
Schau genau! — an Eye Tracking Game With a Purpose

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Abstract

Eye tracking data is used to control a butterfly in the game *Schau genau!* The player collects flowers and classifies photographs of flowers for gathering points. We show in our work that besides the entertaining aspects of the game, the user acquires knowledge on plant species and generates information on the classified photos.

Author Keywords

Eye tracking, gaze control, serious game, game with a purpose

ACM Classification Keywords

H.5.2 [Information interfaces and presentation (e.g., HCI)]: User Interfaces.

Introduction

In this paper, we first introduce the game *Schau genau!* before we present the serious game aspects and to which purpose the collected data can be used. Finally, some results of a preliminary evaluation are given as well as the key aspects of a planned, extended evaluation.

The Game Schau genau!

Before the game *Schau genau!* is started, the player has to go through a calibration process to adjust the *Tobii EyeX* [4] eye tracking device to the player's eyes.

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Therefore, the player has to fixate a dot moving to the edges and the center of the monitor. After the calibration is successfully completed, the game begins with an opening screen, giving a short introduction. The game is then started by fixating a start button. First, the player's avatar, an animated butterfly, flies into the center of the screen. During the gameplay, the user's gaze controls this avatar, moving over a meadow towards the horizon gathering flowers, as shown in Figure 1. This part of the game is called *flower mode*. Once a flower is collected, the player is credited with points, increasing the player's score. Every 5 to 7 seconds, the second game mode is initiated: the *picture mode*.

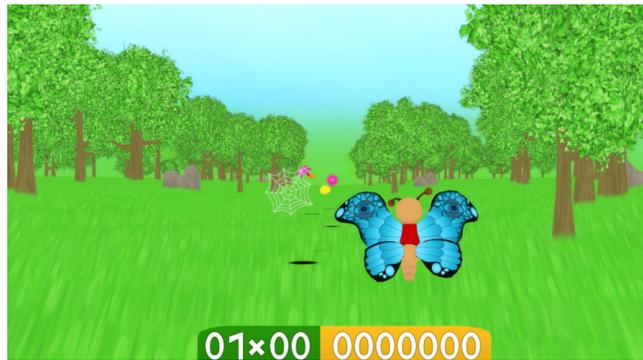


Figure 1: *Flower mode*, the avatar is controlled by the player's eyes.

For each round of the picture mode, shown in Figure 2, one flower label from the database is chosen randomly and presented to the player as text. Afterwards, two pictures fly from the right and left side into the view and stop side by side. One does show an example of the species described by the flower label. The other one is randomly chosen from the database and does not show an

example of the given label. Whether the right or the left picture is the correct one is determined randomly. The player selects one of the pictures by simply fixating it, a selection is visualized by increasing the size of the photo. After a display time of 6 seconds, the selected photo is chosen. During this selection process the user's gaze coordinates are recorded for later analysis. Feedback on the correctness of the player's choice is given visually by a green or a red user interface text. For each correct picture in a row a multiplier is increased. It multiplies the points of the collected flowers in the *flower mode* and is reset to one if the player decides for an incorrect picture.



Figure 2: *Picture mode*, asking the player to identify a thistle.

The game is over when the butterfly gets caught in one of the spider webs, which are randomly distributed between the flowers. Their number increases with the played time. After each game, the player inserts a nickname for the highscore table. Therefore the alphabet is shown on the screen and the user can scroll horizontally through the letters. The fixated letter enlarges until a dwell time is over and the letter is selected. If the player fixates another letter in the meantime, the old one is scaled down again.

This input method was inspired by *The Dasher Project* [7]. On the screens bottom the player can either confirm the input or delete the letter written latest.

The Serious Part of *Schau genau!*

Besides the entertaining aspects of the game, the aim is to teach participants the different species of flowers shown within the *picture mode*. Thus, *Schau genau!* is an educational game [3]. All shown pictures were imported from Google's image search and checked manually. Together with their correct labels they were stored in a database. The data set includes 17 distinct labels and 91 photos, each corresponds to one single label. Due to the manual review, the data set is of high quality and all flowers are clearly depicted.

Schau Genau! as Game With a Purpose

Games with a purpose (GWAP) are computer games that have the goal to obtain information from humans in an entertaining way. The acquired information is usually easy to be created for humans but challenging or impossible to be created by fully automatic approaches. An example of a GWAP is the game *Peekaboom*, presented by von Ahn et al. [5], which pursues the aim to label images.

The eye tracking data, gained while users are playing *Schau genau!*, can be exploited for creating information on the photos appearing in the *picture mode*. In previous work [6], we have shown that by means of gaze analysis, image regions can be labeled with given object categories. Fixations on photos were collected during a classification process. From this data, the areas with the highest visual attention were identified and the classification categories were assigned to these areas. The approach significantly outperformed baseline approaches, using only the image content. The same analysis is planned for the *Schau*

genau! data. Knowing the given label, the photo the user has chosen, and the recorded eye tracking data allows us to label intensively fixated regions in the given photos. Figure 3 shows an example of a photo viewed by one person. The region labels obtained could be used in various contexts, for example to improve image search [2] or synthesising textures [1].



Figure 3: Original flower photo on the left. Attention map on the right, where intensively fixated areas are visible, unviewed areas are covered with black color.

Preliminary Evaluation

We performed a preliminary evaluation of *Schau genau!* with 21 participants aged between 19 and 47 (avg: 28 years), 11 of them were female. The players completed two rounds of the game. Subsequently, they filled out a questionnaire, where they rated a few statements on a 5-point Likert scale from 1 (strong disagree) to 5 (strong agree). It turned out, that most of the participants did not feel uncomfortable in front of the eye tracker as only two out of the 21 agreed to the statement that "The eye tracker disturbed me." The majority agreed to "The game was fun" (avg: 4.1, SD: 0.9).

Future Evaluation

An extended evaluation over a period of six months is planned at a horticultural show (with at least 600,000 expected visitors). Among other exhibits, the visitors will be allowed to play *Schau genau!* presented in a stand-alone arcade cabinet. The data will be collected and stored anonymized for the later analysis. Investigations are planned on the collected eye tracking data for each photo (see Section Game With a Purpose). Besides that, the playing performance under different gaze input interpretations will be analyzed. As the usage of gaze control in 3D games is still new, it will be interesting to compare the performance of players provided with three different gaze control mechanisms. The first approach is a direct interpretation of the gaze coordinates as position for the avatar. The second one is a grid-control variation, with predefined positions for the avatar. The third approach is a mechanism that supports the players by automatically directing the avatar to a position where it will collide with the flower.

Conclusion

We have presented the eye tracking game *Schau genau!*. Besides the fun factor, the players gain knowledge on flora. Additionally, from the eye tracking data collected during the game, knowledge on image region is gained. An extensive evaluation with a few hundred players during a public exhibition is planned for the near future.

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