

# ARM Companion App Development

Toran Bruce Richards

40276179@napier.ac.uk

Edinburgh Napier University - Mobile Apps Development (SET08114)

## Abstract

The aim of this project was to design and implement a prototype of a companion application to a parent product, ARM (Augmented Reality Mirror). The product/app pair was designed to revolutionise clothing retail, bringing it up to date with what is possible with modern technology and thus, enabling the shopper to digitally 'try on' clothes before ordering, all from the comfort of their own home. The aim of the application itself was to provide a simplistic and intuitive way to interact with the product, using existing commonplace technology, the smart-phone.

**Keywords** – Augmented Reality, Fashion, Retail, Computer Vision

## 1 Introduction

**Inspiration** With the modern age of the internet came the end of retail as we knew it. Suddenly it was possible to browse catalogs of gadgets, toys and cookware, fill our virtual *shopping basket*, and place an order; all from the comfort of our personal computers and smart-phones. The time saving and convenience this brought with it made online shopping ubiquitous in the lives of most all humans inhabiting the first-world. Today, roughly one fifth retail sales in the UK are made online [1].

Not all areas of retail, however, have managed to transition into this world of presence-less shopping without drawbacks. One of these markets is clothing. Shopping for clothes without being able to try them on for looks and size often becomes an inconvenient guessing game, frequently resulting in the returning of orders.[2] Shoppers often resort to ordering multiple sizes of the same item [3], and even still have no guarantee it will look good on them once worn.

**The Solution** This project aims to pose a solution to this problem, through the use of modern technology. The ARM is a prototype smart mirror which utilises modern computer vision techniques to augment clothing models, provided by designers, over the users body - allowing them to virtually *try on* clothes. This is paired with a companion app through which the user provides custom measurements and various other details to provide a simple interface with the product.

### 1.1 Related Projects

**Find me a shoe** The team at [findmeashoe.com](http://findmeashoe.com) [4] recognise there is something missing in the way we shop for clothes.

They have aimed to tackle the task of custom shoe fitting and too are utilising modern computer vision to help them achieve this. However, their efforts currently are seemingly focused on solving the problem of size and fit, leaving no room for style and fashion.

**GAP's Virtual Dressing Room** Long established clothing retailer GAP, also recognising the problem that looks can be hard to judge online, have teamed up with Google to create a Augmented Reality dressing room [5]. This mobile application, requiring a Google Tango [6] enabled device, presents the user with a simple virtual mannequin [fig.1], augmented into the space in-front of them using their devices camera. The user selects an item of clothing to display on this mannequin, and can then move around the space to observe it in a 3D, life size form. Again, this virtual dressing room, although allowing the user to view the item in a selected size, is yet to give its real counterpart a run for its money in any area bar convenience.

## 2 Software Design

### 2.1 Design Decisions

The decision to use a mobile application to interface with ARM was made based on that of simplicity, availability and familiarity. Other interfacing options were considered, such as touch screen and gesture tracking. The former was decided against due to the fact that fingerprints would show very prominently on the surface of a mirror and a touchscreen would add decidedly unnecessary expense and complexity to the product. With one of the main goals of the project being to provide a cheap and simple product, this was ruled out. The latter option, although with its merits, was deemed an overly unnatural and cumbersome way of interfacing with the product. Requiring the user to learn and get used to such an unfamiliar control scheme would add unnecessary barriers between users and the product. The mobile application is familiar to most everyone, simple to use and hosted on a platform used by the billions [7]; making it the perfect interface of choice for this project.

It was decided important that this app should present the user with a intuitive, hassle free way of interfacing with the product; in order to minimise the possibility of deterring users, especially those already reluctant to switch over to high-tech shopping. With this in mind, the app was designed to revolve around 5 base screens, utilising familiar controls, with no hidden menus away from the central app. The UI was designed in such a way to allow the entire app to be used with the device held in one hand, with all products intuitively categorised

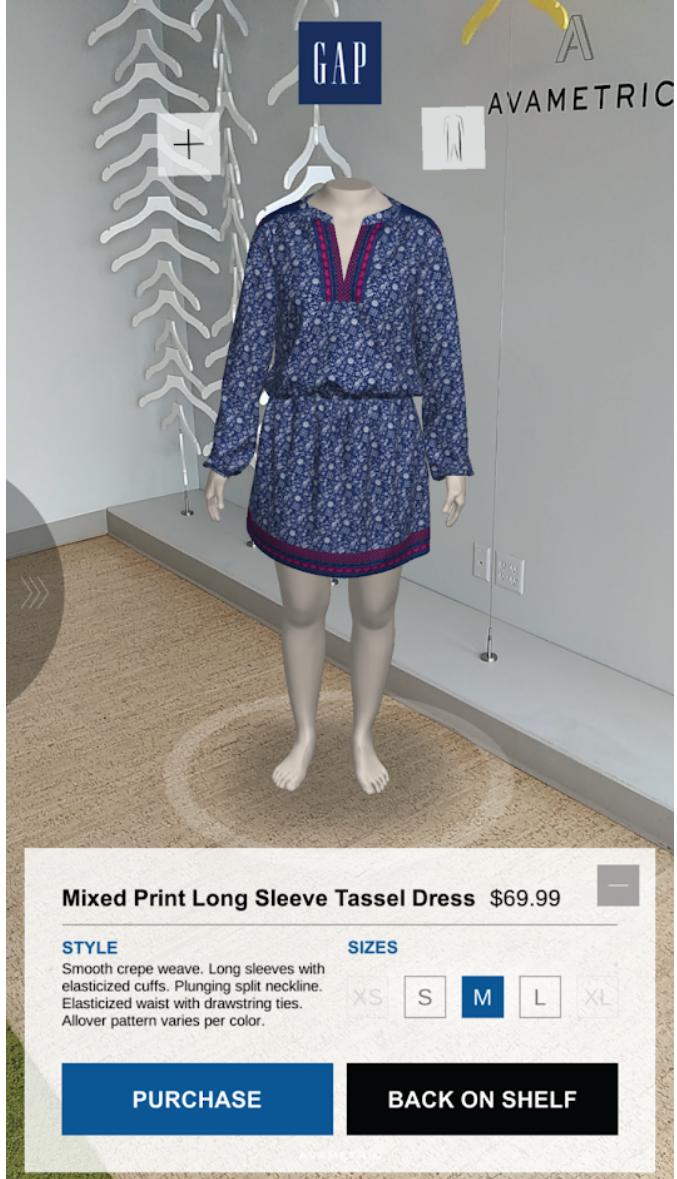


Figure 1: **GAP Dressing Room** - Gap's Augmented Reality mannequin

to prevent the need for typing into search boxes.

## 2.2 UI Design

The UI was sketched out before being implemented within the application. The sketches were kept quick and rough to keep in line with the agile development methodology. A side "burger menu" seen in [fig. 2] was originally considered as a way of navigating to the different menus of the application, however, after some research [8] and thought, it was decided that the use of a *burger menu* subtracts from the main application by unnecessarily drawing the user away from the page and hiding portions of the application from them. A bottom navigation, however, fitted the application's needs perfectly [9] as it keeps the user centered in the application, and provides quick and intuitive access to the entire app.

As illustrated in [fig.2] the UI was designed in such a way to provide an intuitive flow to each item of clothing the user may desire. The associated body part was decided to be an exceptionally obvious and thus intuitive way of instantly

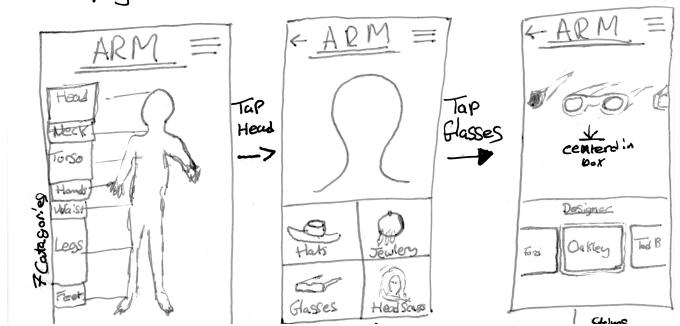


Figure 2: **Main 'Dress up' UI flow** - Main flow with discarded burger button seen at top right.

knowing where every item resides within the app. It also provides an easy way of dressing the user's body in stages, each body part in turn, providing flow to the entire process.

The individual screens of the application, navigated using the bottom navigation, transport the user between five individual main pages [figs.3, 4], allowing them freedom to move about the application easily. Each section is designed persistently, allowing the user to access different sections of the app without losing their current outfit progress.

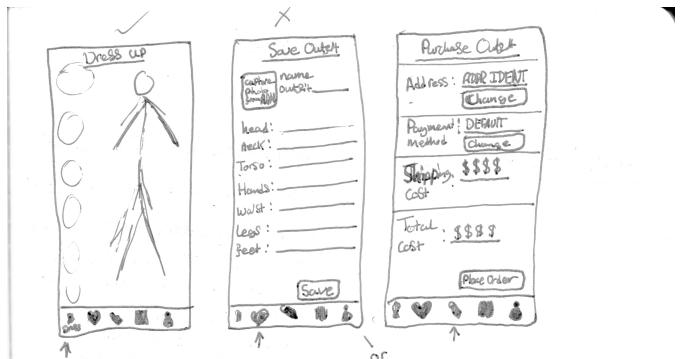


Figure 3: **Main pages** - The main pages of the application, with a discarded design for outfit saving seen in the center.

The original design for the saving of an outfit [fig3] was to use fields of text listing each item selected before saving. This was later decided against in favor of a card based design using pictures/models, through which the user can quickly scroll to get a visual feel for the outfit, rather than spending time reading plain text. As fashion is based on what we see, the later design holds strong.

## 3 Implementation

As this app was intended to be a prototype for later developments, it was decided that, in order to best show off the application whilst trying to avoid including repetitive processes, a single flow of selecting a item from start to finish would be included, in the form of glasses. From this flow the reader can extrapolate the processes and designs that would be displayed to the user when selecting other items of clothing.

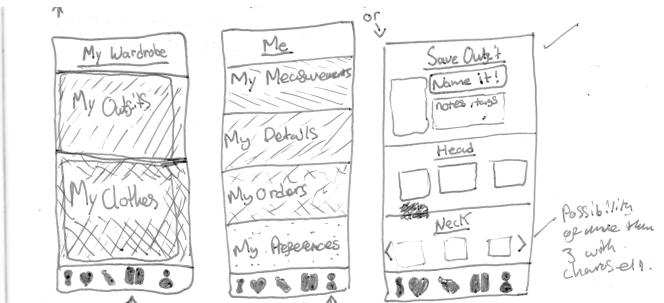


Figure 4: **Main pages 2** - The rest of the main pages of the application, the revised 'Save Outfit' screen can be seen on the right.

## 4 Navigating

As discussed above, the user navigates through the five main sections of the app using the bottom navigation [fig. 5], which expands and shows the title of each section when clicked on.

## 5 Creating an outfit

In order to create an outfit, the user must navigate to the *Dress up* page [Fig. 5]. From here, they select each body part in turn, and are greeted with possible garment categories to choose from. In this prototype we follow the flow of choosing glasses, thus click on *head*. Here [Fig.10] the user is greeted with four categories of clothing to choose from. A visual approach was chosen over a verbose one, to enable quick and effortless navigation, no matter literacy or language. Similar screens would greet a user who selected another body part previously.

From here, the user moves on to their selected garment category, in our case, the glasses, [Fig.11] and chooses a designer displaying their catalogue. From there the user selects a pair to try on and add to their outfit.

## 6 Evaluation

As a concept, this project appears to hold much potential. It addresses many problems in the way of day to day consumerism in the fashion field. In comparison to other applications attempting to do the same thing, it tries to tackle every issue head on, rather than focusing on smaller pieces, with the belief in mind that, in terms of switching people from street shopping, this must encompass their every need and more.

## 7 Personal Evaluation

I could have poured hundreds of hours into this project, and plan to continue it into the near future. Learning from scratch android studio, python, OpenCV, Raspberry Pi's and Linux

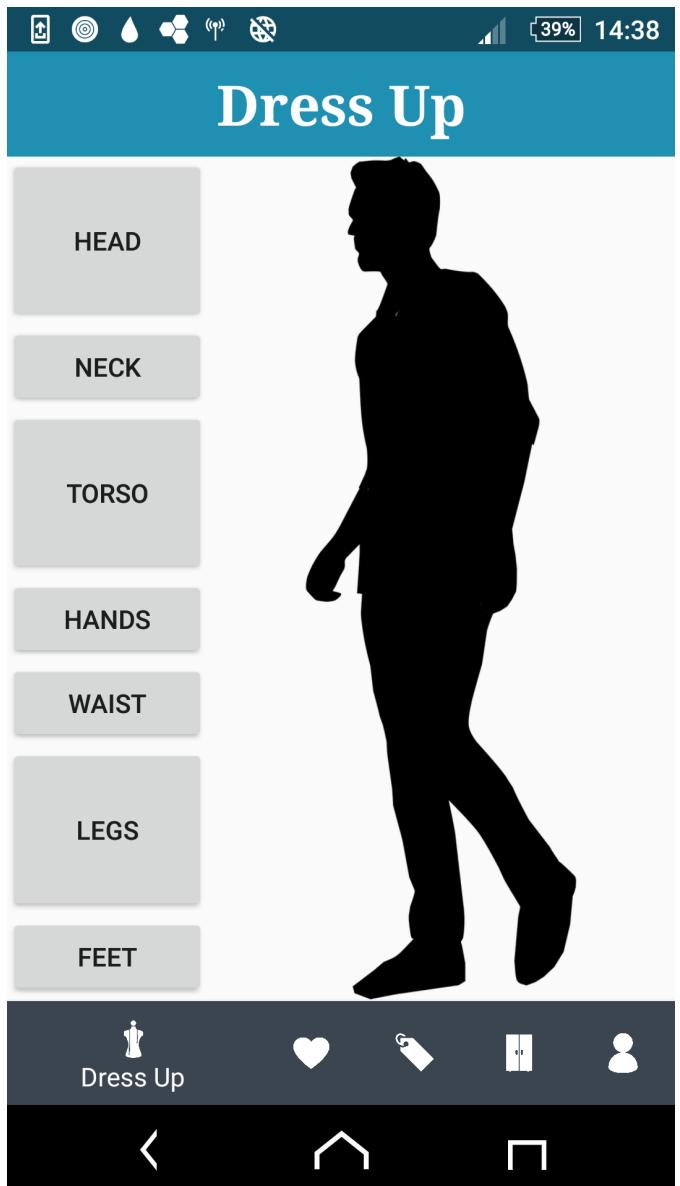


Figure 5: **Dress Up Page** - The main page of the app, through which the user browses and selects items from their catalogue.

in general was no easy task, but it was a very enjoyable one. I regret not being able to finish this project to a standard as I had planned, but such is all too common in this development lifestyle, problem after unforeseen problem kept cropping up setting me back.

I am happy with the idea and design of the product, though I could have gone much deeper into it with more time.

## References

- [1] Office for National Statistics [GB], Internet sales as a percentage of total retail sales, <https://www.ons.gov.uk/businessindustryandtrade/retailindustry/timeseries/j4mc/drsi>
- [2] University of Regensburg 2013, ibi Research. (2013). Re-tourenmanagement im Online-Handel, pp. 33–39

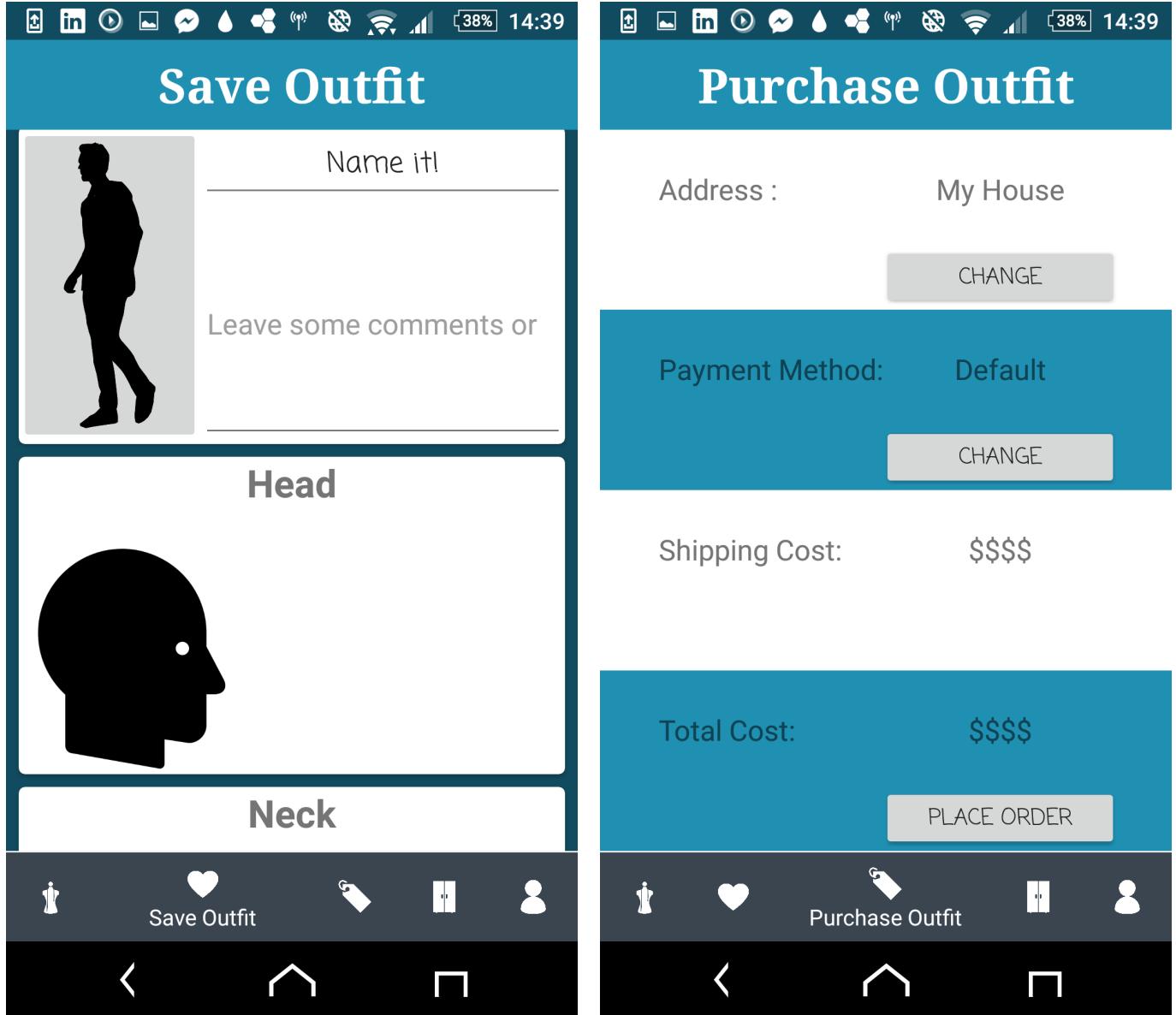


Figure 6: **Save Outfit Page** - Here the user can quickly scroll through every item they have selected to review their outfit, give it a name and leave any comments; then save it to their wardrobe.

[3] BBC News, Most online clothes shoppers send something back, line 21, <http://www.bbc.co.uk/news/business-36395719>

[4] Find me a shoe, <http://www.findmeashoe.com>

[5] GAP Dressing Room, <https://play.google.com/store/apps/details?id=com.avametric.dressingroombygap&hl=en>

[6] Google Tango, [https://en.wikipedia.org/wiki/Tango\\_\(platform\)](https://en.wikipedia.org/wiki/Tango_(platform))

[7] Statista, Number of smartphone users worldwide, <https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/>

[8] techcrunch, Kill the hamburger button, <https://techcrunch.com/2014/05/24/before-the-hamburger-button-kills-you/>

Figure 7: **Purchase Outfit Page** - Here the user can choose to purchase every element of their selected outfit automatically, with minimal haste, pre-fit to their previously input measurements.

[9] androidhive, When to use bottom navigation, <https://www.androidhive.info/2017/12/android-working-with-bottom-navigation/>

## 8 Additional References, Reading and resources used

### 8.1 Colour Pallet Generator

<https://coolors.co>

### 8.2 Info on Material design

<https://www.androidhive.info>



- 8.7 Bottom Navigation Specs**  
<https://material.io/guidelines/components/bottom-navigation.html>
- 8.8 Carousel Design Pattern**  
<https://www.smashingmagazine.com/2013/02/android-carousel-design-pattern/>
- 8.9 Bluetooth Docs**  
<https://developer.android.com/guide/topics/connectivity/bluetooth.html>
- 8.10 Requesting Bluetooth Permissions**  
<https://developer.android.com/training/permissions/requesting.html>
- 8.11 UUID Generator**  
<https://www.uuidgenerator.net/>
- References**
- icons- WEBSITE: <https://thenounproject.com> LICENSE: <https://creativecommons.org/licenses/by/3.0/> HEART Heart by Gregor Cresnar from the Noun Project TAG Price Tag by joe pictos from the Noun Project T-SHIRT Tshirt female by Deemak Daksina S from the Noun Project WARDROBE wardrobe by fahmionline from the Noun Project USER Public Domain GLASSES Glasses by Sergey Demushkin from the Noun Project SUN HAT sun hat by ANTON icon from the Noun Project NECKLACE necklace bust by SBet from the Noun Project HEADSCARF Head Scarf by Creative Stall from the Noun Project SUN-GLASSES Sunglasses by Centis MENANT from the Noun Project SPECS Glasses by Cor Tiemens from the Noun Project BAREHEAD Head by Gregor Cresnar from the Noun Project NECK neck by BomSymbols from the Noun Project TORSO torso by hunotika from the Noun Project HANDS hands by Veysel Kara from the Noun Project WAIST waist by See Link from the Noun Project LEGS legs by Alina Oleynik from the Noun Project FOOT Footstep by Symbolon from the Noun Project

Figure 8: **My Wardrobe Page** - From here the user can navigate to their saved outfits, and their wardrobe of already purchased items. The later could be used to allow quick trying on of already owned clothing before going out.

### 8.3 Documentation on application design-ing

<https://material.io/>

### 8.4 Head Silhouette

<https://cliparts.zone/head-silhouette-cliparts>

### 8.5 When to use fragments rather than activities

<https://stackoverflow.com/questions/20306091/dilemma-when-to-use-fragments-vs-activities?rq=1>

### 8.6 When to use bottom Navigation

<https://www.androidhive.info/2017/12/android-working-with-bottom-navigation/>

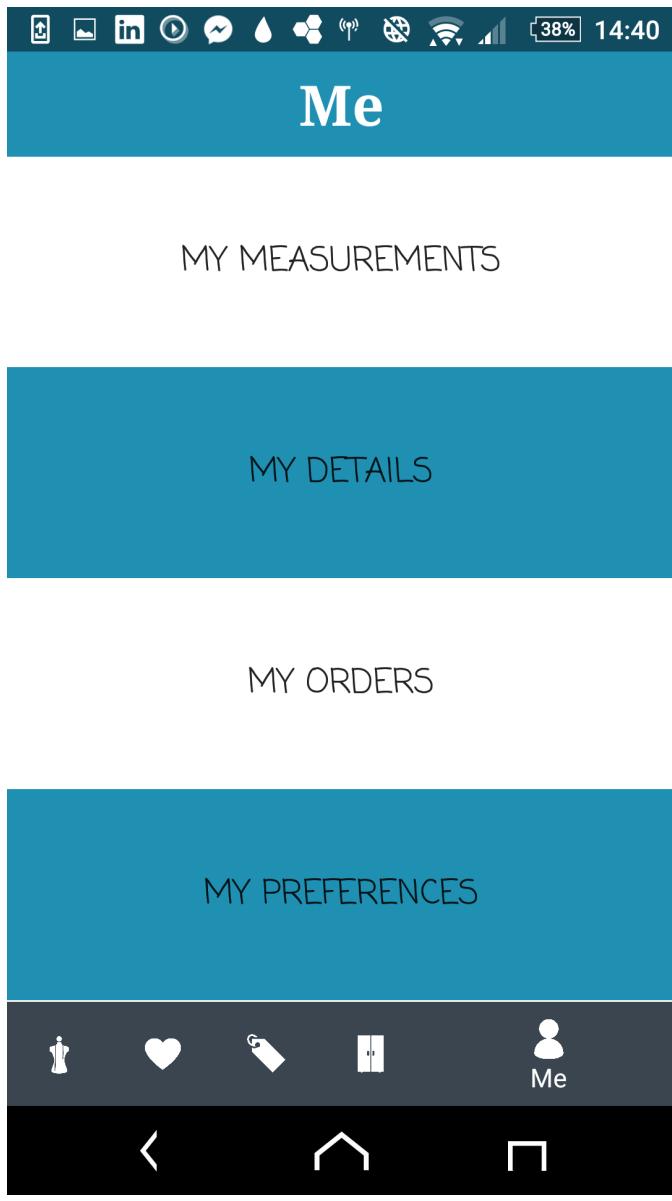


Figure 9: **Me Page** - Here the user can navigate to sections pertaining to information. They can enter, view or edit their measurements, edit their details including shipping and billing, view their previous orders and change their preferences within the app, e.g colour scheme.



Figure 10: **Dress Up - Head** - Here the user can visually navigate to the relevant item of clothing relating to the head.

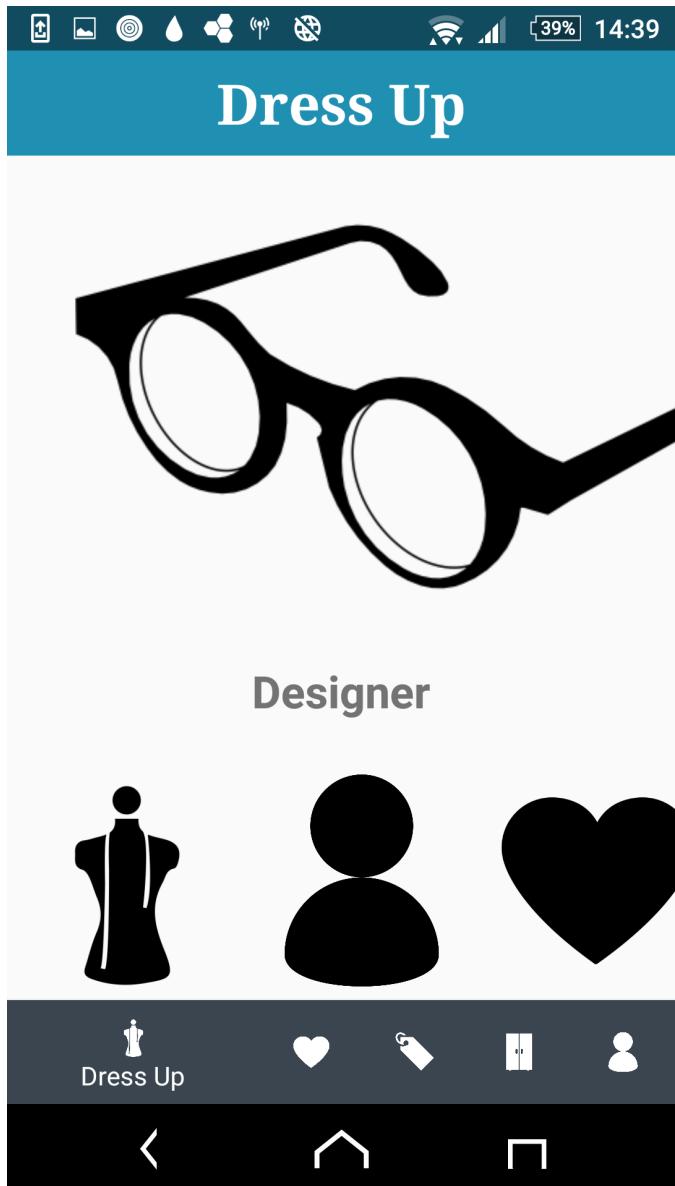


Figure 11: **Dress Up - Glasses** - Here the user selects a designer from the bottom carousel, and chooses a pair of glasses to be instantly added to their outfit and displayed on ARM.