Drunken Ed: A Balance Game for Public Large Screen Displays

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Abstract
Drunken Ed is a 2D balance game specifically designed for public displays in which the player has to balance a swaying drunkard with her body pose. We show that this casual game is well suited for public context and that camera based body tracking offers convenient interaction techniques for large screen displays. The game setting with its drunken protagonist Ed was well received by the players.
This single player game uses the angle of the player's torso in relation to the ground to help Ed keep balance in a wobbling world. Ed's body pose reflects the player's pose, creating a very direct form of control. Results of our evaluation show that this form of control mapping is very easy to learn and the short play sessions meet the requirements of a casual game in public environment. Furthermore, we have designed our level selection menu to fulfill the double purpose of a gameplay tutorial, which was found to be well suited for games on public displays.

Author Keywords
Public displays; large screen display; casual game; balance game; Kinect, gesture control

ACM Classification Keywords
H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous.

Figure 1: In game scene with Ed approaching obstacles

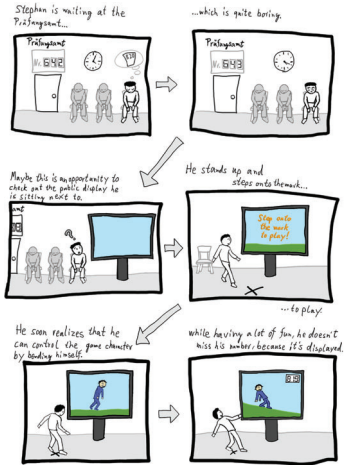

Figure 2: Storyboard with a probable interaction scenario

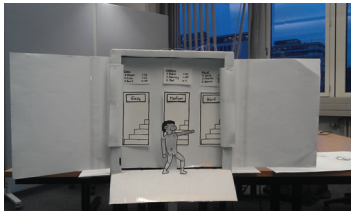

Figure 3: Paper prototype of Drunken Ed to test interaction

Introduction

The balance game *Drunken Ed* was developed with the goal of creating an application for public large screen displays, which could provide some sort of entertainment. Games are intrinsically motivating [5] [2], thus it is not mandatory that the application fulfills any further useful purpose. By designing the game for a large screen display with vision based body tracking for the controls, *Drunken Ed* can be easily installed in a public area, e.g. a waiting room, where it serves to entertain and shorten the wait. The gameplay of *Drunken Ed* can be briefly described as a single player balance game. The mission is to guide Ed home safely: The players must keep balance and avoid obstacles, as depicted in Figure 1, while attempting stagger along the sidewalk as far as they can. The direct control mapping is easy to understand and helps players to relate to the protagonist more strongly.
Ed never actually reaches his home, thus this is purely an endurance game with the goal of travelling as far as possible. Thereby, we allow players who approach in groups to compete with their friends for the best scores and with appealing visuals we strive to provide entertainment to players as well as spectators, as has been previously proposed by O'Hara et al [4].

Design Principles

To create a game suitable for public displays, we designed *Drunken Ed* with the following properties, which were partly inspired by the work of Kultima et al [1]:

- *Simplicity:* The game must be easy to understand and to play. This is especially important for public displays, since the users' attention spans tend to be short and they may have varying expertise.
  Therefore, we have reduced our game to one main input (the upper body orientation) and one simple goal (walking to the right).
- *Brevity:* Games on public displays target passers-by who might not have any intention to play, and it has been shown that interaction with public displays happens in short, sometimes tentative, bursts [6]. Our short play sessions should accomodate this circumstance and encourage turn taking among multiple players.
- *Acceptability:* All content should be suitable for the public. Featuring a drunk person in our game may be considered morally problematic. However, in our interviews we have found that this situation is widely accepted and considered fun. Our game aims at humorously pointing out the problematic consequences of drinking.
- *Accessibility:* The game should not require any prior knowledge or special abilities and should be playable by anyone who approaches it. We strive to fulfill this requirement with our simple gameplay and physical setup with a large screen and visual tracking. However, the tracking with the Kinect sets a couple of limitations, such as when dealing with occlusion, bad lighting situations or overcrowding.
- *Flexibility:* This is ensured by forgiving mistakes and gracefully recovering from situations such as when the player suddenly leaves the tracking area.

Design Process

Drunken Ed was created in a participatory design process which entailed the creation of storyboards (Figure 2) for use in semi-structured interviews and paper prototyping (Figure 3) for Wizard of Oz experiments. With these we wished to evaluate the comprehensibility of our level selection menu, the user's readiness to learn the controls and the need for in-game hints and explanations. At this stage we made valuable observations on which we based

Figure 4: Performing a think aloud study with users

Figure 5: Hints are displayed to teach players the controls

Figure 6: Inviting the player to step onto the mark to play

Figure 7: Initial screen while no player is detected

our design decisions, such as to implement a menu, which is operable with the same mechanics as the game itself. Thus the menu serves a double purpose as a tutorial teaching the player how to play.

Heuristic Prototype Evaluation

After developing a first interactive prototype, we analyzed our game regarding Nielsens 10 Usability Heuristics [3] and added two further principles targeting the aspects of *motivation* and a *steep learning curve* required for games in public context. Thereafter, a think aloud study was performed with several users of varying expertise (Figure 4), which lead to further improvements of the game according to Nielsen's heuristics. In the following, we will summarize the challenges we faced in the overall process and the resulting design decisions.

- *Steep learning curve* due to brief interaction sessions: To quickly teach the player *how* to interact, we designed a game with natural input gestures and direct mapping. In addition, we implemented hints with both animated text and icons as proposed by Walter et al. [6], demonstrating the possible actions, if no valid input is made for a certain time (Figure 5).
- Creating a *level selection menu* for gesture based interaction: This process lead from a button interface based on hand selection with dwell times, to an approach with full body interaction and direct gesture mapping. In plain terms: The spatial menu representation may be navigated by leaning, thus making Ed stumble left or right. A selection is possible once Ed holds the drink of choice in hand and can be triggered by performing a drinking gesture, which makes Ed empty the drink.
- *Invisible limits* of the tracking area: The range of a Kinect is limited. A simple solution would be to mark the interaction area on the floor in front of the screen. This however imposes certain requirements on the installation location, which we wished to avoid. Therefore we implemented a warning screen to be displayed when the user leaves the optimal tracking region for error prevention. This screen shows the optimal spot marked with a red "x" and the player's relative position, with an arrow guiding her back (Figure 6).

Game Play and Mechanics

When no player is present a bar is shown with three blackboards displaying the highscores for the respective levels (Figure 7). A call to action invites passers-by to enter the tracking area, upon which Ed appears. By bending to one side, the player can move Ed along the bar to choose a level by selecting one of three alcoholic drinks which are placed on the counter: beer, wine or vodka (Figure 8). The difficulty of each level corresponds to the type of alcohol consumed - beer signifies the easiest level while vodka is the most challenging, causing the world to rotate faster and more uncontrollably. The choice is confirmed by performing an expressive drinking gesture. At this point, the main game starts with the objective to make Ed walk as far as possible. Ed walks in an uncontrolled manner, always following his center of mass, resembling the typical accentuated movement of a drunk person. Ed's upper body has the same orientation as that of the player and creates a fixed axis around which the world rotates. Bending Ed's upper body shifts his center of mass, making him stumble in a certain direction. The closer Ed bends towards the ground, the faster he walks. The player must compensate the world's rotation to keep

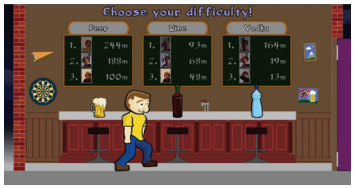

Figure 8: Selecting a level and difficulty by choosing a drink

Figure 9: The game ends when Ed falls down

Figure 10: Game over screen after reaching a highscore

Figure 11: Ed spreading and swinging his arms as a warning

Ed from falling, which happens when the angle between the upper body and the floor becomes too small. In addition, Ed stumbles if he goes too fast, or trips over obstacles that lie in his path. To overcome the latter, a short hop makes Ed leap into the air.

The game is over once Ed falls down (Figure 9) and the distance traveled is shown as the player's score. Players with a highscore may take a picture of themselves for the highscore list above the bar (see Figure 10), which is once again triggered with the drinking gesture. To avoid taking the picture, the player can wait for the displayed countdown to end, or simply leave the playing area. The game then returns to the level selection menu.

During gameplay Ed's arms play an important role to convey information to the player. In the menu the arms are controllable by the player, while in the main game Ed's arms hang down idly emphasizing the loss of physical control. Furthermore, this contributes to the players orientation and allows to estimate Ed's movement, because his arms always point towards the ground, i.e. the direction of gravity. They also have an important feedback role, which can be seen in Figure 11: If Ed walks too fast, he begins to flail and if he is close to falling, his arms start to swing as if trying to balance. Players quickly interpreted these actions as alarming indicators.

Implementation

The game was implemented using OpenGL for the graphics and SimpleOpenNI to process input from the Kinect sensor. The players are represented by the rag doll Ed, who reflects their body pose and forms the fixed axis around which the world begins to rotate. This is unusual for balance games, where most often the world remains fixed instead. Ed's tumbling is physics based, i.e. it depends on Ed's locomotion and angular velocity.

Conclusion

Creating games for public displays brings many new challenges in game design, ranging from teaching novel input techniques and unaccustomed mechanics, to catering for strongly varying degrees of expertise. With our work we wish to give insights into some of these aspects and propose the direct mapping of body poses as effective controls for gesture based interaction.

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