The Users Time Perception: The effects of various animation speed's on loading screens

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Abstract. Loading screens are still a thing in 2017, and there is a reason for that. They provide a great way to give feedback to the user in the interface during wait times after a user's action, and is a well established way to increase and keep a user's satisfaction. From previous research, it has shown to be essential for a well designed interface. This study specifically examine the looped, passive animation screen on how the animation speed effects the user. Results suggests that with an faster animation, perceived wait time gets shorter and a generally more satisfied user.

1 Introduction

Technology is constantly in development and getting faster and more efficient by every day. The internet and user software are faster than they were 10 years ago, still, there persists these moments were the user have to wait in order for the software to be processed. This is a vital part of an interface in order to get the user to feel some kind of perceived performance. Perceived performance is how the user experience how quickly a software appears to perform and by so, a important part for holding the users attention and satisfaction to the software [1]. The time it takes to preform a task is closely tied to the users perceived performance. There is a specific time limit of 1-10 seconds before the user loses the attention and immediately exits the software or site [2].

The load time a user is willing to wait actively depends on the context, for instance, the user is willing to endure longer loading times for paying taxes than they would for starting up a mobile game application. Loading screens and indicators in the interface helps the user get a better perceived performance for the software [1, 2] and is a part of the universally applicable principle in user-interface design for showing the visibility of the system status [3]. There are different types of loading screens: passive, progressive and interactive ones [4]. They all have different uses for different objectives. The passive loading screen for example, is usually used in a much shorter time frame than the progressive and interactive ones [3]. The passive loading screen usually have the form of a circle that rotates in a great variety of ways and animation speed's. There is no general rule for how fast the animation should be in a progressive loading screen in order to create the best possible experience for the user.

1.1 Objective

This paper studies how different animation speed's for passive loading screens effects the a user. More specifically this study will attempt to answer the following questions:

- How does the time perception for a user change depending on the animation speed of the loading screen?
- Does the animation speed effect how the user feel on how effective the program is working, i.e. does the users patience and annoyance change.

2 Theory

2.1 Time perception

Time perception is a subjective experience of time. It is someone's own perception of the duration it takes between two successive events. One persons perception of time cant be experienced or understood as there is different fundamental aspects of our own experience of time [5]. Time perception has been studied for a long time that still just have theories. As of now, the strength model of time memory is the most relevant and likely theory that provides a simple and direct means of assessing the duration of an event .i.e the time perception [5].

2.1.1 The strength model of time memory This model describes that there is a memory trace which persists over time, and with that memory trace, one can judge the age of a memory (and therefore how long ago the event remembered occurred) from the strength of the trace. The longer ago the event was, the weaker the trace will be [5].

2.2 Temporal illusions

Temporal illusion is a distortion in the perception of time. They occur for a various kinds of reasons, such as due to different kinds of stress, in such cases, a person may momentarily perceive time as slowing down, stopping, or speeding up as the timing and temporal order of events are wrongly perceived. When a person feel the time slows down, the internal clock actually speeds up, which gives the feeling that the rest of the world slows down [6].

The perception of time can also change by different kind of illusions.

2.2.1 The Kappa Effect The kappa effect refers to occasions when the temporal duration between a sequence of consecutive stimuli is thought to be relatively longer or shorter than its actual elapsed time, which is a result of the spatial separation between consecutive stimuli [7]. For example, if three light sources flash with equal time intervals between each of the flashes, the temporal interval between the two light sources that are closer together tends to be perceived to be shorter than that between the two light sources that are further away from each other, even though the time intervals are the same (see Figure 1).

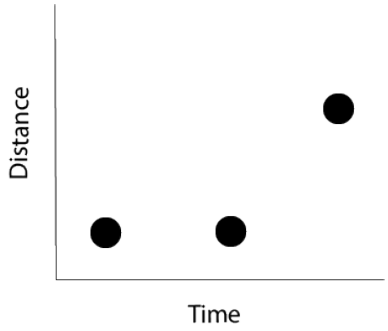

Fig. 1: Displays an example of the kappa effect for three light sources that have the same time interval between blinks but different distance between the first two and the last, creating the perception that the last light source blink with a delay.

2.2.2 Intensity Different kind of intensity such as volume, brightness, colour, size, speed and dynamics can create the effect that an object last longer than those with less intensity [8].

2.3 Usage of loading screens

User feedback is an important part in any interface. It can easily prevent frustration on the user by giving appropriate feedback for the user's actions. If there is no feedback, there is no way to know if the program crashed, or even registered a click or not which often cause great deal of anxiety for the user. Repeated extra clicks and double orders results in that the user also get more hostile and annoyed [3]. There should always be some kind of immediate feedback, the moment a user's initiates an action, the user's wait time begins. Some wait times lasts just for a blink of an eye, some can takes minutes or second. The right kind of feedback for these waiting times can be crucial in order to have them stay and wait for a task or a website [3]. Here is some guidelines for what kind of feedback that should be used.

2.3.1 Actions longer then one sec A user's action and its wait time is usually instantaneous in everyday use of applications, computers, mobiles, and the web has all come to the point where almost all actions take less then one second to load, but there is still moments when the user have to wait longer then that. After about one second of wait time, the user starts to wander. These are the moments when some kind of loading screen becomes relevant to display to the user[3].

2.3.2 Passive loading screen's There are all kind of different shapes, colours, animations and sizes for a passive loading screen. They typically take form of a circular spinners or a looped progress bar. This kind of indicator a good for

actions that has a waiting time between 2-10 seconds. Anything less than that will only be distracting for the user [3].

2.3.3 Progress loading screen's For actions that takes longer than 10 second's, progress loading screen's are a great tool to use in the interface. They give the most informative feedback to the user as they show the current progress of the waiting time. This gives the user more control of what is happening, decreases uncertainty. Progressive Loading screen's also may reduce the perceived time, as it can distract the user with animations and the feel of progress [4, 3].

3 Method

3.1 Participants

The test included 24 participants where the age ranged from 20-29 years. 67% were male. The participants where recruited in person. The location for where the test took place was evenly distributed in both public and less stressful environments, in private homes, and on a university campus located in northern Sweden.

3.2 Materials

The test was conducted on a Android smartphone that was released the year 2016. Three separate, very familiar applications were made in Android studio. The participants started all three of the applications, were the only indicator between them was the colour of the icons located on the home screen with the colours white, red and blue (see Figure 2).

3.3 The three applications

The three applications that was used were almost identical to each other, they all had a loading screen of 10 sec, same background-colour of orange and the same welcome text saying "Hello!". The only thing that was different between the three was the colour of the icon and more importantly, had three separate loading animations speed's. The animation of the loading screen's consisted of a passive round circle that went clockwise, with different animations speed's in each (see Figure 2).

- The white (slowest animation speed) application rotates 360 degrees 4 seconds.
- The red application rotates 360 degrees in 2.5 seconds.
- The blue (most rapid animation speed) application rotates 360 degrees in 1 second.

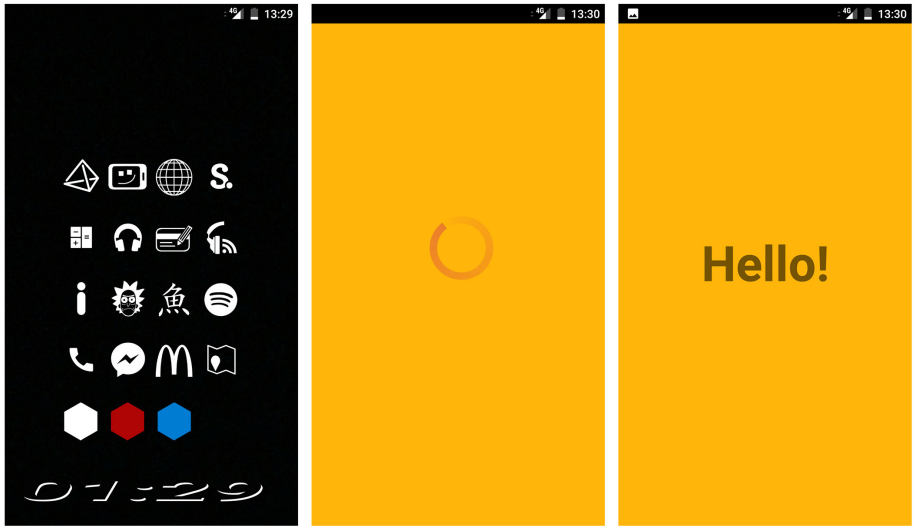

Fig. 2: The three screens that the participants interacted with. Left:Home screen, Middle: loading screen, Right: The welcome screen of the application and the three test applications (The applications with a white,red and blue icon colour).

3.4 Survey

After having started up all the three application, a series of questions was asked. The participant had to choose one of the three that they liked the most, and which of the three application that they felt had the shortest, respectively the longest time to boot up.

3.5 Procedure

The test that was conducted on the participants had a simple, short introduction, the reason for this is because of the prospective paradigm that might occur.

Prospective paradigm is when a user gets informed that it should keep track of the time, making them focus specifically on the time and by so, creating self made strategies to measuring the time frame [9]. They were therefore simply introduced to the three applications located on the home screen, were they was told to boot each one of them up until they came to the welcome screen of the application, saying "Hello!", starting from left and continue to the next located to the right (see Figure 2).

In order to not make the test bies depending on witch one of the application the person launched firs or last, they were shuffled for each test participants. The total number of permutations the three application could form was $3! = 6$ ways (wrb, wbr, brw, bwr, rwb, rbw). These permutation was each tested four times which resulted in a total of 24 test's.

4 Results

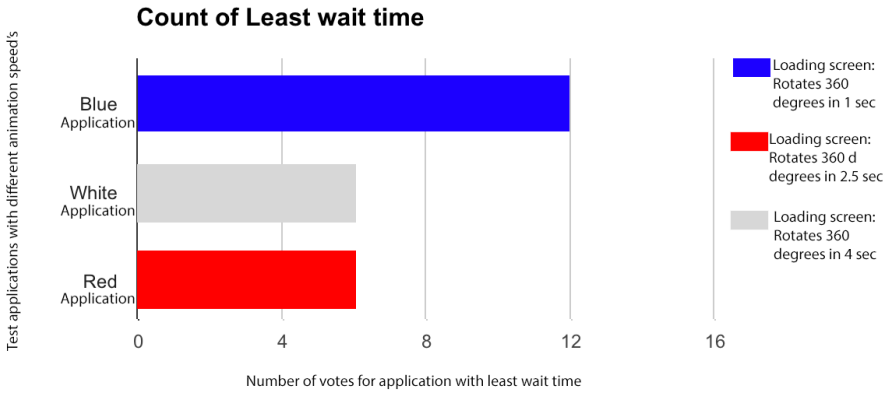

Fig. 3: Displays the result for what the participation's answered on what application they thought took the least amount of wait time to boot up.

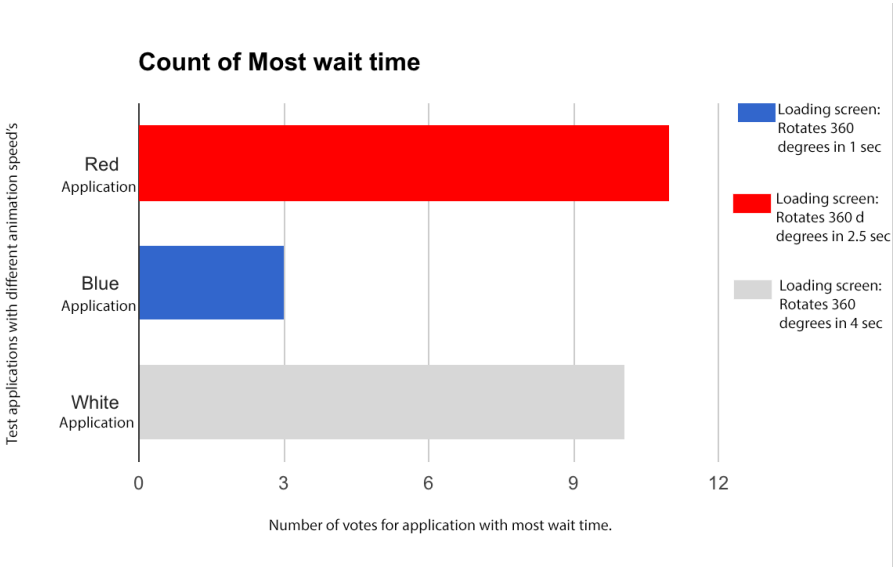

Fig. 4: Displays the result for what the participation's answered on what application they felt took the most amount of wait time to boot up

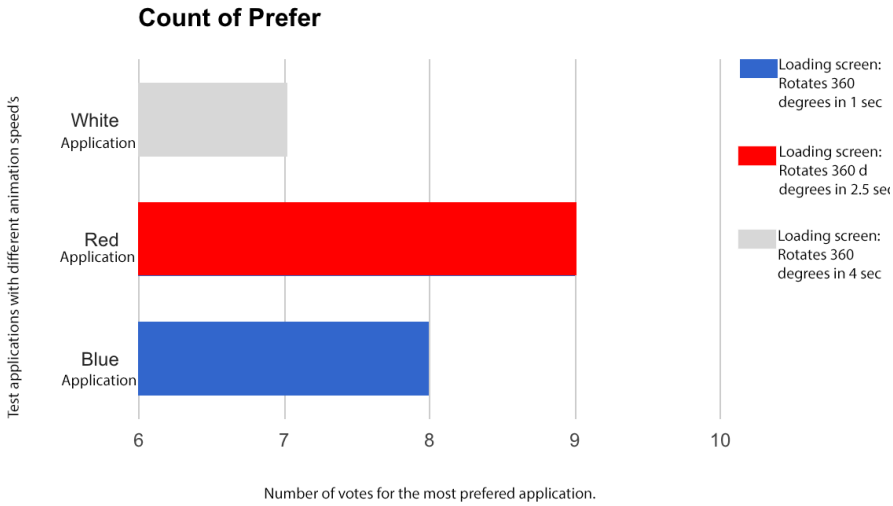

Fig. 5: Displays the result for what the participation's answered on which of the three application they preferred the most.

The data from this test shows that 50% of the participants thought that the blue application felt like it had the least amount of time to boot up, which had the most rapid animation speed of the three. The white and red application had the same amount of picks (see Figure 3).

When the participant's got the question on what they thought took the longest time to boot up, the majority of the answers were between the red and the white application. Both of them had slower animation speed than the blue one (see Figure 4). The order of the application on which the participant's started first, second and last reflected their final answer for which they thought was the slowest, fastest wait time, and the application they liked the most in general. The participant's answered 90% of the times that they preferred either the first or the second application the most, and that they thought the last application they booted up was the slowest. None of the applications had a big majority of votes they thought was the best. They all had quite similar votes (see Figure 5).

5 Discussion

From the results of the test, the blue application was the one that in general got the most positive feedback. It had the highest count of votes for being the fastest to boot up, and the same time had least amounts of votes for being the slowest. It was also closely tied to the red application which had the second fastest animation speed. From the data that was gathered, it seems that the animation

speed of the passive animation screen correlates to a user's time perception. It seems as the faster the animation is, the less wait time does the user perceive.

The votes on which application the subjects preferred was quite even, but there was still a majority that voted for the two application with the fastest animation speed (Red and blue). The reason this question was asked was to see if the animation speed effect's the user into thinking that the faster the animation goes, the harder the application is working and by so, making the user more positive and patient to the application. As the result suggest, this might have some truth in it, there is no clear evidence though, as the question is very broad and can depend on so many other variables. The order for which the patient's booted up first and last for example, had an effect on their final answer.

The test that was conducted also had its flaws, as the order for when they were booted up had a strong connection to which they preferred the most. A different kind of test could be made, for example, the test could have a structure that had much less focus on the loading screen, and more on a specific task that the participant had to complete. That way, the data from the test would reflect more of a real life scenario and by so, creating a more realistic and accurate answer. It also seemed that some participant's felt the question about which one of the application they preferred the most was odd, as they was nearly identical. For example, a participant had the motivation they preferred one application more than the other too simply because of the colour of the icon. x

6 Conclusions

The data from the test shows that the faster the animation speed is on a passive loading screen, the more a user is likely to prefer it, and that the perceived time a user gets on a passive loading screen corresponds to the animation of it.

The are several limitations in the test that was conducted in this paper. More test data is needed in order motivate future research on this topic. 24 participants is a good start but more data is needed to safely say that they correspond with each other. First of all, most participant's where young adults and students which makes it so that it cant be generalised to other population and background. However, the participants that attended are is the the age-group that has the most active users on the web [10], and a great population to start with. This paper has focused on how slow and fast animation speeds effects the time perception and the overall satisfaction of an application. A thing to consider in future research is if there is a specific speed limit that works the best.

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