# Measuring The Effects Of Affective Inputs On A 2D Running Game Experience

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## Abstract

Traditional way of player interacting with digital games, like touch screens and game controllers, have been there for a while. In this paper, we investigate another way of controlling digital games, which is emotions. Digital game is a broad concept, so for better accuracy, we narrow down the topic to a 2D running game specifically. To find out whether affective inputs or emotions does help improve the gaming experience. We first build our 2D running game with two game mode. One with affective inputs, one without affective inputs. We then conducted a mixed-methods study using these two game modes. Our results show that participants have a preference for the emotion mode with affective inputs. This implies that affective inputs can help improve a digital game to achieve better user experience.

## 1. Introduction

Computer games have evolved considerably since the initial days of Pong (Atari, 1972) and Space Invaders (Midway, 1978) [1]. In fact, not only computer games, games on other platforms like mobile devices, Xbox, Play Station and Wii are getting more and more popular as well. However, the way a player interacts with

Figure 1: Mega Run, a running game available on both iOS and Android



Figure 2: Jetpack Joyride

games have been limited to mostly game controllers and touch screens.

In the past few decades, companies have been exploring different ways of interacting with games other than controllers and touch screens to help user gain better gaming experience. Some have been put on commercial use successfully, like Nintendo Wii and Microsoft Kinect. These are great new ways for players requires player to stand up and perform body motion, these techniques can only apply to some types of games.

Researchers did not stop exploring different ways of interacting with games either. Some are exploring physiological input in biofeedback games for stress reduction [2]. While these researches are related to games, however they are more focused on biological purposes. There're also researches that are more related to experimenting gaming experience, but they are not accessing from the affective inputs. For example, some are accessing from the point of physiological inputs, some are accessing from the point of affective games. In this paper, we will be focusing on accessing the effects of affective inputs on traditional games. Games that people would play in their daily life.

Nowadays, almost every mobile phone, tablet or laptop has a camera. So it would be very easy for us to collect facial expression if we develop games on those devices. Unity is a perfect tool for us to develop game that can be run on all those platforms, while maintaining one single code base. However, there're some main challenges that we need to consider in advance:

1. How do we set up the testing conditions to make sure the final result we get is convincible?
2. What types of affective inputs do we care about? For the affective inputs we gathered, how should we apply it to our game, so that it helps to achieve better user experience?
3. How should we handle the delays in gathering user's emotions?

## 2. Related Work
There's a lot 2D running games out in the market, on many platforms like mobile phones and tablets, but none of them had ever tried affective inputs. On the other end, there are a lot researches related to affective gaming. But non of them really used affective inputs to change gaming settings or experience.

### 2.1 2D Endless Running Game
There are many popular running games in the market right now, especially on mobile platforms like Android and iOS. Some of examples like, Mega Run (See Figure 1) and Jetpack Joyride (See Figure 2). All these running games are actually very similar. Some of the main characteristics a 2D running game might have, are the following:

1. There's usually one spirit running towards the endless end.
2. There're obstacles on the road that the spirit need to pass or avoid.
3. The game will not consider to be end until the spirit hit one of those obstacles.
4. Player will accumulate scores while pass obstacles or hit some coins.

These are some of the common characteristics that a 2D running game has. We should follow these rules to build our game, so that the testing result we get in the end can be easily apply to games that have the same characteristics.

## 2.2 Affective Gaming

In the recent years, there're many researches that try to relate human-computer interaction to gaming. Some of them try to extend existing interaction paradigms in videogames [3]. NovaEmotions is one of those examples (See Figure 3). It's an affective game where each player can play and win the game by performing different facial expression.
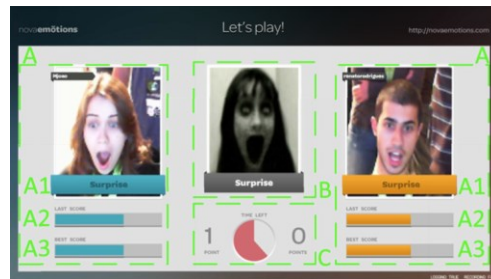


Figure 3: NovaEmotions

There's some other papers that try to use physiological inputs like respiration, EMG or body temperature to control the game (See Figure 4).



Figure 4: A game that uses respiration to control the enemies size.

## 4. Method

In the paper, we propose a 2D running game that meets the characteristics mentioned in the previous section. In this game, we present two modes, one with affective inputs, one without. We will present this game to different users, asking them to play either one of the modes or both mode. Their feedback will be collected after they played the game.

## 4.1 The Game

In our game (See Figure 5), there's one spirit called Boy, who's running or flying toward the right side of the game screen. The Ground sites at the bottom of the game screen. Normally, the Boy would just be running on the ground. Player can make the spirit jump or fly by tapping anywhere on the screen or double tapping anywhere on the screen.
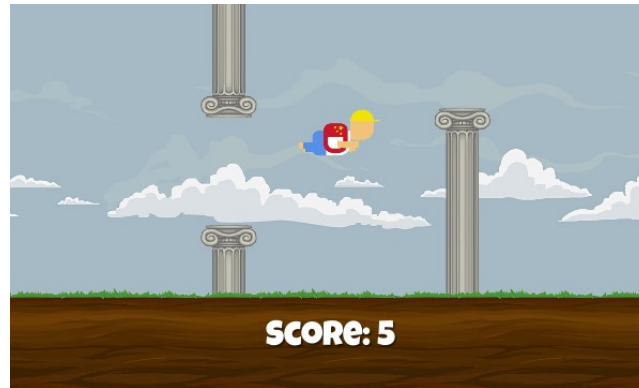
Figure 5: Our game

There're three types of obstacles, one of them is the double sided pipes, where the player need to make the spirit fly through the middle space of the pipe. The second type of obstacle is the single sided pipe, where the player just need to make the spirit jump over the pipe. The third type of obstacle is a bear that will try to attack the spirit while it gets closer to the spirit. At any time if the spirit hits the obstacle, the game will end.

There're also coins in this game. In the case the spirit hit the coin, it will not die but rather gain more game scores. There're two types of coins in this game. One is small coin that gives player five scores, the other big coin will give player a hundred scores.

## 4.2 Emotion Mode
In the emotion mode of the game. Depending on player's emotion, especially their happiness level. The game will perform differently. One of the major changes is the spirit's running speed and the distances between different obstacles. As the player's happiness level increases, both spirit's running speed and the

distances between different obstacles will increase, making the game easier to play. The obstacle will be easier to pass, because the space between pipes get bigger as the player gets happier (See Figure 6).
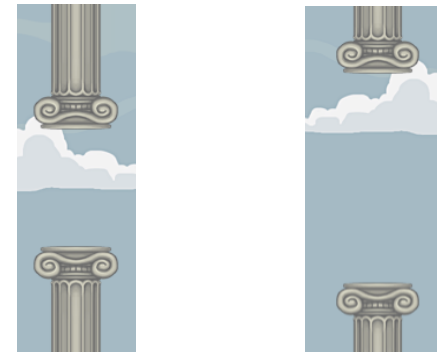


Figure 5: Pipe space at normal mode vs pipe space with happier emotion at emotion mode.

The happiness level also affects coins as well. As the player gets happier, more coins instead of obstacles will be coming into the game screen, making the game easier to play again.

## 4.3 User Study
We carried out the user study on 8 participants, aged from 23 to 28. They were separated into two groups, each group with 4 participants. Participants in group 1 were asked to play the game on both mode, one after the other. In the end, they will be asked to give a rating from 1 to 10 on both game. In this group, participants will be able to play both modes and compare, so there will be more chance that they will give different rating on each mode. Participants in group 2 were only asked to play either the normal mode or the emotion mode. In the end, they were

asked to rate on the game they played from 1 to 10. After each user has completed their rating, they were asked to provide general feedback based on the game they've played.

## 5. Results

We carried out analysis based on the ratings given by our participants. Both on group 1 and group 2, and overall analysis. From the analysis on group 1(See Figure 6), we found all participants who played both mode, tend to give emotion mode a higher rating, which indicates that they have a preference on the emotional mode.
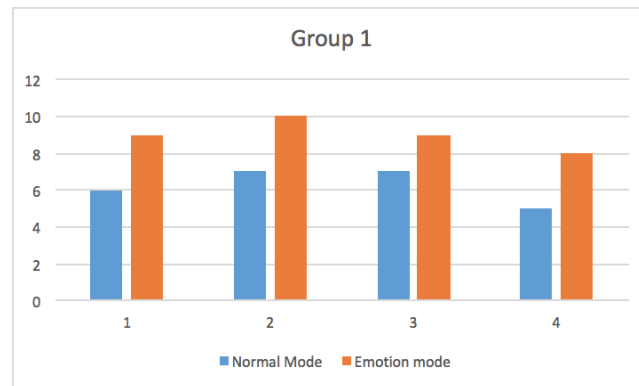


Figure 6: Analysis on group 1

Analysis on group 2 showed that participants that played the emotion mode, on average, had a better experience than the normal mode. Given that two participants in group 2 have given same rating on two game mode, while the other two participants give different rating.
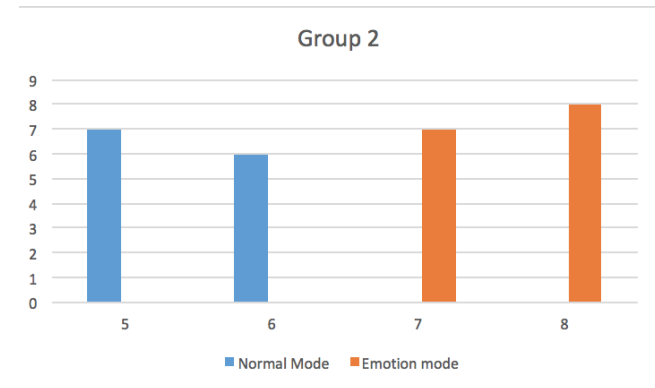


Figure 7: Analysis on group 2

Overall, we have found that people tends to give better ratings for the game with emotion mode.



Figure 8: Analysis on all participants

## 5. Conclusion

As we build a very standard 2D running game which is neither too fancy nor too boring. Traditional ways of interacting with games, in our case, tapping on the screen, is still very reliable. And it's also very entertaining, as from the fact that every user gives the normal mode a rating that is not lower than 5. From the other side, we also can see that, once we've added the emotion inputs to the game, people felt better about the game. Most of the participants mentioned that having emotional inputs indeed helped them gain better gaming experience. This result is very inspiring, because not like other biological inputs, nowadays, most mobile devices have a front camera. Which means, it's relatively easy to capture these inputs. So the result not only showed a way to help a game to achieve better experience, but also an easy to implement way.

## References

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