

Interactive Transparent Display

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INTRODUCTION & BACKGROUND

CURRENT SITUATION

Transparent Displays have been used for a number of years in the form of Head-Up Displays (HUD) in aircraft, with their purpose to provide information which assists with the use of various instruments within the cockpit. It has only been recently that this is now starting to become a feature within cars to display speed and satellite navigational data. However, most of these types of displays are not part of the windscreen but are merely reflections from separate hardware.

Some modern HUD's are also using Augmented Reality (AR) to provide additional helpful information on the windscreen for users to effectively drive safer by identifying potential hazards.

Interactive Transparent Displays are mainly used within the advertisement and marketing industry. Some of the modern day interactive displays have multiple touchscreen points for users to actually interact with the display directly, the concept is to provide additional information and advertisement on the item placed behind the screen. The display itself is similar to a computer monitor where it will show whatever software is currently being interacted with on the computer.

As a result, its general usage is currently very limited, however the team have identified two potential areas in which Interactive Transparent Displays may become extremely useful. A zoo or aquarium environment and a commercial meeting room environment.

DESIGN AIMS

The main aim is to create a design which allows the user to focus on the screen they are interacting with, along with being able to visualise the desired target beyond the screen.

These are separated into two scenarios. The first being that the target beyond the screen is the main focus of the user. For example HUDs are normally designed to provide additional information to the user to aid in a task that they are performing.

Computer games use this type of display quite frequently to provide the user with additional information in order for them to be aware of the key statistics of their character. For example, Figure 1 displays the HUD within the HALO series, it is used to display ammunition, bearing, potential hostiles and life information.



Figure 1 - HALO 5 Head Up Display

Because this is a familiar type of UI it needs to be investigated whether this type of UI can be implemented in a real world environment providing a host of information without detracting from the main focus.

The second scenario is whether it is possible to develop a real world scenario where the content is the main focus of the screen.

The example below is a demonstration of a transparent display with the content being the main focus.



Figure 2 – Minority Report UI

Figure 2 is an example from the film Minority Report and one of the first uses of Interactive Transparent Displays within the film industry. While the displays look really impressive, it needs to be identified whether in a real world scenario is there an actual use for this type of display apart from aesthetical reasons. Other questions that need to be raised though not necessarily answered in this report is what should be displayed on the opposite side of the screen. Should a reflection or inverted version of the content be displayed, how would this type of display provide an advantage over standard displays and how transparent does the display need to be in order for it to be affective?

DESIGN OVERVIEW

In order to identify the most effective way to display information within a zoo/aquarium environment I created a set of wireframes within Photoshop to make key decisions on font and background colour, transparency levels and content placing.

After the wireframes were completed, two HTML prototypes were created to demonstrate the scenario in a zoo environment and an aquarium environment. Videos were used to display the key content (as an example of watching and animal within a zoo/aquarium) with the interactive content displayed over the top of it in a similar way to what would be expected in a live environment.

The idea would be then to use this on a touchscreen display to work in a similar way to the final product.

The zoo example can be found at <http://uni.blue-phoenix.co.uk/DSP>

The aquarium example can be found at <http://uni.blue-phoenix.co.uk/DSP/whale.html>

RATIONALE

Here are a list of key design choices intended to achieve the user needs.

TRANSPARENCY



While the background of the content is set to black, each item where content is displayed is set to approximately 50%.

The level of transparency will allow users to see any activity behind the content while seeing the content clearly.

BORDERS

The borders of each of the content boxes are of a bright blue. The idea behind this was allowing the user to easily distinguish between each content box and the background. The key to the borders are for them to be clear while not being overwhelming hence why a gradient is used to allow the content box border to merge into the box itself.

The colour is equally important, and necessary to use a bright colour. Two prototypes were created, one at sea and one on land, the idea of this was to test whether the content boxes could still be clearly seen in both scenarios using the same styling.

Blue has been chosen at present as it is a calm and cool colour, which is ideal as most visitors to a zoo or aquarium will be there for relaxation. It is also not an overly distracting colour, once again aiding towards allowing the content to be secondary to the animals behind it.

Some quotes regarding the colour blue from Color Psychology of Blue

http://psychology.about.com/od/colorpsychology/a/blue_res.htm

Blue makes me feel cool, weightless, and spiritual.

Blue for me is tranquillity - I associate it with water, and the wonderful weightlessness of water.

CONTENT LOCATION

The initial design for the content display was placed on the left hand side of the user's visual perspective.



It was felt however users are known to look at digital media in an F-shaped pattern

Eye tracking visualizations show that users often read Web pages in an F-shaped pattern: two horizontal stripes followed by a vertical stripe.

JAKOB NIELSEN APRIL 17 2006 - <https://www.nngroup.com/articles/f-shaped-pattern-reading-web-content/>

As I did not want the content to be the main focus of the display the location of the content was moved to the bottom, designed to be below the user's direct sight line.



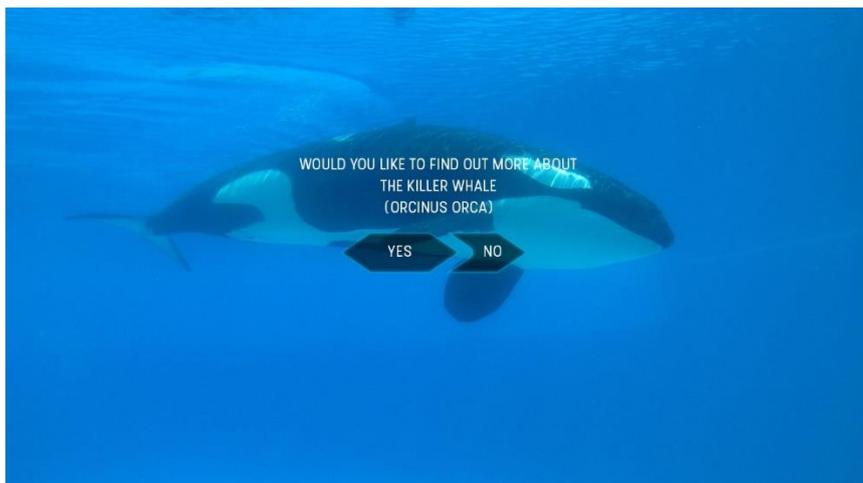
Z-Pattern scanning occurs on pages that are not centered on the text. The reader first scans a horizontal line across the top of the page, whether because of the menu bar, or simply out of a habit of reading left-to-right from the top. When the eye reaches the end, it shoots down and left (again based on the reading habit), and repeats a horizontal search on the lower part of the page.

BRANDON JONES 19TH OCT 2010 - <http://webdesign.tutsplus.com/articles/understanding-the-z-layout-in-web-design--webdesign-28>

This will allow the user to focus on the animal first and read the content as an alternative task should they desire.

START SCREEN

The idea of the start screen was to give the user the option to access the additional content or not. In an ideal real life scenario, using Augmented Reality, the display would identify when the user has walked up to the screen and automatically display the option to view content on the animal.



The initial question is displayed at sight level to draw the attention to the option, by pressing on the yes option, the content will be displayed. A slightly smaller no option has been provided which allows the user to not display the content and just focus on the animal.

However if the no option was selected accidentally or should the user change their mind a question mark button is provided to reopen the information window.



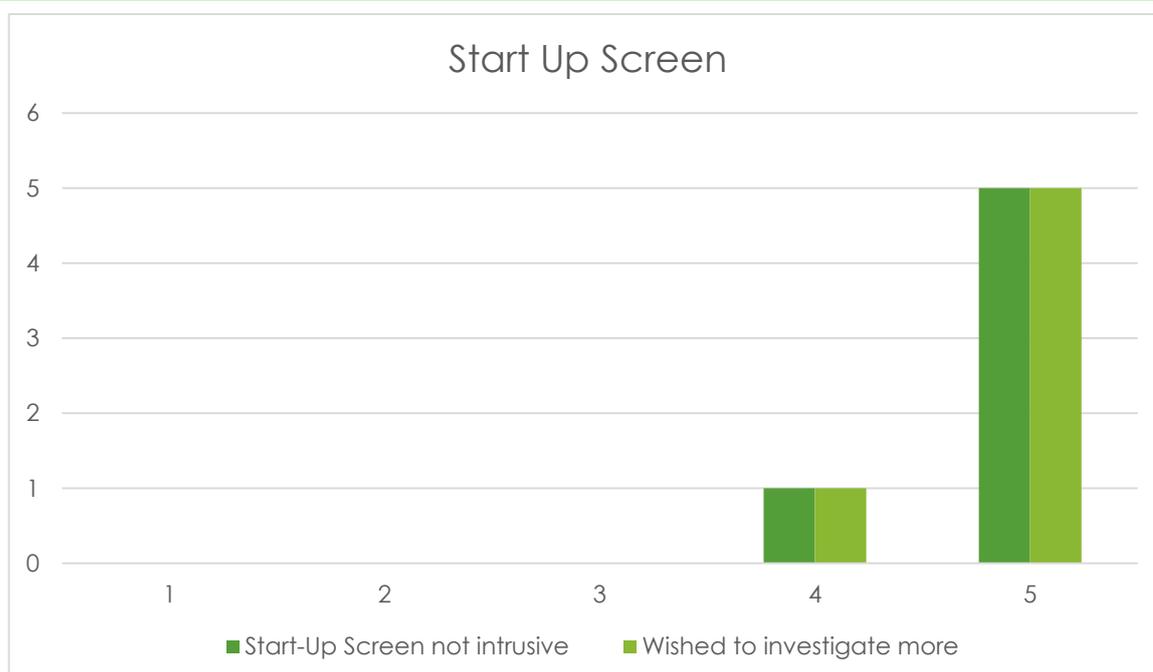
The question mark is displayed at the bottom left of the users eye sight meaning they can concentrate on viewing the animal with almost all their focus.

USABILITY FORUM RESULTS

A forum was put together to get opinions and feedback on the prototype designs created. After a demonstration was provided a questionnaire and discussion was made in order to identify positives and places for improvement on the current design.

Six questionnaires were filled in and the graphs below show results with 1 being requires improvement with 5 being positive feedback.

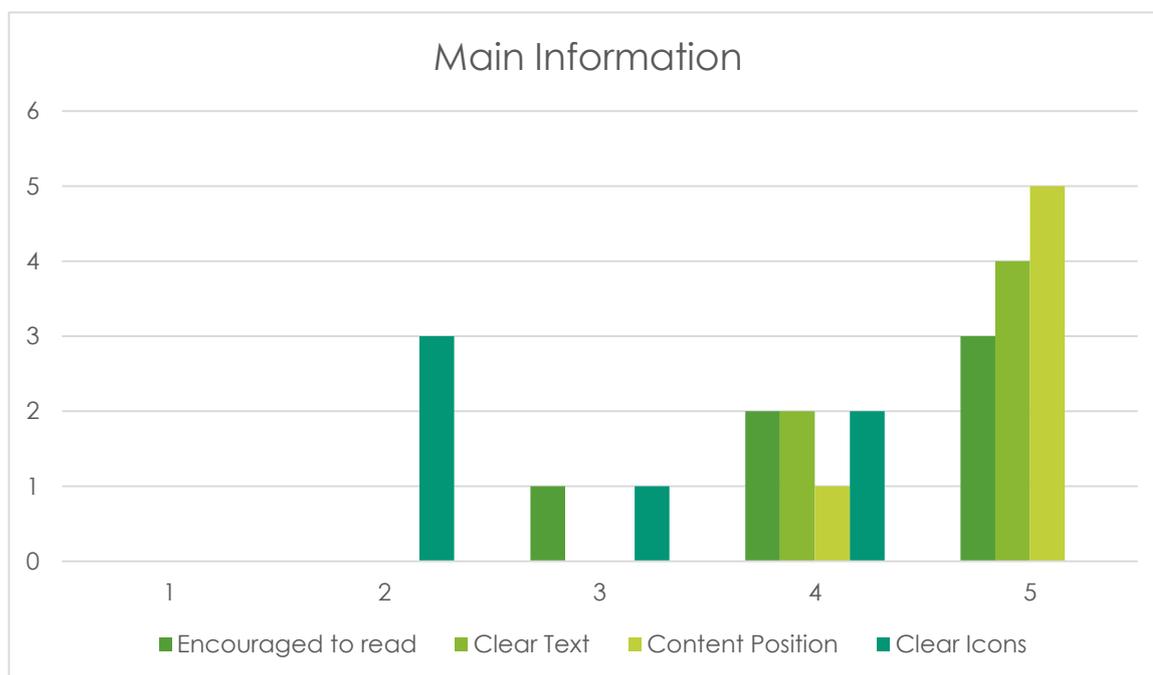
START UP SCREEN



Based on the feedback provided, the initial start-up screen was not found to be intrusive and actually encouraged all the users to investigate further.

A comment raised with this procedure though was the inclusion of choosing your language as part of the process. It would need to be investigated on how this could be included without adding an additional step to the start-up.

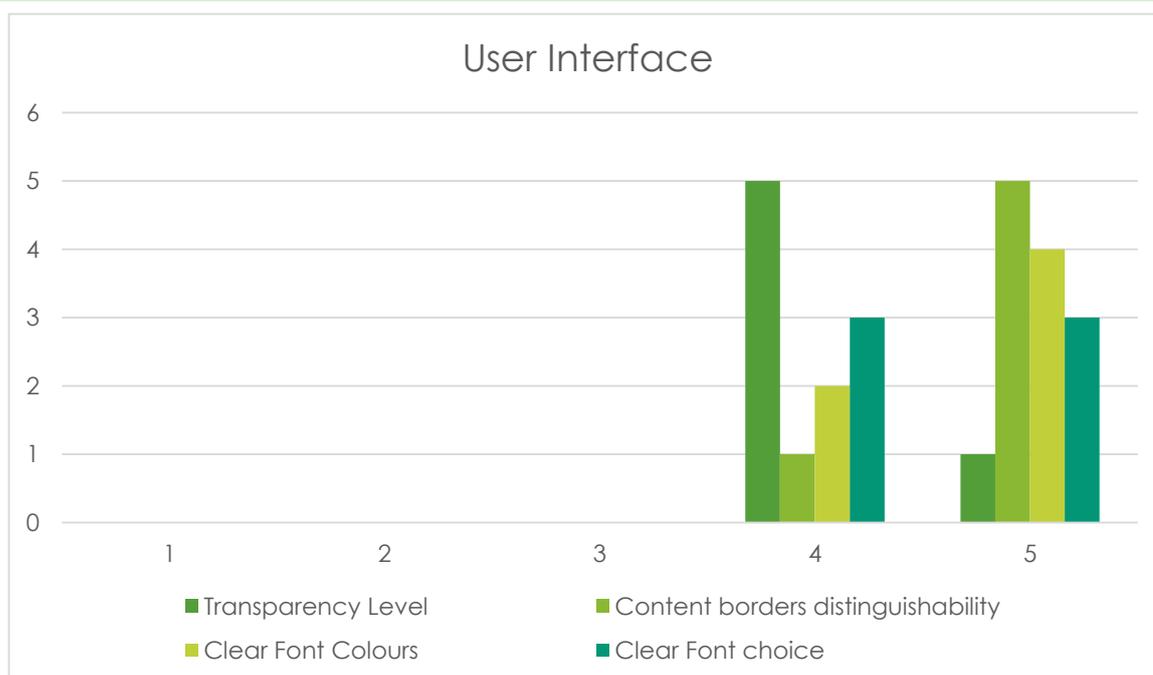
MAIN INFORMATION



The results of the questions based on the content location and clarity was overly very positive. It was felt that the location of the content was correctly placed and not a distraction from watching the animal, while the content was considered clear.

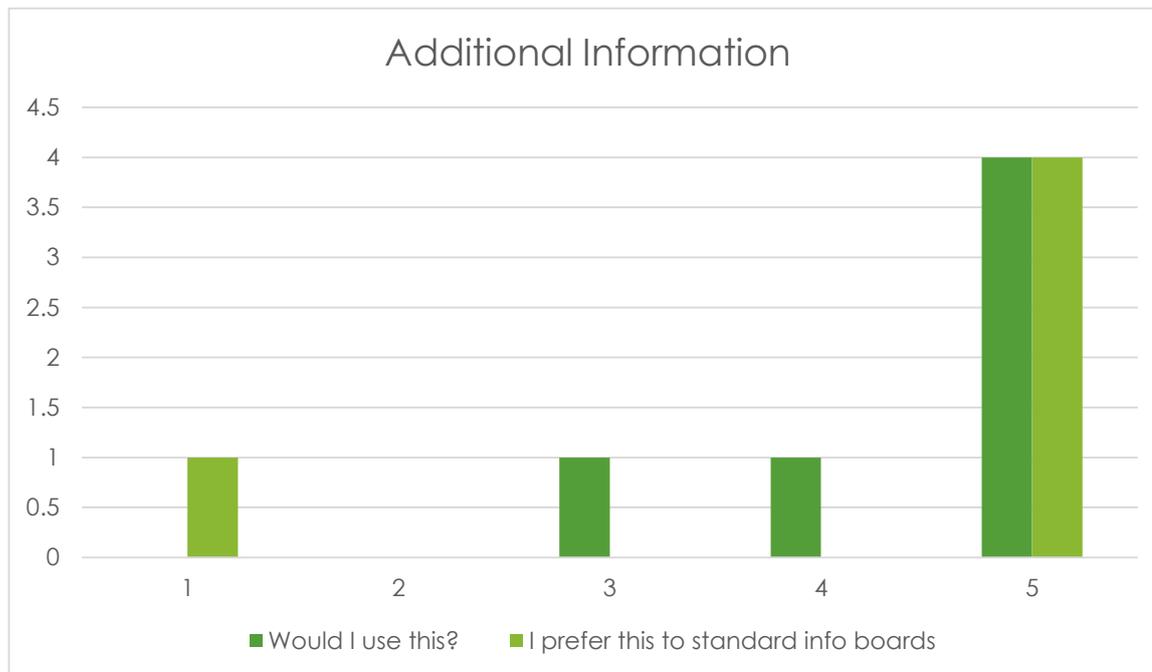
The only issue on the current design was the icons were not necessarily clear on what they meant. Alternative icons would be required or a combination of icons and text, depending on spatial limitations.

USER INTERFACE



Overall the UI design was correct with the level of transparency, colours and font choices, there was however a small level of improvement potentially available with the transparency level.

ADDITIONAL INFORMATION



If this was placed within a real world scenario, the response was very positive and most users would prefer to use this over the standard information boards currently displayed within zoos and aquariums.

COMMENTS

Some key comments were made during the demonstration of the prototype.

It was felt that a language option was required as part of the start-up screen. This is believed to be a very important feature, however how this is displayed from start-up without it being intrusive or creating too many additional steps would need to be investigated

During group presentations or tour guides it was felt that one large presentation should be displayed instead of individual displays. Other people not part of the group could then listen to the presentation being given or wait until finished to receive their own individual presentation. The option for the content to appear on the left hand side instead of below and take up most of the display could provide a suitable view for users within the group to all view the content at the same time.

QR codes could be made available on the screen for users to access additional content via their personal devices including the option to display the games attached to the animal in question.

It was felt that some sections which included videos could be perceived as too much information, as an alternative, this could be converted into a simple video icon which users can press if they so desired.

DISCUSSION

- Ideally the prototype was to be displayed on a large touchscreen and User Acceptance Testing would be performed on this. Unfortunately no Touchscreen monitor was available for testing, therefore a conceptual video was created and displayed in order to obtain feedback.
- Colours and interaction have not taken into account the potential distress this could cause animals, therefore full investigation into this would be required.
- A video was used for the prototype which do not necessarily show an accurate environment in which the animals may position themselves in different locations than what is displayed within the video examples.

USER INTERFACE QUESTIONNAIRE

In order to create the best user interface for an Interactive Transparent Display for a zoo or aquarium, there is a requirement to better understand the initial reaction to the prototype creation. Please answer all question below where possible and a space will be left for you to add any additional information.

General Information										
1. What is your age?										
18 - 24	<input type="checkbox"/>	25-34	<input type="checkbox"/>	35-44	<input type="checkbox"/>	45-54	<input type="checkbox"/>	Over 55	<input type="checkbox"/>	
2. What is your gender										
Male			<input type="checkbox"/>				Female			<input type="checkbox"/>
3. Please state your main occupation										
Zoo / Aquarium Information										
4. How often in the last 10 years have you been to either a zoo or an aquarium?										
Never	<input type="checkbox"/>	1-2 times	<input type="checkbox"/>	3-5 times	<input type="checkbox"/>	6-10 times	<input type="checkbox"/>	More than 10 times	<input type="checkbox"/>	
5. When was the last time you went to a zoo or an aquarium? (Tick 1 option)										
Never			<input type="checkbox"/>				Within the past 6 months			<input type="checkbox"/>
Within the last year			<input type="checkbox"/>				Within the last 5 years			<input type="checkbox"/>
Within the last 10 years			<input type="checkbox"/>				Later than 10 years ago			<input type="checkbox"/>
6. How often do you read the information display boards next to animal areas?										
Never	<input type="checkbox"/>	Rarely	<input type="checkbox"/>	Occasional ly	<input type="checkbox"/>	Often	<input type="checkbox"/>	Always	<input type="checkbox"/>	
Prototype Experience – Please rate the following										
				Disagree		Agree				
Start-up Screen				1	2	3	4	5	Not Sure	
7. I found the start-up screen intrusive.				<input type="checkbox"/>						
8. The Start Up Screen made me want to investigate the animal further.				<input type="checkbox"/>						
Main Information				1	2	3	4	5	Not Sure	
9. I want to read the information provided.				<input type="checkbox"/>						
10. The information text is very clear.				<input type="checkbox"/>						
11. The content is well positioned allowing me to concentrate on the animal.				<input type="checkbox"/>						
12. The icons are clear and I understood their purpose.				<input type="checkbox"/>						
User Interface										
13. The level of transparency of the content boxes was correct.				<input type="checkbox"/>						
14. If not satisfied with the transparency, would you suggest less or more										
Less Transparency			<input type="checkbox"/>				More Transparency			<input type="checkbox"/>

	Disagree			Agree		
15. The content box borders helped me to easily distinguish each area	<input type="checkbox"/>					
16. The colour of the font made the text clear	<input type="checkbox"/>					
17. The font choice made the text clear	<input type="checkbox"/>					
Additional Information						
18. If put in a real world scenario I am likely to use this to find out more.	<input type="checkbox"/>					
19. I prefer this display of information over information boards	<input type="checkbox"/>					
20. What I liked about the scenario						
21. What I disliked about the scenario						
22. Additional Comments						

WIREFRAMES

All wireframes and the prototype video can be found at <https://app.box.com/s/b95f0blaehgdb220013bnmn1py716ot6>

PROTOTYPES

<http://uni.blue-phoenix.co.uk/DSP>

<http://uni.blue-phoenix.co.uk/DSP/whale.html>

Prototypes are designed for 1920 x 1080px monitor screens. It's suggested to use IE10 or above. It has also been tested on the latest versions of Chrome and Firefox

BLOG

The Interactive Transparent Display blog can be found at <http://dsp.blue-phoenix.co.uk/>

REFERENCES

Color Psychology of Blue:

http://psychology.about.com/od/colorpsychology/a/blue_res.htm

F-Shaped pattern reading web content:

<https://www.nngroup.com/articles/f-shaped-pattern-reading-web-content/>

Understanding the Z-layout in Web Design:

<http://webdesign.tutsplus.com/articles/understanding-the-z-layout-in-web-design--webdesign-28>

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