

Introduction

I am tasked with finding ways to improve the museum user experience using AR, this means I will need to conduct field research to examine how museum users currently experience the museum and its exhibits. I visited two museums to conduct my field research the Horniman Museum and the Royal Air Force Museum. My primary preconception is museums are primarily for kids therefore, my improvements will be based on my observation of my kids' experience.

Field Research

My research method will be observational I will ask questions based on any issues I identify whilst watching my kids on the museum visits. The focus of my observation is to see how the museum displays its exhibits, and watch how my kids interact with the exhibits and see what areas they show interest in and the areas they don't have interest in. I haven't been to either museums therefore, I have no expectations, I will try to compare between the two museums looking for strengths and weaknesses in how they display their exhibits and examine how they use interactivity if at all. I will make notes of any issues I come across and use a straw man approach to solve these issues using AR.

Horniman Museum

I found the Horniman had a more traditional approach to displaying their exhibits, they had two tours per day otherwise you were free to explore the museum on your own. They had several exhibits which had a small degree of movement, the dinosaur was able to move its head or open its mouth. Also, there were four or five small pits with berried fossils which the kids could play at being an archaeologist and unearth. This was the extent of it for interactivity. However, these were very busy, and I found my kids had to wait for some time to get a chance to have a go which they found frustrating. Each exhibit was accompanied by an information board telling the visitors about the individual exhibit, shown in figures 1 and 2. However, the words on these boards where at times complexed both my son who is eight and daughter who is twelve had a go at reading these information boards and both struggled. I also had a go at reading them and struggled with some of the bigger words, this was also observed of other parents.



Figure 1 shows an exhibit of a prehistoric insect.

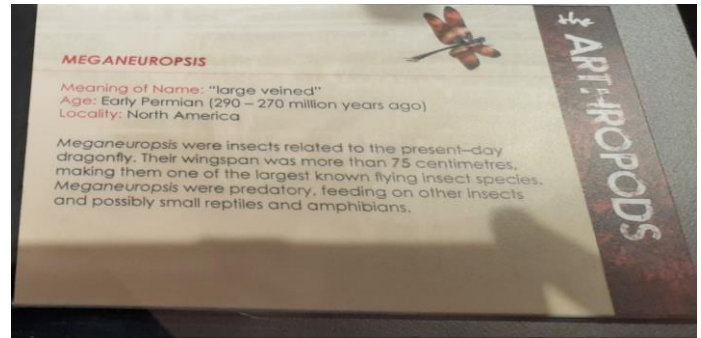


Figure 2 shows the accompanying information sign.

Royal Air Force museum

I found the Royal Air Force Museum, had more interactive items making it more fun for the kids there was a flight simulator, some air crafts you could go inside and a VR simulation of the dam buster mission. I took my kids along with me as I wanted to get their views. Overwhelmingly they enjoyed this museum more from there feedback it was because they could do a lot more than simply look at the exhibits, which was the case at the Horniman Museum they could interact. Allot of the exhibits still had the traditional information board attached to them with large amounts of text. These exhibits my kids showed less interest in. Although this museum made big efforts to make the experience more fun and interactive, they still suffered the same issue of long waiting times to get to use the more popular exhibit. An example of this is the VR dam buster experience, shown in figure 3. When I arrived with my two little ones there were four people ahead of me, bearing in mind it is a ten-minute experience this meant a forty-minute wait, something I would not have considered if it was not for my need to gather information on the experience from my kids.



Figure 3 shows my son and daughter using the VR experience at the RAF museum

Summary

I found the two museums to be completely different, the Horniman museum had a traditional approach little to know interactivity, my kids had very little interest. This was what I expected from a museum basic models of dinosaurs no interactivity. The RAF museum took a

more modern approach to displays of its exhibits with the use of videos and VR. I did not expect this, I had assumed they would have the same traditional approach as the Horniman museum. The benefit of this was, I was able to see the benefits of making the museum experience interactive. I could see the interest my kids showed in this museum. I also asked both my kids which museum they preferred both preferred the RAF museum. In addition, I asked why they both preferred the RAF museum and the answer from both was the same, there was more to do.

Key issues I found with museums and AR solutions summary:

Hard to read information signs, due to long complicated words. I will use AR to create an audio and visual information experience that is overlaid on the exhibit information board and pictures. Essentially this means when the user points their device at the information board or picture, they will have the choice of being able to watch a video or listen to the information about the exhibit. The benefit of this is that the user will not have to read the information board, removing the problem of reading tricky words. Also, the user controls the information flow, be it by video or simply listening to an audio message. At current some exhibits have videos playing on a continuous loop, this means if you arrive part way through the video you would have to wait for it to loop around again, some of these videos last ten minutes, therefore, potentially a long wait. With this feature of the AR, app the user controls the start of the information flow. It would appear when the visitor points their device at the exhibit, shown in figure 4 and 5. Where I used the picture of a T-Rex and overlaid an informational video about the T-Rex. This solves the issue of hard to read information signs.

AR can make the whole museum experience interactive, bring the exhibits to life. The exhibits many of which are models can be viewed through the user's device when the user touches, the exhibits at specific points on their device. The exhibit will tell the user information about itself and that part of its body using overlaid graphics and animation. An example is touching the stomach area on a T-rex, it would tell the user about its diet and how much food it eats. However, with current time restraints, this will not be possible for the prototype as it would require considerable amounts of animation, therefore the prototype will display the information in audio, meaning the user can listen to the information. Also, with text which is overlaid using AR. This means I will need to create 3D objects of the models in the museum to use as Triggers for the information to be overlaid on to. As the user controls what information is displayed by the part they touch, and the information is read out. This fixes the problem of hard to read information signs and make the experience more interactive and utilize 3D object tracking. As shown in mockups figure 7 and 8.

Long queues for interactive items. With AR each visitor can have their own experience through their device or with a rented device from the museum, therefore, no need for cueing. For example, the dam buster VR experience had long queues as each participant had to wait for the person in front to finish their VR experience. With AR each person could control their experience. This means multiple people having the dam buster experience at the same time, therefore, no cues. This opens the possibility of recording their experience to take home with them.

DESIGN CONCEPTS

My design concept is an AR app which has two primary functions. Firstly, it would allow the user to view overlaid information on pictures and information boards. Secondly, the AR app will allow the user to view models in the exhibits from many angles and see overlaid information. This function will require the use of 3D object tracking.

I will use AR to turn the 2D information signs and pictures into AR windows giving information about exhibits. 2D simply means the information has length and height but no width. This will allow users to watch or listen to the information instead of just having to read the information board. This would work through overlaid information on the information sign. The initial prototype did this using a pop-up video which talks about the exhibit, this can be seen in figures 4 And 5, where I overlaid a video on a 2D picture of a T-Rex. For this prototype the picture is used as the target used to recognise the photo, however, a better way which I will use in finished AR app is to use fiducial symbols which are easier to recognize than a picture

I will Use AR to give information on the various models in the exhibits which are 3D meaning they have length, height and width. With AR Information will be overlaid on the exhibits, many of which are models. With the use of Vuforia Object Scanner, I can make a 3D model of the exhibit. This 3D model is then imported to Unity as an object to be used as a trigger. This means when the user points their device at the real model in the exhibit it is recognised, and the user can access information on their device about the exhibit through simply touching the screen. For the prototype, I will use a 3d model of a T-rex to show how I will use AR to add overlaid information. The T-Rex 3D model is used as a representation of the models in the actual museum exhibit. This will allow the user to view the model in the exhibits through their device and by touching the screen get information via video audio and written text. The user has the choice of which way they wish to receive the information, for example, the audio would be simply listening to the information, video watching and listening and written text a speech bubble appears on the user screen with information. In this way the AR will solve the issue I found of kids struggling to read some of the more complex words and make the experience suitable for visually impaired and deaf people. This can be seen in mockup images in figure 7 and 8.

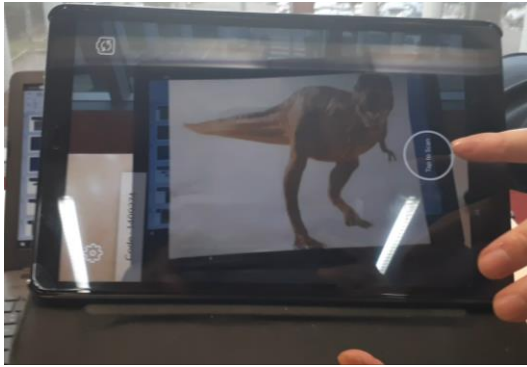


Figure 4 shows the initial prototype that allows users to see overlaid information using AR. user can view a picture, in this case, one of a T-Rex and video appears with information



Figure 5 shows the overlaid video.

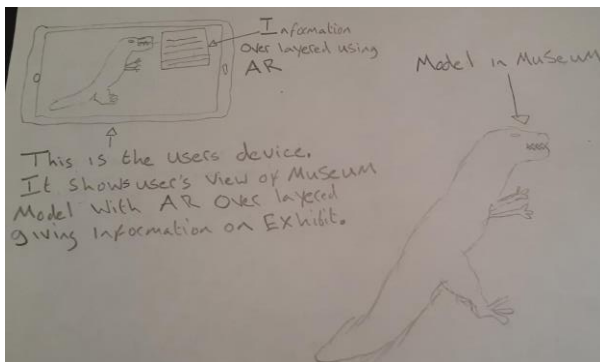


Figure 6 shows a sketch of my initial idea. It shows a model of a T-Rex in the museum and the view of it through a device with information overlaid using AR.

Mockups



Figure 7 shows the view through the user's device. I used a model of a T-Rex to represent a model in the museum. The labels are layered on to the model to show the user where they can touch to gain more information.



Figure 8 shows the view through the user's device with information overlaid using AR.

In figure 7 and 8 above I used a model of a T-rex to show how I will use AR to enhance the museum experience. The model is representing a model in the museum. The area the user can press is highlighted for illustration purposes. What can be seen in the image is the view the user will have via their device when looking at an exhibit by pressing on an area of interest information will be displayed with text with voice-over option. Figure 8 shows information overlaid using AR, all information will be displayed in the same way, therefore, only one image of this is necessary. By touching the information box, the user can get more detailed information. The target will be created using 3D object this means I will be able to allow the user to gain information from all around the model.

AR feature and implementation

I will be using Marker-Based AR specifically 3D object tracking. This means I can use augmented reality to blend virtual reality with real-world objects. With 3D object tracking all the dimensions of a museum model can be considered as a trigger for overlaid information. A trigger is a point where I can place information where it can be triggered and displayed by the user.

I will use Vuforia Object Scanner to create the 3D objects, this will allow me to scan a 3D model and import them into unity. With the use of Unity, I will be able to place multiple triggers on the models. A scan of the T-Rex model using Vuforia object scanner can be seen in figure 9.

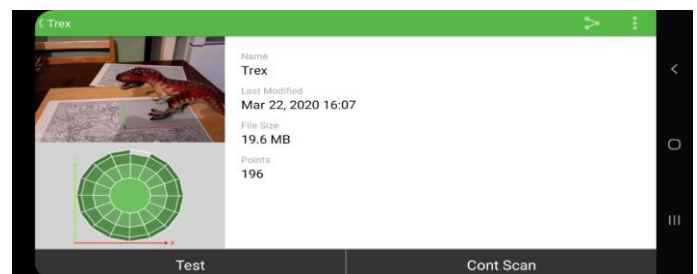


Figure 9 shows the scan I created using Vuforia of the model of the T-Rex this will allow me to make a 3D trigger.