Functional Specification:

Brief:

“The essential functional elements should be defined and described,

including data paths. This functional specification should not assume

any specific technologies, only functional technologies (Short range

wireless technology is a functional statement whilst Bluetooth is a

specific technology)”

InteriAR would have all it’s users log in using an external company to log in, that would hold their account information such as Account information, Password, from that we will have users in a database that will hold Reviews of that user and their chosen augmentation(s) as well as smaller information such as how many times that user has used the app. ( If customer has bought 4 times, or if decorator has done 10 jobs )

Upon opening the app, it would use premade augmented reality libraries combined with computer vision techniques to correctly project the orientation and position of the 3D object. This would also aid in changing the colour of walls within the app. The user would potentially have to make changes to aid the projection and to gain additional data. Once the user has chosen and finalise a design, this would be stored in a database once again overwriting the old one (maybe or added with it); Then it’ll be sent to a decorator. Lists of decorators will also be in a database. Their profiles will be displayed by area to the user who can contact them directly with our built in messaging system.

The messaging system will likely use libraries that have been already made as a starting point. As this chat won’t differ much from a standard chat, it wouldn’t have very much different from the standard chat. Once the decorator accepts the design sent to them, an escrow payment system will be shown. This will also include an existing libraries to aid in the structure of the payment system.

We will also have an agreement that users will abide to that states that the money will be released once the job has been completed. Once the completed job has been confirmed, the user will have the option of reviewing the Decorator and allowing them to use the captured augmentation on their profile to help them build up their reputation.

Technical Specification

Having validated the proposed solution with users and answered any

open technical or feasibility questions, attribute specific technologies to the functional architecture and present this as a technical architecture.

Justify your choice of technologies with reasoned arguments for

rejecting or retaining alterative technologies.

{Some mention of market research questionnaire and how it helped us validate our app}

Database

As we won’t be using our own database to be validating and logging in users, we have come to the conclusion of using Facebook and Googles login API to help create accounts. The reason is due to feedback we got from potential users, who said they usually, and prefer to login with Facebook or Google. Even though this implementation will exclude people without the above services, it makes the whole process of signing up to the app a lot faster. It also solves some issues we may have encrypting and protecting the data correctly as passwords won’t be stored with us.

In our account database, we have decided to use a MongoDB. The reason being that it is easiest to implement over MySQL. Furthermore, it has better capacity, speed and reliability than MySQL.

Augmented Reality Implementation

The main selling point of InteriAR, is the augmented reality. We aim to allow users to pretty much visualise a whole room within their phone. To develop this, we have decided to use Unity3D. Unity is designed for, but not restricted to, 3D games. As Unity an excellent 3D engine that can be worked outside of just game development, it seems to be the perfect software to use, also because it can pretty easily be deployed to Android and IOS. As an alternative, we did look at using Android Studio. We chose Unity over Android Studio simply because Android Studio doesn’t natively support 3D modelling and design, however, Unity does. Every augmented object will be a 3D model.

{Something about how we chose to model the app on a mobile over tablet, however it’s ideal on tablet because of space, however most people will have a phone. Won’t work for laptop users unless you would have an external webcam that you can point to the room, which most people do not have. (As per survey)}

One feature of our Augmentation would be the ability to change the colour of walls and even whole floors. We would achieve this by using a computer vision technique called K-Clustering, which is a form of Image Segmentation. This would give meaning to different sections of an image that are separated by some common factor. Through prototyping, we have seen that simply taking the RGB value of pixels in an image has its problems, as pixels change colour due to multiple external factors.

For the actual technology behind the augmentation, we have decided to use an external Unity Library called Wikitude. We chose this over Vuforia (another Unity Library for AR ) as Vuforia is good for recognition based AR. This is using track-able images as basis for projection such as a leaflet. Through prototyping we have discovered that this is not practical as we would like users to not need to use trackers to place things in their rooms, not to mention that if you’re too far from a tracker, the Augmentation would get ruined. Wikitude uses a projection based augmentation called SLAM. Simultaneous Localisation and Mapping is the type of AR that we need as it can recognise space and angles pretty well and correctly project the right orientation of the 3D object. We did also look at ARCore ( Androids AR library) and ARKit (Apples AR library) however they only support their respective platforms.

Messaging

We aim to including instant messaging to allow customer and decorator to securely communicate with each other. We have chosen to use an instant messaging API over standard SMS as people may not be comfortable giving their numbers out. The API we will use is called Pusher.

Payment

For the Payment within the app, we have decided to use Paypal as it supports standard card use as well as PayPal accounts. We aim to have an escrow system to hold the money until the job is done to avoid scams. In principle, this would be simple, however payments aren’t going directly to us. There is one available python library that can implement Escrow called Balanced. However, the documentation about it does not currently work and there isn’t much information available about it.

Wikitude – Can provide SLAM development and is free to use.

SLAM – We don’t want to use trackers. SLAM uses multiple techiniques to project 3d in real life better than lighter versions of AR tracking.

K clustering (Image Segmentation) – For the walls

Android / IOS – Will be scalable to tablet, won’t work on computer without external webcam

Unity – Excellent for 3d modelling as as well as deploying / Didn’t use android studio for the difficulty of 3d design and development

Libraries (idk)

AR Core – Didn’t use as Android only and doesn’t support SLAM

//Vuforia – Used for functional prototype, however doesn’t support SLAM

Mongo DB (PyMongo) -

Some Messaging API

Some Payment API - PayPal

Google/Facebook login API - Aids in data protection as we won’t hold passwords or sensitive account information, It’ll be on googles databases

Maps API (Location options thing maybe)

Evaluation

How you intend to test and evaluate your software during and after

development. It may be useful to specify individual test cases.

Test cases:

Are users able to login successfully?

When logging in, is the correct personal data displayed?

Does having a phone smaller than 4.7 Inches affect the usability of the app? (I.e pressing buttons, dragging things onto the screen etc)

Does the app change the colour of the walls to a preferred colour?

Does is successfully change the colour/Material of the floor?

Is the projection of objects orientated correctly? ( I.e correct angle, correct focal point etc)

Are we able to project multiple objects?

Can the space we are projecting in, relative to a 3D space?

Are messages sent instantly?

Are payments held in escrow correctly?