movement patterns of children and adults', Walker et al. (2017) investigated how bottom-up and top-down attentional processes influence people's gaze behaviour when viewing paintings in a museum, and if there is a difference between adults and children. They collaborated with the Van Gogh Museum to analyse the eye patterns of viewers for five Van Gogh paintings.

Known psychologists James Gibson and Richard Gregory proposed the bottom-up and top-down theories for attentional processing. Adhering to the bottom-up model, our eyes move according to the visual input they receive. Thereby they are heavily based on the salience of stimuli such as intensity, colour and orientation (Gibson, 1966). The top-down model argues that our eye movement is driven by the goals of the observer and derives from our preliminary knowledge (Gregory, 1970). These theories are now seen in conjunction, where an interplay between both bottom-up and top-down factors coordinates eye movements (Awh et al., 2012). However, it is found that the reliance on bottom-up processing decreases with age and older people tend to rely more on top-down processing (Açik et al., 2010).

To uncover the extent to which eye movement is driven by bottom-up or top-down factors, Walker et al. (2017) analysed the salience and regions of interest (which are interesting due to related background information) in the paintings. They compared the painting analyses with the eye movements of participants, which were tracked with a mobile eye-tracking device.

Results of the research showed a significant difference in the natural gazing behaviour between adults and children (phase 1 in Figure 1). The gaze of adults fixated on regions with similar salience values, salience did not appear to affect their eye movements. For children, the most salient regions captured their gaze first with following fixation points decreasing in salience. After receiving descriptions for the paintings, the gaze of both adults and children tended to fixate on regions of interest that were mentioned in the description (phase 2 in Figure 1). For children, the eye movement patterns drastically changed in this phase, while the eye movement patterns of adults were relatively similar.

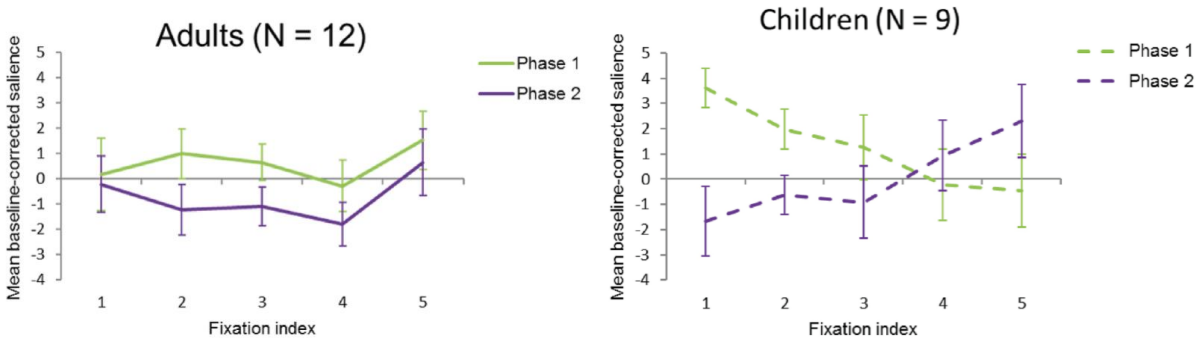

Figure 1 Mean baseline-corrected salience values over fixation index per phase (Walker et al., 2017)

This suggests a different form of attentional processing when looking at paintings for children and adults. While adults tend to use a top-down process which is based on their prior knowledge, children's gaze is attracted to salient features of the painting, thus driven by bottom-up processes. This conclusion fits the notion of previous research comparing eye movement patterns in different age groups (Açik et al., 2010). Additionally, it is found that when children receive background information about the painting, they make use of top-down processing as well.

Currently, a follow-up study is being conducted in collaboration with Rijksmuseum Amsterdam. Here the study focuses on the effect of tailored painting descriptions on children's museum experience (van Putten et al., 2022).

Method

Concept

Given the results of the research by Walker et al. (2017), it could be possible to differentiate between children and adults based on their eye movement patterns when looking at (Van Gogh) paintings. I found this to be interesting and quite surprising. While taking notes and sketching out ideas (see Figure 2), it made me think about the popular BuzzFeed personality quizzes with titles such as 'We Know Where You'll Meet Your Soulmate Based On The Vegan Sundae You Make' or 'Choose 10 Funny Moments And I'll Guess Your Zodiac Element With Amazing Accuracy'. These quizzes often base their results on an unexpected relation, for example between sense of humour and zodiac element, that is not scientifically proven. It does not seem the goal of the quizzes to give a valid result but to be playful and fun for the quiz-taker. However, the research done by Walker et al. (2017) uncovered a scientifically significant correlation between the way people look at paintings and their age group. A claim such as 'I Can Guess Your Age Based On How You Look At These Paintings' lends itself perfectly for a BuzzFeed post. To investigate the premise of this correlation further, I decided to create an interactive BuzzFeed quiz as a playful way of expressing the original research outcomes and simultaneously testing the deduced correlation between the prominent attentional processing model and age.

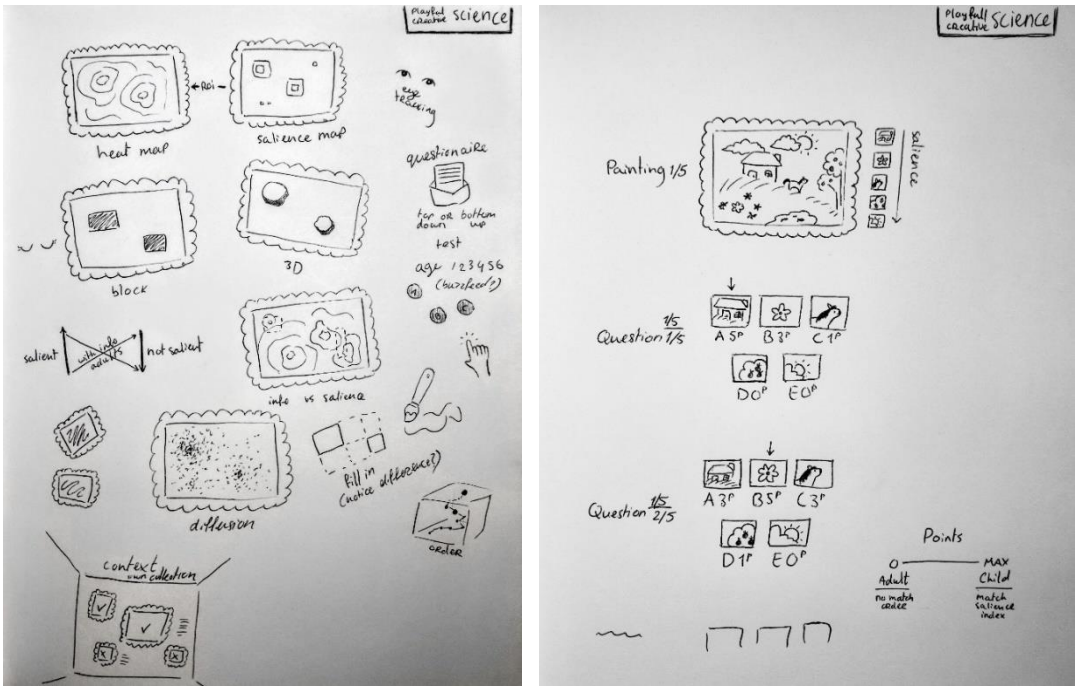

Figure 2 Brainstorm and quiz design sketches

Replicating the research data

The quiz is based on the found premise that children's eye movement patterns are mainly driven by bottom-up factors. Children look at the most salient areas of the painting first, with the following fixation points decreasing in salience levels. By showing a Van Gogh painting and asking the quiz-taker when salient areas were noticed, the answers could be compared to the salience index. A match would indicate a child-like way of looking at the paintings. It was important to get a thorough understanding of the salience levels in the paintings. To get this understanding, I replicated a part of the research regarding the paintings' salience analysis. The analysis was done using the Salience Toolbox created by Walther & Koch (2006) in MATLAB (see Figure 3).

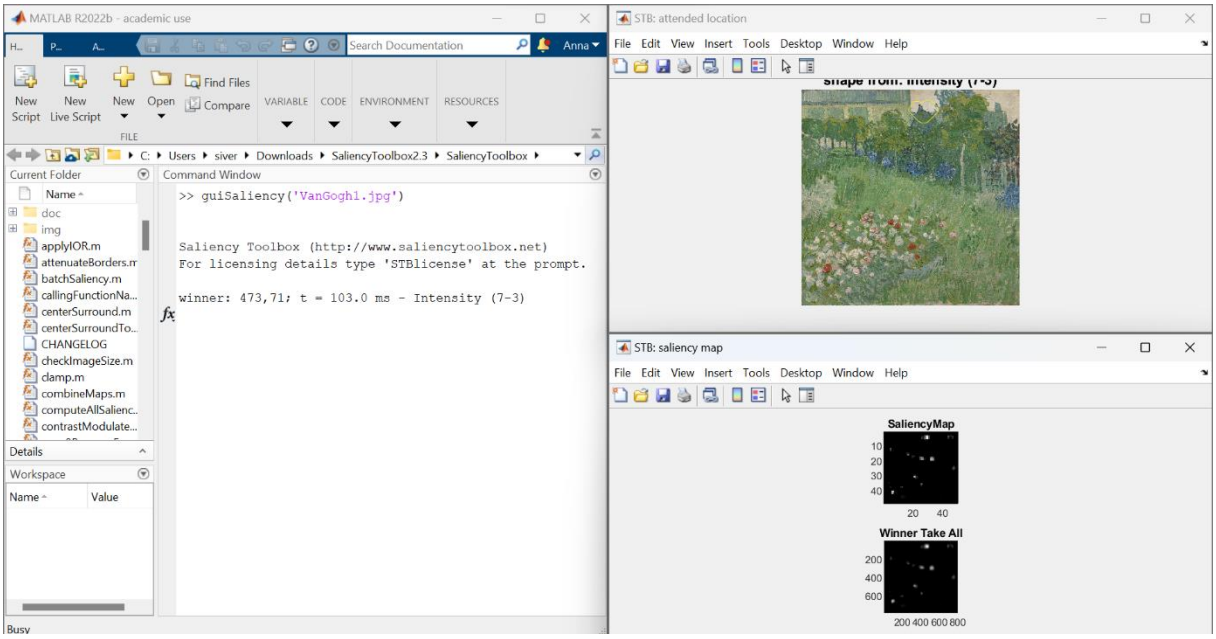

Figure 3 Calculating the salience values of the painting Daubigny's Garden with the Salience Toolbox (Walther & Koch, 2006) in MATLAB

Following the steps as described in the paper, I could calculate the exact salience values for the five most salient areas and experiment with the data. Figure 4 depicts the salient areas in order (with an added marker for the start position) and the generated saliency maps.

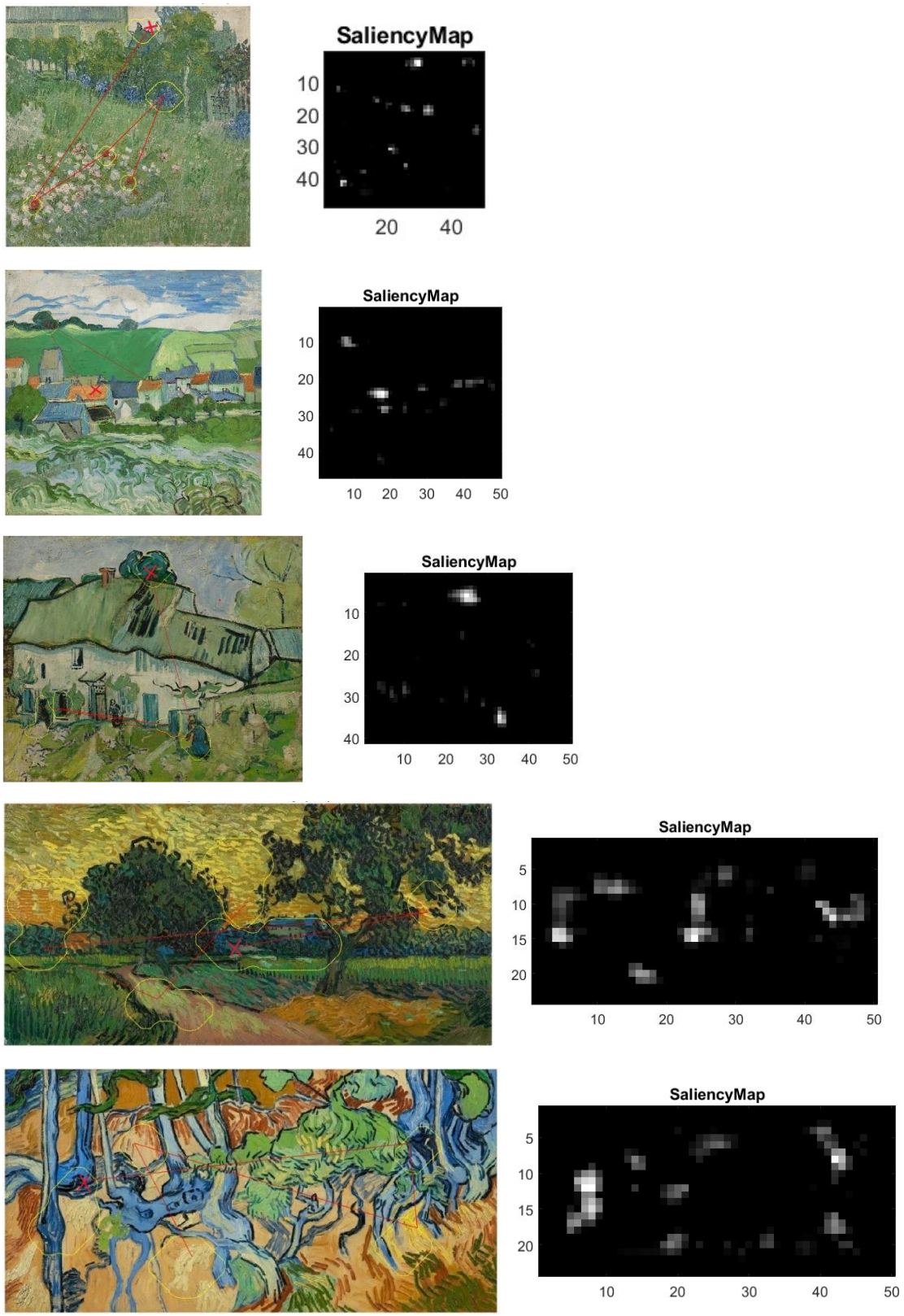

Figure 4 Salient areas in the paintings and saliency maps generated with the Salience Toolbox (Walther & Koch, 2006) in MATLAB

Quiz design

By showing the analysed Van Gogh paintings and asking the quiz taker when certain areas are noticed, it can be calculated if the answers correspond with the salience index and thus bottom-up eye patterns. Answers could not be ordered directly by the quiz taker with the BuzzFeed quiz editor. Therefore, for each of the five paintings, five questions about the viewing order were created where one area of the painting could be selected as an answer (there were five fixations analysed in the original research). The images were added from the Van Gogh Museum, MOMA and Unsplash.

The scores were calculated with the mean baseline-corrected salience values per fixation index of all paintings, for the children group. This data was found in the open database of the original research (Walker et al., 2017). The values were mapped to a scale of 0 to 5 to be more convenient for scoring. The maximum score is earned if the selected answer is an exact match with the index of the salience level. To have a more nuanced result, points are also earned if an area with a similar salience level is chosen.

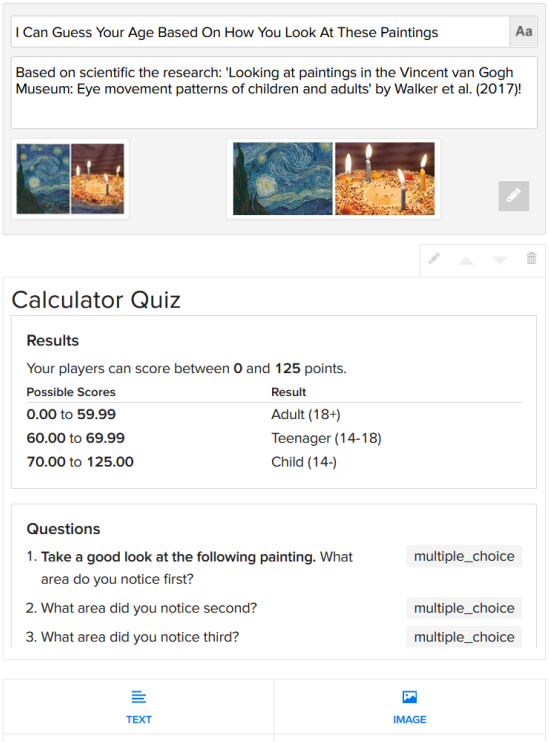

Figure 5 The BuzzFeed quiz editor

The higher the score, the more bottom-up processes seem to be used, which is indicative of a child-like way of looking at the paintings. For the quiz results, ages were estimated based on the minimum and maximum ages of the original research participants. For results that fall between the adult and child groups, a teenager category was added. After testing the quiz, the teenager margin was made slightly smaller, because the final score tends to lie close to the middle values. See Figure 5 for the quiz in progress.

Results

The new outcome is a published BuzzFeed quiz that lets the quiz-takers experience the original study in a playful way, while simultaneously testing the suggested correlation between the prominent attentional processing model and age. Follow this link to view and try the quiz yourself: https://www.buzzfeed.com/annaatleiden/i-can-guess-your-age-based-on-how-you-look-at-thes-f18hfry31b.

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