seeUV: using augmented reality to create an engaging tool for today's SunSmart generation

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Abstract. Cancer Council Victoria's SunSmart program has achieved decreasing melanoma rates among Victorians aged under 55 years (Curchin, Harris, McCormack & Smith, 2018) – the 'SunSmart generation'. To build on this success, SunSmart Victoria sought innovative ways to engage younger audiences with skin cancer prevention messages.

For this project, which was conducted between May and November 2017, SunSmart investigated whether augmented reality could be used to tackle two key barriers to skin cancer prevention among young people, namely: a lack of understanding of the UV Index as the best indicator of sunburn risk, and a disregard for the future consequences of UV damage at the individual level.

Introduction

The SunSmart program has been a world leader in skin cancer prevention since its inception in the 1980s by Cancer Council Victoria and VicHealth. The program has had a substantial effect on the incidence of melanoma in Australia, with an estimated 43,000 skin cancers prevented (Shih, Carter, Heward & Sinclair, 2017) and falling melanoma rates in the under 40 age group (AIHW, 2016). However, to maintain this progress and continue having an impact, the program needs to find innovative ways to engage audiences.

SunSmart identified misconceptions around heat and UV as an area for opportunity. In qualitative research conducted in 2016-17, SunSmart found some adults did not perceive UV forecast information (and sun protection times) to be more beneficial than their own judgement and experience to inform decisions around sun protection (Nicholson, unpublished). Further, survey research has shown one-third of young Victorians continue to rely on indicators such as temperature, cloud cover, wind and humidity for guidance as to whether to use sun protection and may be exposing themselves to an increased risk of UV damage, and skin cancer (Dobbinson, unpublished). These findings highlight the need for strategies that communicate the relevance and importance of UV information as part of comprehensive skin cancer prevention efforts in Victoria.

An issue in communicating UV and associated risks is that it cannot be shown directly to audiences in their environment. People rely on their experience of UV damage, which has usually occurred in summer, when both UV and temperature peak and therefore incorrectly conclude that heat is the cause. Furthermore, because the risks posed by over-exposure to UV radiation of skin cancer and premature ageing take decades to manifest, young audiences may perceive these risks as being less relevant (Brinker et al. 2017).

Augmented reality (AR) provided a possible solution to these problems. AR superimposes a computer-generated image over an actual image of the user's environment. It presents an opportunity to show users UV as a tangible risk in their environment, and address misconceptions about heat as the cause of skin damage, thus encouraging people to better protect their skin. AR also has the potential to make the long-term effects of over-exposure to UV radiation more immediate through superimposing computer-generated skin damage over the user's face. SunSmart engaged Deakin University's Software and Technology Innovation Laboratory (DSTIL) to explore this further.

It was agreed that an app would be the best method of delivering this AR experience, due to cost-effectiveness, potential reach and the success of previous apps created by each partner.

For this project, SunSmart Victoria investigated whether augmented reality could be used to tackle two key barriers to skin cancer prevention among young people:

1. A lack of understanding that the UV index is the best indicator of sunburn risk;
2. A disregard for the future consequences of UV damage at the individual level.

App development

This led to the development of two key functions of the app, a UV visualiser and a skin damage selfie.

UV visualiser

The UV visualiser was created to improve awareness of UV radiation, particularly on cool and cloudy days.

To create the UV visualiser, it was important to establish the complexities of depicting UV using AR, in particular the ability to:

- represent UV reflection in the environment, including snow, concrete, sand and water;
- distinguish between shaded and unshaded areas and depict UV absorption; and
- recognise whether a user is in an indoor environment, where UV would not be present.

The colour and shape of UV depicted also needed to be carefully considered, to convey increased intensity at higher levels of the UV Index, while remaining understandable to the user. Aligning the colours of the UV index to the app was considered, but this was ruled out in favour of using red for levels of 3 and above and green for levels below 3 as this was perceived to be simpler and align with existing associations of these colours held by users.

It was decided that weather information and advice was a necessary component of the UV visualiser. Tailored to the weather and temperature of the day, sun protection advice aims to counter the myth that UV damage cannot occur on overcast or cool days.

Figure 1. seeUV's UV visualiser function shown where UV is high (left screen) and low (right screen).

Skin damage selfie

The use of AR was also identified as an opportunity to relay the long-term consequences of UV damage at an individual level and add an engaging element to the app that would resonate with young audiences and could be shared via social media platforms. This was conveyed via a selfie feature, which allows the user to take an image of their face and be shown their image with an AR overlay adding UV damage, including wrinkles and blotchiness. This type of skin damage was depicted in order to make a confronting yet engaging appeal to users' concerns about premature ageing. Using AR to depict a cancer growing on the user's skin was considered but ruled out due to concerns about unduly worrying users. Furthermore, depicting premature ageing allowed SunSmart to convey messages about skin damage in a light-hearted way that users were likely to share with their peers.

Figure 2. The seeUV overlay uses facial recognition to find the features of a face in an image and apply a UV damage filter to it.

Data sources

Using the existing SunSmart app server, the seeUV app was able to access weather data from reliable sources, including the Australian Bureau of Meteorology and the Australian Radiation Protection and Nuclear Safety Agency. Global positioning satellite (GPS) services on user devices provided a relatively simple way to ensure seeUV would return relevant location data to a user. This supported the incorporation of accurate and timely sun protection advice.

Key achievements

The seeUV app was released in November 2017 for Android and Apple users, to coincide with the launch of SunSmart's 2017-18 summer campaign. As of 1 March 2018, it has had 8,314 downloads.

seeUV was promoted through paid and unpaid promotion. Unpaid promotion of the app consisted of a launch in Melbourne in November 2017 with a media release sent to news outlets across Victoria. The unpaid promotion was particularly successful with the app attracting widespread media interest across print, television, radio and online outlets, generating more than 300 media articles.

seeUV was also promoted in a series of digital advertisements on social media and content seeding platforms, including Facebook, Outbrain and Tribe.

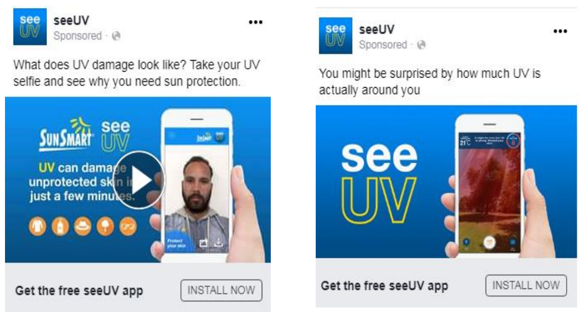

Figure 3. Examples of digital advertisements produced for Facebook.

The project has received limited user feedback to date, however an evaluation is underway to understand the impact of seeUV on i) common misperceptions about UV and ii) the future consequences of UV damage is underway.

Discussion

Here we demonstrate that augmented reality can be used to convey information about UV radiation in an engaging and interactive format.

There were a number of challenges in creating seeUV. The primary issue being AR technology is in its infancy and neither the technology nor devices are sophisticated enough to accurately distinguish shade, reflective surfaces or whether a use is indoors or outdoors. To address this, to proceed to the UV visualiser, seeUV incorporates a message that advises users that it the app is only intended for use outdoors.

While the app was able to successfully identify face within an image, there was a lack of refinement in the facial overlay in the skin damage selfie. The variety of facial features and skin types, along with lighting conditions made it difficult to create a highly sophisticated overlay.

An unforeseen difficulty also arose over approvals for release in the App Store as Apple's review process raised concerns that users may be misled into believing their device's camera was detecting UV radiation rather than this being an augmentation based on an external data feed. A disclaimer was developed to overcome this challenge and approval was ultimately achieved.

Evaluating seeUV also proved challenging as research partners were reluctant to ask participants to download an app due to privacy concerns, despite the fact that no personal data is collected through seeUV and the skin damage selfie is stored on the user's phone as with any other photograph. When this was explained, SunSmart managed to engage a research partner to deliver an evaluation of seeUV.

Conclusions

The project found that while AR presents a good opportunity to communicate UV, the emerging nature of the technology is such that it is difficult to accurately depict the complexity to which UV behaves in our environment, nor project an overlay that recognises the many different skin types and lighting conditions that are required.

However, it is important established skin cancer prevention programs like SunSmart continue to explore new technologies like AR to enhance their methods of engagement in an evolving media landscape.

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