
Human Pencils

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Abstract

Human Pencils is a game that gives players a unique experience when it comes to creating art. The game allows participants to paint on a virtual canvas by moving around and using the movement of their own bodies as paint strokes. Collaborating, sharing ideas and working together with others is the key to enjoy Human Pencils to its maximum.

Author Keywords

Guides, instructions, author's kit, conference publications

ACM Classification Keywords

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

<http://www.acm.org/about/class/1998/> for help using the ACM Classification system.

Introduction

Merely waiting within a large building can be a boring thing. We stroll around the airport for another time, we interact with whatever device we are carrying, if only just to kill some minutes of the hours we have left on our hands. A form of amusement that requires no prior knowledge, has no time restraint and gives no pressure in any sort of way, wouldn't that be one of the best solutions? Collaboration is the key factor of such a

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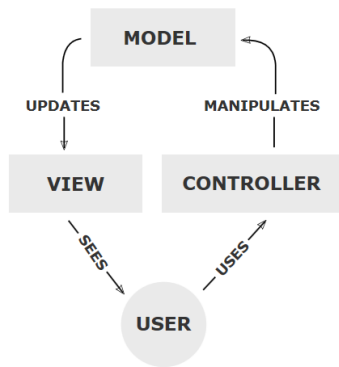


Figure 1: The MVC-Process.
Source: [2]

solution. A game that encourages just that will be more inviting to a broader public than a competitive one, because sometimes, using your own imagination is all you need. Combining all these aspects, we introduce Human Pencils, a painting game that is only limited by your own creativity. Draw with your friends, parents or children, share idea's with strangers and create your own piece of art with anybody around you. Human Pencils gives players a unique drawing experience.

Game-play

In Human Pencils, players are able to draw on a canvas by using movement and gestures. Participants are able to freely roam the playing field, turning themselves into a colouring brush at will. To join the game, players can simply walk onto the canvas, a large area of the floor defined by the field of view of a top-down camera. Upon joining, the new players gets one of the three defined colours assigned, let it be red, yellow or blue. In order to apply the colour to the field, players should increase their own span by stretching out their arms. The painting brush width increases as the span increases, but will be switched off when players keep their arms close to their body. In order to switch between colours, a player can move on top of one of the four corners of the canvas. Besides the three primary colours, the player can also select the eraser option; the colour white. There are more colours to achieve however. Players can blend colours by painting over an existing stroke, creating either green, orange, purple or black. The latter will appear when blending all three primary colours at the same spot.

Players have a clear view of their creation on both the playing field and an adjacent wall. The projection on the floor enables players to draw and erase with higher accuracy, as well as giving an indication of the players'

position on the canvas. On the wall, players can easily judge the quality of their work, and determine if they are satisfied with it.

Prototype & Technical aspects

Image processing is used to determine where players are walking. First a background is set every 10 frames, so people don't draw when they stop moving. Then the difference with the current frame is taken and noise reduction is applied. After that a circle is drawn around the contours of the remaining object and the center of each circle is calculated. The center of the circle is used to track players and the radius is used to determine the pencil size.

The system can be separated in three different subsystems, which (somewhat) relate to the model-view-controller (MVC) design pattern. (See [Figure 1](#))

Image Processing

The image processing subsystem resembles a controller, because this directly takes user input in the form of camera images. It then uses these images to detect movement and pass this movement to an API in the form of detected minimum bounding circles.

Detecting player movement is done using a very rudimentary approach of setting a background image every 10 frames, calculating the absolute difference between the current frame and the background, applying a threshold to filter noise, finding contours and creating minimum bounding circles around those contours. These circles can then be filtered by filtering out circles that are too large or too small to be of human origin depending on the actual game setup parameters, such as the difference between the floor and the camera.

Player Tracking

The player tracking subsystem converts detected circles and tries to map them to previously known, or new players. The player tracking subsystem resembles a model, as it is manipulated by the controller (the image processing subsystem) and it updates what is to be displayed on the screen by the view. Tracking players between input frames is accomplished by mapping each input circle to the closest player from the previous frame. From the second frame on, we also store the direction the player actually moved since the last frame and use that when trying to map circles to players. In that way the player tracking is not trying to match a circle to where it last saw the corresponding player, but where we expect a player to be this frame.

Game Engine

The game engine subsystem is basically the libGDX^[1] dependant part, which actually paints on the screen and therefore resembles the view component the most.

Play-testing & User-experience

During a demo market for our project, we were able to test our game with other people. They were very enthusiastic and were drawn to our game. With all these people playing our game we received some valuable feedback. With the feedback we got we made some changes to our game. Focusing on the quality of the game-play, we made some changes to various of thresholds. For example, the span players have to create by extending their arms has been adjusted to reasonable distance, rather than almost impossible ones. Furthermore, whenever players first entered the canvas, avoiding any of the coloured sections on the list, they would always get the colour red assigned to them. As for the game in its current state, players will randomly obtain a colour when performing the same

actions. This way, we avoided any excess presence of one particular colour.

Why play Human Pencils?

As stated earlier, Human Pencils puts emphasis on the collaboration aspect, so players will not experience the pressure to perform as they would with a competitive game. To complement this aspect even further, the game has a very smooth learning curve. The presence of both these factors makes it easier for different types of people to step in and play along. Once they step onto the canvas, these players will have to communicate in order to achieve a satisfying result. They can share their ideas, adapt to each other and continuously look at the projections to judge the progress of their work. Human Pencils really allows players to be artistic, enabling them to paint in a unique way. The overall goal was to design a game that was meant to be played in a large place, a location where lots of people often have some spare time. In this context, Human Pencils forms a perfect solution; it is an obvious time-killer. Completing an entire painting definitely requires some time, and since the game does not have a limit in any sort of way, it will be an inviting solution for bystanders to get rid of their boredom.

Conclusion

Human Pencils is a collaborative game, that focuses on the creativity of the players. It offers a unique way to create your own art.

References

- [1] libGDX Java Game Engine.
<http://libgdx.badlogicgames.com/>.
- [2] MVC Process.
<https://commons.wikimedia.org/wiki/File:MVC-Process.svg>.