**R34 Airship Project Emerging Technologies**

**Week One – Identify a broad area of interest**

There are many technologies that are starting to appear all the time, with some making it big and some losing headway quickly. Each technological area spans off to take different paths of reaching the same goal while other companies build on top of existing technologies to create new tech that will work along side these other pieces of technology. An example of this is the leap motion which was originally “designed to be placed on a physical desktop, facing upward.” (Leap Motion, n.d.) However, they later developed the technology to work alongside Augmented Reality and “can also be also be mounted onto a virtual reality headset” (Leap Motion, n.d.) to allow further interaction with virtual reality (VR) games.

However, the technology that interests me the most is Augmented Reality (AR) because of how the technology brings reality and the virtual world together by replacing “the real world environment with a simulated one.” (Augmented reality, n.d.). I have heard of many areas that have used AR to help improve their area such as, but not limited to; Visual Art, Architecture and Video Games. There are many possibilities for AR with the advancement of mobile phones the technology is now widely available to the everyday consumer, because of this I would like to research further into how AR has developed over the past two decades and how that can be applied to mobile phones for anyone to download and use, whether it’s a video game, help for an art show or to help with education.

**Week Two – Evaluation of the history of chosen technology (Augmented Reality)**

Augmented Reality (AR) has been around longer than most people are aware with researchers exploring the technology back in 1970, even now researchers such as Liberati (2016) say that AR is still “in its infancy and so even the general idea of what a good augmented reality should be is still uncertain.” Throughout the years AR has had issues but has come a long way, before AR was available for use on mobile phones researchers had to use a backpack and head mounted display to be mobile in their research, they then moved on to use UMPCs and PDAs. However, since mobile phones have become much more powerful, “smartphones are aiming for a different market” (Wagner D, and Schmalstieg, D, n.d).

Mobile phones then started to make better use of AR around the early 2000s with the first self contained AR application being developed in 2003.

**Week Three – Identify a problem or opportunity this tech could provide a solution for**

Just searching through the internet for Augmented Reality (AR) shows a large list of situations and opportunities that AR has provided a solution for in a wide range of industries, for example in Education “AR has been used to complement a standard curriculum. Text, graphics, video, and audio may be superimposed into a student's real-time environment.” (Augmented reality, n.d.) this allows students to be more engaged in their studies rather than just reading from textbooks, some pages could incorporate a scanner that the student could show to their AR enabled device allowing them to interact with their learning environment.

AR can also be used by the Military allowing soldiers to wear a Heads Up Display (HUD) which can show them information about the world around them real time, for example if there is a building with known intel about it, all the solider would have to do is look at the building and the HUD will display any known useful information to the user, it can also be used to show information about friendly and enemy positions.

An example in the medical sector shows that “augmented reality can project information directly onto the body of a patient. For example, the [Veinviewer](https://www.christiemed.com/products/veinviewer-models) system projects a real-time image of infrared vein scans directly onto the patient’s skin. Creating the impression that the skin is transparent. This allows the clinician to “see” the veins directly.” (Augmented Reality – What is it?, n.d)

This all shows how AR has helped overcome many situations and will lead to many more opportunities being overcome. I like the idea of creating an interactive book to engage people and keep them interested. Whether it’s for a school, museum or just an everyday fictional book, this is definitely an avenue I would like to explore.

**Week Four – Proposal of the artefact - Uploaded**

This week I had to create a proposal for the project I would like to create for the rest of the module. I knew that I was going to be using Augmented Reality (AR) has I have been looking into this for a couple of weeks now. However, an opportunity presented itself as a member from the museum in Diss, Norfolk was looking for students to undertake a project to create an interactive experience to mark the centenary of the R34 airship liner, dubbed “The First Transatlantic Airliner” and also one of the “Pulham Pigs”.

The project for the R34 really interested me as I grew up in a town a couple miles away from Diss and Pulham, so while growing up I would always hear things about the “Pulham Pigs” and the R34, another reason why I was interested in this project is because Basil Abbott was asking us to create an *interactive* experience, this sounded like the perfect opportunity for me to test some AR features out.

Once I had chosen to undertake the R34 project, Tom Gibbs and Elliot Chester had also agreed to partake and help with the assignment. I started off asking around the town where I grew up, asking friends and family for any information they might have on the R34 and the rest of the “Pulham Pigs”. Once I had gathered some information about the R34 I was then told that the Pennoyer Centre would be a good place to look for information, so I had a look on the website which stated that the centre holds “a fascinating archive of Airship memorabilia relating to RNAS Pulham. The Air Station was created in 1916 for airships to patrol the North Sea searching for enemy U-boats. Two of its most famous airships, the R33 and R34, are featured on Pulham St Mary’s village sign.” (Pennoyer's History, n.d) I arranged a meeting with Sheila King from the Pennoyer Centre in Pulham who was able to share a lot of information about the R34 that the centre has collected over the years

Once everyone from the team had collected information about the R34 Tom contacted Basil Abbott, who had arranged the project, to ask about what direction he would like the project to take. After several email exchanges we arranged to meet with Basil to brainstorm ideas. Once we arrived at the museum Basil was very happy with explain how large this project was going to be with lots of different organisations getting involved, explaining to us that he was quite open with the path that the team would take to produce a finished project for him and the only request is that it is something that a wide range of age groups would be interested in the end result.

Basil then showed the team and myself around the museum looking at some of the items that will be on display when the centenary takes place and helping to fill in any blanks we were missing from our own research.

When the team got back to the University we then discussed everything that had been spoke about during the day and decided that we should all make three separate projects to present to Basil. Tom decided to use the Xbox Kinect, Elliot chose to use Virtual Reality (VR) and I decided on AR.

As I spoke about in my previous blog entry I am quite interested in creating an interactive book, and I feel like this project could give me a chance to have a go at creating something that will be interesting to a broad range of age groups creating a book that when scanned can show 3D models come to life on the page, information about the R34, videos showing the R34 and many other exciting options, that the older generation would be interested in as they will be able to find out more information about the R34 but also to the younger generation as it will make the learning and informative process more interesting for them.

There are some limitation to the launch of a project such as this, if people come to the centenary and do not have access to a smartphone they could potentially miss out on some information that will be presented within the book, this is something that will need to be taken into consideration when choosing what information will be physically on the page and what information will be behind potentially a reality wall between the virtual and physical worlds.

**Week Five - Document the development process of the application**

While searching for ways to start developing Augmented Reality (AR) I came across Vuforia. After looking into the technology some more I found out that Vuforia used to be a Unity3D plug in, however it is now integrated with the game engine, this sounded like a good place to start. I did have a look at other VR tools such as Google’s ARCore. There is no real reason I chose to use the former over the latter, but I could only use one.

I started reading up on Vuforia and following some tutorials on how to upload an image to a database and then download that database to be used within Unity3D. I had a look around the web and a couple of images to use just for testing purposes, I scanned and uploaded these images to the Vuforia database.

After populating the database, I then had to find some models to load into Unity3D so that once the camera picked up the marker something would happen to show that the application was running correctly. Firstly, I loaded in a static model that would just stand there and do nothing whenever the camera read the image. Unfortunately, this is where I encountered my first issue, nothing was loading up when the camera was pointed at it. After reading up on Vuforia a bit more I found out that I was still using the default Unity3D camera and needed to start using the Vuforia ARCamera, I also needed to activate the camera by registering as a Vuforia developer and receiving a product activation key.

Once I had successfully loaded in a static model using Vuforia and Unity3D I then found a model that has some premade animations built in, this worked a lot better than I was expecting and was very simple to implement, I loaded the model into Unity3D selected an image to associate with it from the database I had created, I then had to select an animation to be the default animation used when the model loads up as at this current time I was not able to interact with the scene, this week was just to get the project set up so that I could progress further into Vuforia and Augmented Reality.

I came across a few minor issue with Vuforia that I was easily able to fix, however I am not able to test the program on any Apple devices as you need an Apple Developer License to do this, this is something I will need to look into, this is because as I stated in a previous blog a lot of people may not have access to a smartphone, this issue will also cut off people who use iPhones or other Apple devices.

**Week Six - Document the development process of the application**

Following from the last blog after getting Unity3D set up to work correctly with Vuforia, I added in a model of the R34 that was created by Elliot Chester. Using this new model I was able to start making my own animations and see how to set them up to work with Vuforia, I was able to create a “*Take-off*” animation that triggered when the ARCamera picked up the specified image marker, I was then able to cause the airship to move into a hover animation to make it look like the airship was flying through the air, this gave me the idea of how in the booklet I would be able to show some of the places that the R34 would have passed on its transatlantic voyage. Currently the model is static other than the floating animation, however I would like to implement a recreation of the voyage to show users the journey that was taken and some of the hardships the R34 would have had to face before reaching its destination in America and then the return trip back to England.

Later in the week Tom, Elliot and myself got together to record the progress we had made on the project, especially in the Augmented Reality side of the project. We decided to use the front cover of the R34 Log Book that he had kindly given to each of us when we went to meet him. The reason we uploaded this image to the Vuforia database rather than using one of the images we were already using was to give Basil something he would recognise, hopefully helping him understand that any image with enough detail could be used to showcase some features of Augmented Reality, meaning that at the centenary event, we could use images that would already have been included at the event so nothing would seem out of place, letting visitors know to look out for certain objects to activate an Augmented Reality scene.

With this ability to use any image, as long as it is detailed enough for the ARCamera to be able to distinguish what the image is I will definitely be looking to create an information booklet, most of the information will be contained within the booklet but people who are able to use the application that I create will have a more interactive experience by being able to “see” what the booklet is talking about, and I think this will definitely encourage the younger generation to partake.

**Week Seven - Document the development process of the application**

This week I wanted to see if I would be able to use the Model Loader that Vuforia offers, this allows a 3D model to be scanned in the real world and then the application can replace that with an Augmented model on the device. This then allows the user to interact with the model in ways they wouldn’t be able to normally, such as changing the colour of a car, or adding parts onto a model to see what they would look like.

Unfortunately, I was unable to fully test this feature, as the phone that I have access to, to test my development was not UpToDate enough to run the software that would scan the model into Unity3D. Once the model is scanned on, any phone can then use the model but because of this I was not able to progress further down this avenue.

The reason I wanted to test out this feature is because I thought it would be a good idea to have the application can also register a 3D model of the R34 that could allow users to update / find out more information about certain parts of the airship by clicking on them.

Following this I attempted to make the scene change when the user clicked on the screen, I tested this by having a Unity plane load up when the model loaded up, covering the image marker and set the colour to green to act as grass below the airship, when the user taps the screen the plane then changes colour to become a blue like the ocean as if the airship is travelling over the Atlantic. This is something I would like to investigate further as it could be a good way for users to see two different sides of a story that could be shown through the device.

**Week Eight - Document the development process of the application**

This week I wanted to try and use the leap motion, I know that it is different from what I would like the final artefact to be, but it is something that I would like to try and incorporate into the application, so I thought I would investigate it. “From a hardware perspective, the Leap Motion Controller is actually quite simple. The heart of the device consists of two cameras and three infrared LEDs. These track infrared light with a wavelength of 850 nanometers, which is outside the visible light spectrum.” (Alex Colgan, 8-9-2014). This is a very interesting take on how technology has advanced, once the LeapMotion has read the data provided by the user’s hands, it then stores it in its internal memory to stream through the USB connection once it has completed its algorithm.

However, I ran into a host of problems trying to incorporate this into my existing project. When I tried to use the leap motion it would keep opening the application using the Vuforia ARCamera, although this is something that I would have liked to have happened, for the initial testing of the technology I wanted to test the capabilities in a standard Unity3D scene. To overcome this, I tried disabling the ARCamera and using the default camera, this did not work, I then tried to create a new scene, but this also kept opening the ARCamera, I eventually had to create a new project. Although this worked I feel like this would cause too many issues in the main project, so I decided to scrap the idea and continue focusing on just the booklet idea.

http://blog.leapmotion.com/hardware-to-software-how-does-the-leap-motion-controller-work/

**Week Nine – Document the development process of the application**

This week I decided to add text to the scene so that when the image was recognised an image could show up, once the image has shown up some text could be displayed to the scene to give some information about what is being displayed. I started by adding in just a panel to the scene and adding some placeholder text, I then created a text file with some information about the R34 airship. Once I had this set up I was able to get Unity3D to read through the file and split each line up into an array of strings this was fairly easy to set up and gives the user a lot more information about what is being displayed on the screen rather than just a floating airship that at this moment in time doesn’t do anything except hover.

I have set it up currently so that when the user taps on the screen the text will move onto the next line to display a new piece of information to the device. I will need to spend some more time researching into the R34 to make sure I have solid facts to display to the user. I have already managed to get a lot of information, but I will need to spend the rest of the week making sure that everything is validated and correct.

Currently the text box is set up that it will display one line of text at a time, if the image is lost it will remember the line that was being displayed to the user so that they do not lose their place, however if the user has reached the end of the file and then loses the image and comes back to it, the file will reload so the user can go back through the information if they so wish.

I have tried to use Vuforia’s built in trackable data to test which image in currently being shown on the screen and then using this data to display different text boxes using reusable code, to try and achieve this I had to delve into the Vuforia source code and try to make some changes. However, after a few attempts my little knowledge of the source code proved not to be enough and I have had to find other solutions to the problem.

//For this scene where the airship is just hovering on the spot I am also going to cause the airship to //spin on the spot, this will make it easier for users to explore the outside of the airship with ease and //understand that they are able to move the camera as long as they keep the original image in view //of the ARCamera.

**Week Ten – Research the R34 airship**

Now that I have the images working correctly I need to research more into the R34 so that I can make sure I am displaying the correct information. Reading up on the R34 shows just what an impressive Airship it was, the R34’s “cost was around £350,000” (''R34'': the Record Breaker, n.d.). The R34 was originally to be used to aid in the war efforts of the first world war, however the development process was not completed until after the end of the war, on March 14th 1919 the R34 started her maiden flight “lasting nearly five hours, was uneventful and the ship was returned safely to her shed. (''R34'': the Record Breaker, n.d.)

Looking through all the information available on the R34 I am having to shift through it all deciding what is important and should be incorporated into the application and what should be included if there is time / relevance. This could cause an issue as something that I might deem to be unimportant, might be very important to an R34 enthusiast, so I will need to be very careful in what I decided to use and what is not used. I will try and include information about the different sections of the outside of the airship, offering information about the R34 as an airship, followed by more specific information about the gondolas, engines and various other sections of the magnificent aircraft. It would be nice to include some more obscure information that might not be as easy to find out about to make the application more unique and interesting to the users.

**Week Eleven – Evaluation of the project and learning outcomes**

I feel like the project could have gone a lot better because I ran into a lot of bugs using Vuforia. The documentation was not very helpful, and any help online did not help with the issues I was having. Some of the simple issues that I had were with Unity3D where I was unable to get the full airship model rotating whereas on a different model the rotation worked fine, I was unable to find an explanation for this.

I learnt a lot while working on this project, useful skills such as getting two or more different technologies to work together by using Unity3D, LeapMotion and Vuforia. I was also able to learn a lot about the R34 which is of interest to me but I have also taken many skills from Vuforia and Augmented Reality (VR) as a whole which I will be able to use in future projects, although this assignment has come to an end I would still like to work with Basil to create a finished product ready for the centenary in 2019. This would greatly improve my skills further with the use of VR.

I did not learn a great deal from using LeapMotion as I was unable to get it to work correctly however it looks and feels like an impressive piece of technology that I would like to research into further in my own time. Overall, I enjoyed working on the project and look forward to seeing how it develops over the next couple of months working with Basil.

Unfortunately, I was not able to get any proper assets in for the final project and was still using the 3D model that was kindly provided by Elliot Chester. I would have like to have got some good quality assets made for the R34, L33 and the Gondola / Engines to showcase in the project, but hopefully this is something I will be able to draft a designer in to help with.

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**Ar tennis**

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