A Game to Crowdsource Data for Affective Computing

Chek Tien Tan
chek@gamesstudio.org

Hemanta Sapkota
hemanta.sapkota@student.uts.edu.au

Daniel Rosser
daniel.j.rosser@gmail.com

Yusuf Pisan
yusuf.pisan@gamesstudio.org

Games Studio, Faculty of Engineering and IT, University of Technology, Sydney

ABSTRACT

This game submission describes BeFaced, a tile matching casual tablet game that enables massive crowdsourcing of facial expressions to advance affective computing. BeFaced uses state-of-the-art facial expression tracking technology with dynamic difficulty adjustment to keep the player engaged and hence obtain a large and varied face dataset. FDG attendees will experience a novel affective game input interface and also investigate how the game design enables massive crowdsourcing in an extensible manner.

Keywords

Games with a purpose; crowdsourcing; facial expression analysis

Categories and Subject Descriptors

I.2.1 [**Applications and Expert Systems**]: Games.

1. INTRODUCTION

Affective computing involves research and development of systems that can analyze and react to human affects [6]. A vast majority of such systems utilize machine learning algorithms that are heavily dependant on training sample datasets. Facial expression analysis is a key topic in affective computing which generally involves recognizing facial expressions like happy or sad, and then making inferences about what they mean. To obtain good recognition performance, the face database needs to be large with images having high variability. This includes intra-person variability like pose and illumination as well as inter-person variability in terms of gender, age and other facial features. Face datasets that are made public (e.g., CK+ [3] and MMI [5]) are also central to advancing state-of-the-art because they provide common benchmarks to compare different algorithms objectively. Many prominent works have also used these databases for training and testing purposes (e.g., [1]). Though widely used, these databases are greatly limited in the number of unique participants, and are mostly confined to laboratory settings. This is because the method of collection is often rather manual and time-consuming, which also makes extending them difficult.

Inspired by a recent trend in using crowdsourcing to alleviate the
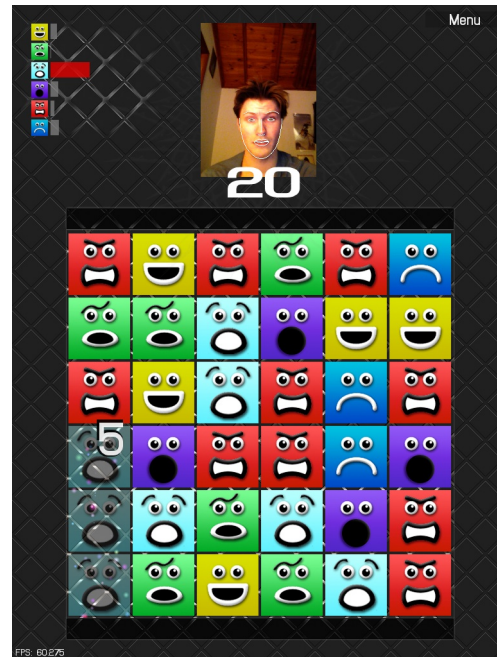
Figure 1: A screenshot of the BeFaced game. The player has aligned three tiles in the bottom left corner and cleared them to score 5 points by successfully making the shocked facial expression on the matched tiles. The facial expression is tracked in real-time and the white splines in the video on top shows the tracked feature points.

above problem (e.g., [4]), BeFaced [7] was developed based on a game-with-a-purpose [8] design paradigm to enable massive crowdsourcing of facial expressions. It is a tablet game with a core gameplay mechanic that is based on a tile matching mechanic common in many popular casual games. For example Bejeweled[1] is an immensely popular puzzle game based on this mechanic, which has been downloaded over 150 million times. In BeFaced, an alternative version of the tile matching gameplay mechanic was created that included facial expressions as the primary player input and feedback interface. The aim is to use a popular gameplay mechanic to obtain a large database of varied facial expressions in the wild.

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[1] www.bejeweled.com
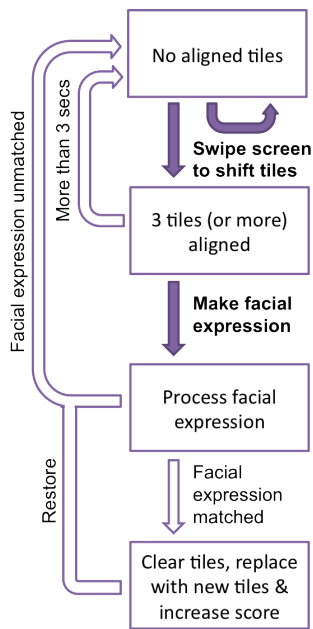
Figure 2: A high level overview of the user and system interactions in BeFaced during gameplay. Boxes depict game states and arrows depict user/system actions. User actions are differentiated by solid arrows and bold labels.

2. THE BEFACED GAME

The full game design and engine implementation details of Be-Faced can be found in a separate paper [7]. The core gameplay of BeFaced involves matching facial expression tiles as shown in Figure 1. A broad overview of the user interaction process can be seen in Figure 2. Whenever three or more tiles are aligned, the user has to make the expression shown on the tiles in order to advance in the game. BeFaced is currently implemented on the Apple iPad. It uses the iPad's front device camera to capture facial expressions of the player, which is the primary input interface for the game.

As shown in Figure 2, the game starts in a default state where no tiles are aligned. The user first needs to perform swiping actions on the touchscreen in order to get three or more tiles in a line. When three tiles are aligned, the game then provides visual cues on the tiles (highlights tiles and overlays user's video on them) to prompt the player to make the expression shown on the tile. The user then has three seconds to make the expression. When the expression is made, the game then processes it in which the captured expression is passed into our dynamic facial expression classifier. If the classified face matches the aligned tiles, the player scores and these tiles are destroyed and replaced, otherwise the game is restored to the original state. Dynamic difficulty adjustment (DDA) [2] is employed in the classifier in order keep the players interested in playing more, and hence providing more examples to our database. The facial feature points in the current video frame are also uploaded and labelled according to the expression shown on the aligned tiles.

A pilot study has also been performed with 18 participants and we found that most users enjoyed playing BeFaced and were intrigued by the novelty of interacting with the affective interface. Details can be found in the associated FDG work-in-progress submission.

3. BEFACED DEMONSTRATION

3.1 Significance

BeFaced will be of great value for researchers and practitioners at FDG who are interested in the cross-over domains of games-with-a-purpose design and affective user interfaces for games. Having a hands-on live interaction at FDG provides attendees with a first-hand experience of BeFaced and serves as a platform for attendees to discuss related domains of game design and interfaces and further their own research/development.

3.2 Game Availability

BeFaced is currently in the process of submission to the iOS App Store for certification and so is still not publicly available. However, we are currently using TestFlight[2] as our Beta testing platform and any FDG reviewer/attendee can sign up to test our app by providing a valid Apple ID[3] via the first author's email. A video can also be seen at www.youtube.com/watch?v=pRUz7_B5z1o.

3.3 Technical Requirements

BeFaced simply requires the use of an iPad (any generation with a frontal camera). The authors will provide at least one iPad during the conference. The presence of good lighting will greatly enhance the experience, though standard office lighting will suffice.

4. ACKNOWLEDGMENTS

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[3]https://appleid.apple.com