Car Steering in Racing Games: Similar Performance with Joysticks and Keyboards

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ABSTRACT

Many gamers use keyboards for playing computer games. Yet it is a commonly held belief that the control of the game is better with a more dedicated input device such as a joystick. This study set out to explore the effect of using keyboard and joystick for a car driving game. A car racing game experiment with $n = 20$ participants was set up. The results show that there is no difference between the two input devices. In fact, the spread in the measurements were larger for the joystick.

CCS CONCEPTS

• Human-centered computing → Human computer interaction (HCI) → Interaction devices → Pointing devices

KEYWORDS

Gameplay, Car racing, Joystick, Keyboard

1   Introduction

This study set out to explore the difference between using a conventional keyboard and a joystick controller in terms of computer gameplay. It has been pointed out that there is relatively little research into the performance of computer game input devices [2]. Although studies have compared various types of game controllers there are very few comparisons of the commonly used keyboard and joysticks. However, keyboards and joysticks have been studied extensively in terms of text entry tasks [5]. Although some joysticks allow for continuous range of input values, this can also cause input errors and games often employ some type of filtering of joystick input rather than

using the joystick reading directly [3]. The use of touch devices for controlling games have also been addressed where the user makes directional commands on the touch display [1]. Although performances have been reported to be comparable to those obtained with physical joysticks a lack of tactile feedback is a challenge and may lead to finger drift. In a comparison of mouse, joysticks and the Wii pointing controller on a set of pointing tasks it was found that the mouse was superior to the other two and that joystick gave the lowest performance [4]. Moreover, users preferred the Wii controller. Other input devices for games have also been compared.

A joystick is a special purpose input device while a keyboard is a general-purpose input device. We therefore hypothesized that users would also prefer gameplay using the joystick compared to the keyboard. Moreover, our second hypothesis is that users will perform better with joysticks compared to keyboards as many joysticks allow for more freedom in terms of direction of movement and magnitude of movement, while keyboards provide binary states for each key, typically four cursor navigation keys.

2   Method

A within-subjects experimental design was chosen with game completion time as dependent variable and two independent variables, namely input device and track. The input device factor had two levels namely QWERTY keyboard and joystick controller, and the track had two levels, namely track 1 and track 2.

2.1   Participants

A total of 20 participants was recruited for the experiment. They were all students at the authors institution and regular gamers.

2.2   Equipment

The experiments were performed using Trackamania Nations Forever (http://trackmaniaforever.com/) using two custom made tracks. Two quite different tracks were designed. They were designed to be simple to facilitate learning. Thus, there were no

obstacles or no possibility of driving off the track. Both tracks were pilot tested prior to the experiment. Trackamania Nations Forever is claimed to be one of the most popular online racing games. For the tests a regular QWERTY keyboard was used as well as a Playstation Dualshock-4 game controller with a joystick and control buttons.

2.3 Task

Each participant was asked to play the game under each condition three times to get a reliable measurement, that is, each participant played the game on both tracks using both keyboard and joystick. The order in which the participants used keyboard or joystick controller and the order in which the participants played track 1 and 2 was balanced to prevent learning effects. The car was controlled using the four cursor navigation keys using the keyboard, and joystick and buttons. The joystick moved the car to the left or right and the *R2* and *L2* buttons were used to accelerate and deaccelerate.

The participants were asked to complete a questionnaire asking about demographic information, what platform usually used for gaming and their preferred input device of the two. The experiments took between 7 and 10 minutes and were conducted individually in a quiet room at the author's institution.

2.4 Measurements and analysis

The measurements were obtained with a stopwatch and each trial was measured from the beginning of the game to the completion of the game. The results were analyzed using JASP version 0.8.6.0.

3 Results

Fig. 1. shows the results of the experiments. Clearly, there is only a minimal differences between the results obtained with keyboard and that with joystick and a repeated measures ANOVA confirms that there is no significant difference ($F(1, 19) = 0.179$, $p = .67$). As expected the two tracks takes significantly different time to complete ($F(1, 19) = 1153.4$, $p < .001$). There was also no interactions between track and input device ($F(1, 19) = 0.358$, $p = .56$).

However, the spread is slightly larger for the joystick compared to the keyboard for both tracks. This suggests that users have a somewhat more consistent use with keyboard compared to the joystick. One reason could be that one may assume that all users are familiar with keyboards, while not all the users may be equally familiar with joysticks. In fact, 60% of the participants reported that they usually played computer games using a PC or a Mac, while only 40% usually used a game console.

The participants preferences for the two input devices were divided equally, as half of the participants preferred the keyboard and the other half the joystick.
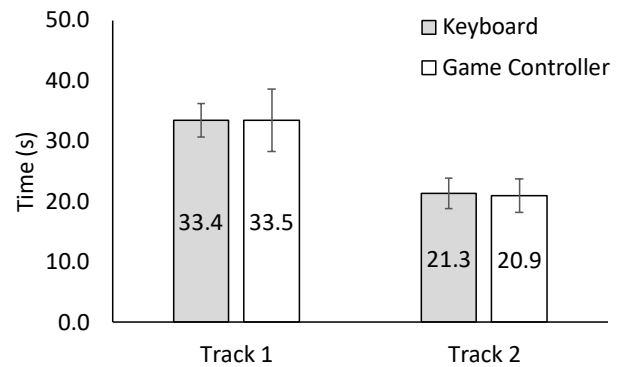

Figure 1: Results. Error bars show standard deviation.

4 Conclusion

This study compared the effect of input device on game play for a simple car racing game. The results show that there was no significant difference between keyboard and joystick for controlling the care on a virtual race track in terms of game completion times. However, a slightly larger spread was observed for the joystick which is probably explained by the fact users are more trained using keyboards than joysticks.

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