IT OVERVIEW
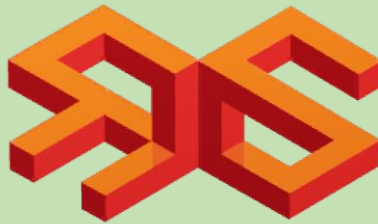## Augmented Reality Research REPORT
Human face Detected Application: Eyes and Lips

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OVERVIEW and CONTENT OF THE REPORT:

As we have chosen our research and development of the IT project is in the futuristic and present ruling Technology, where it eases most of the hard real time problems and provides super relevant solutions all-over from the vehicular industries like comparing calculated and actual crash test imagery to the AR in Education such as a complement a standard curriculum. Firstly, we have a detailed research on Basics and core technologies of the AR used in face recognition, where we have explored an IKEA application to get an initial idea. Secondly, as per our prof. advice we have some Hand-on the Utility tool kits and AR Toolkit to get an immersive idea to mapping our idea into product. Furthermore, we have found the exact required opensource project for Virtual try on to try the Lipsticks and eye colour change as a requirement. It provides a solution predominantly to advertisement models and actress, who they are in need to change their Lipsticks frequently. As all our Efforts into action that we have shown the demo of our product at the presentation session.

Augmented reality (AR)-Where Experience Matters!

Augmented reality (AR) is a hot topic in recent technology news. You must have heard this wonderful word. For most of the people, AR is still not so well-known field. But, it's on a right path to gain more interest and popularity among new technologies. Don't you think this as an emerging technology that deserve your attention? AR is an interactive experience of a real-world environment whose elements are "augmented" by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic, somatosensory, and olfactory. The overlaid sensory information can be constructive or destructive and is seamlessly interwoven with the physical world such that it is perceived as an immersive aspect of the real environment.

Before getting into the core characteristics, we should know the **Difference Between AR and VR:**

Most importantly, the AR and VR are completely different. In VR, or virtual reality, you are fully immersed in a virtual world, completely disconnected from reality. There is no trace of the user's real environment. The user might physically be in their living room, but through VR they might be fighting aliens in deep space.

As opposed to AR where you are still using elements of real life and adding Computer-generated imagery (CGI) elements that aren't there, like a Pokémon in the middle of the road.
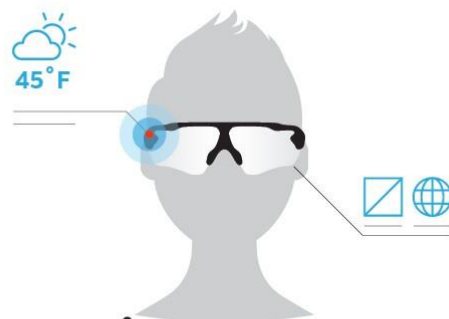
VIRTUAL REALITY (VR)

Completely digital environment
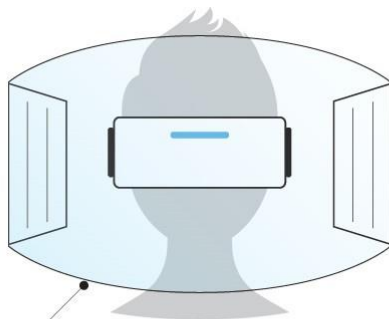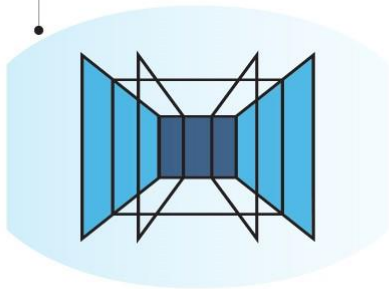
Fully enclosed, synthetic experience
with no sense of the real world.

AUGMENTED REALITY (AR)

Real world with digital
information overlay

45°F

Real world remains central
to the experience, enhanced by
virtual details.

Before into Technology: Core Characteristics:

One of the recent design goals in Human Computer Interaction has been to extend the sensory-motor capabilities of computer systems to combine the real and the virtual in order to assist the user in performing a task in a physical setting, Basically there are three basic characteristics to be fulfilled to Implement AR.

- Overlay of Real and Digital world
- Real-time interaction
- Registration and Alignment in 3D
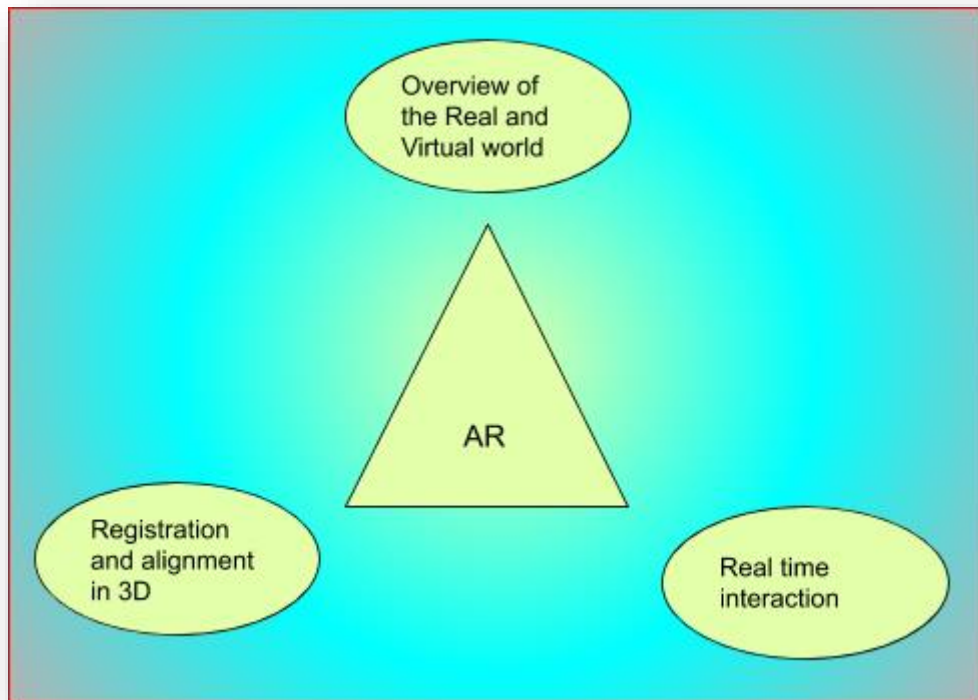
To explain this, let me ask you a question. Is any digitally enhanced image an Augmented reality? The answer would be No. Any digitally edited 2D image is not an example of Augmented reality technology. And, what about science-fiction movies like "**Jurassic Park" and "Godzilla**"? The answer would again be **No**. In these types of movies, virtual objects have superimposed with the real environment in 3D. But they are not interactive and thus not the examples of AR.
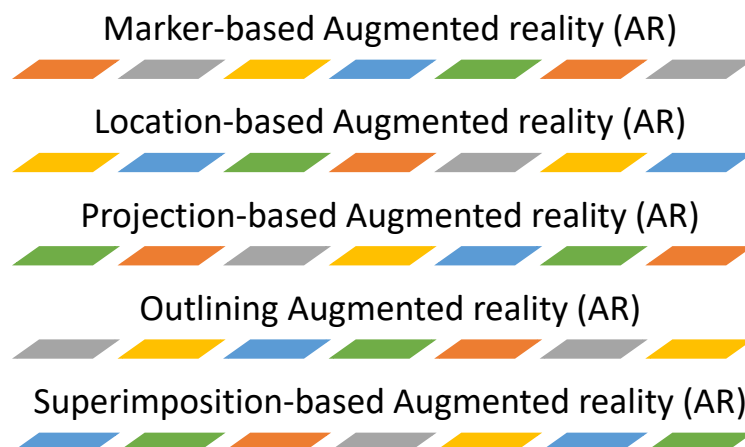

Secondly, what about the live telecast of any cricket match on TV, where you see a virtual line or curve representing the path of a ball? Is this an example of AR? Now the Answer would be **Yes.**

AR makes the Decision Easy! In this example, virtual line or curve has created in the real-time by using the live feed from the match and thus meeting all the three basic characteristics of Augmented reality technology. Thus, Augmented reality definition is incomplete without these three basic characteristics.


Types of Augmented reality (AR) and Key Takeaways– Categorization based on interaction

Marker-based Augmented reality (AR)

Location-based Augmented reality (AR)

Projection-based Augmented reality (AR)

Outlining Augmented reality (AR)

Superimposition-based Augmented reality (AR)

In fact, other than Location-based Augmented reality, other types of Augmented reality work on the concept of Marker-based Augmented reality, In our project we actually used the **Outlining Augmented reality (AR),**

Outlining-based AR application merges the outline of any object, so that you can pick up the same with your hand. You would also be able to manipulate it with a virtual object that does not exist in real view. The concept behind this type of Augmented reality is to track the outline of your face with the help of a camera and then reorient the virtual object. A similar approach is also used for tracking a face.
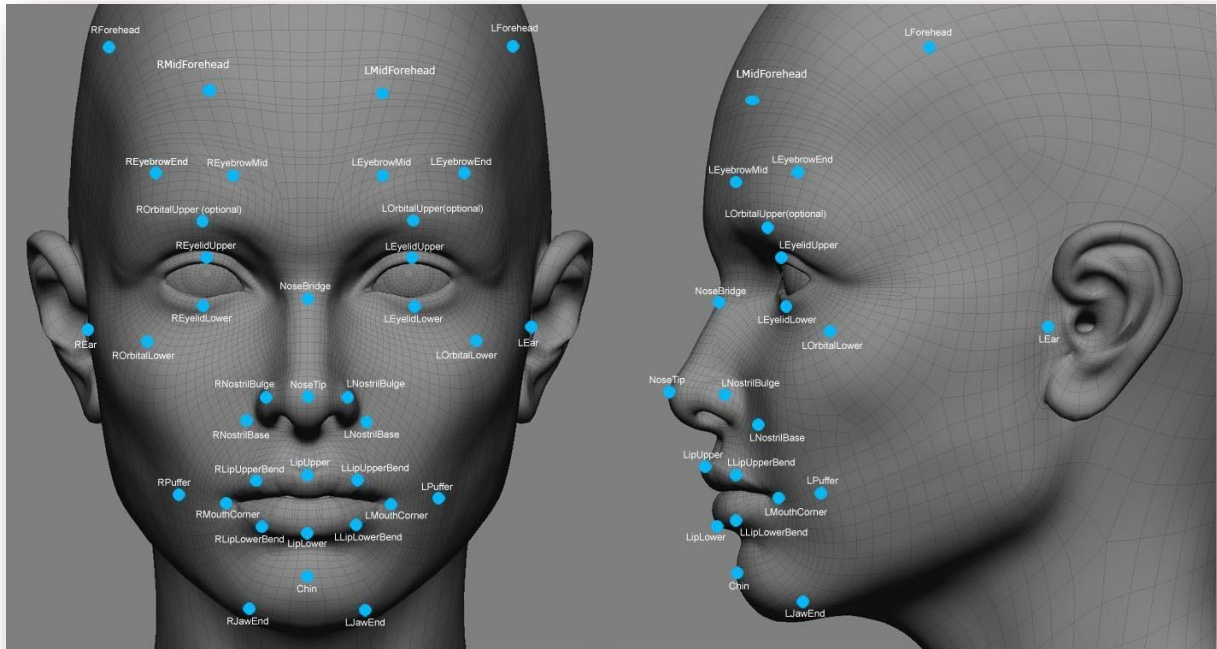

After detecting a face, AR software recognizes the position of the main features of the face, like the **mouth, nose, eyes**, etc. Using these positions as reference points, **68** landmarks for face detection.
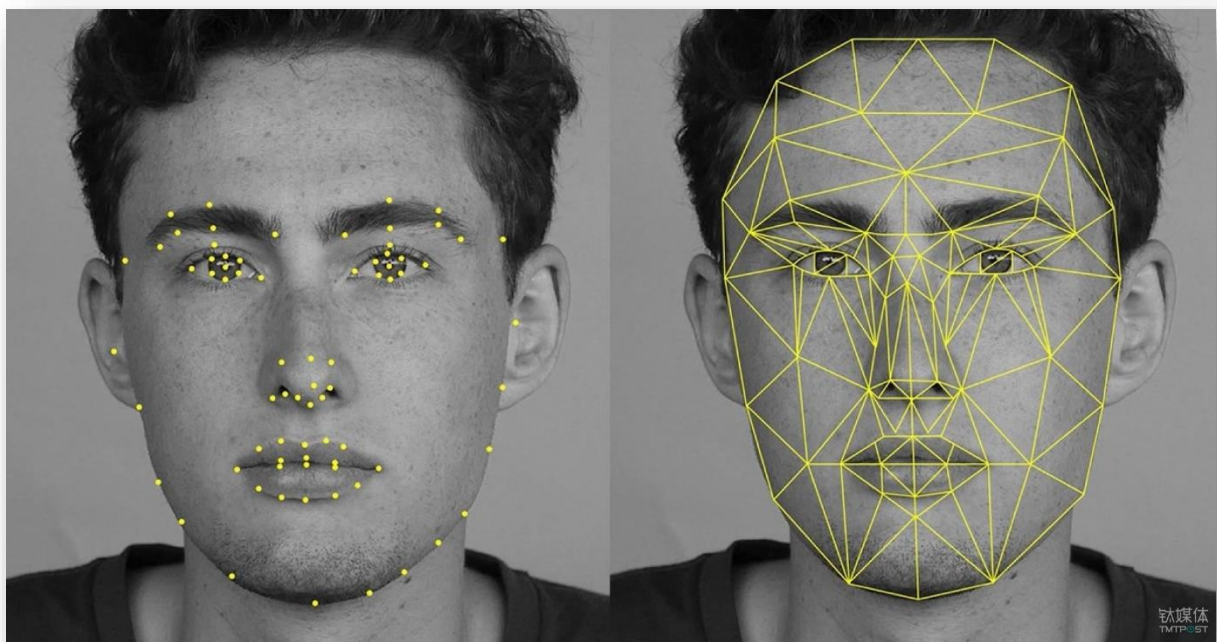
Using these positions as reference points, software overlays virtual object on the face. Once this recognition and connection between virtual object and face have established, the software can redraw the virtual object in the real-time with the actual movement of the face.

Transforming IDEA to Product -Before Starting our Project:

As before getting into our project we had an enough research on various open source projects and tools to kickstart with precision of project as follows: AR Toolkit and Utility
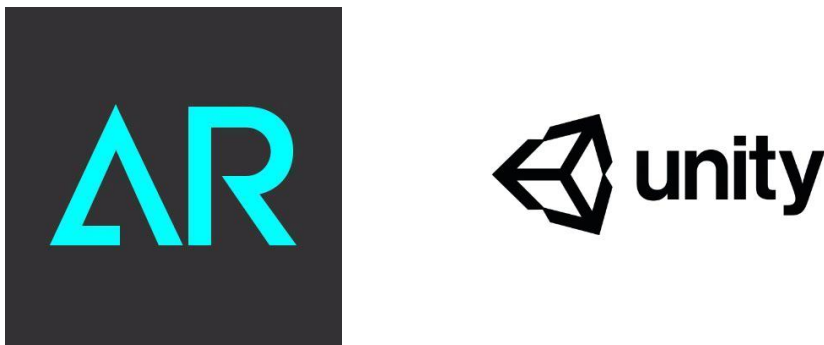

- **AR Toolkit:** AR Toolkit is an open-source computer tracking library for creation of strong augmented reality applications that overlay virtual imagery on the real world.
- **Unity ARKit Remote:** This is a feature that can be used with Unity's ARKit Plugin. Unity ARKit Remote allows you to run a special app on the iOS device which feeds ARKit data back to the Unity Editor, so you can respond to that data in Realtime.
- **Facial AR Remote**: Facial AR Remote is a low-overhead way to capture performance using a connected device directly into the Unity editor. It's useful not just for animation authoring, but also for character and blend shape modelling and rigging, creating a streamlined way to build your own animoji or memoji type interactions in Unity. This allows developers to be able to iterate on the model in the editor without needing to build to the device, removing time-consuming steps in the process. For more details see the docs.

How we Built our Product:

Starting project of researching the augmented reality makeup. The idea is to use the experience like an interactive advertisement's clients watch a beauty vlogger talking about a specific brand of cosmetic, and a new "Virtual try on" feature will show them how they could look while wearing the product. We are positioning the new feature as a way of getting more people's attention compared to a non-interactive video ad on virtual lipstick.

The team built an AR based image recognition website to detect human face with 68 points which using the face-saving library. Then we build an application allowing user could choose colours of the lipstick that they want to try on their face.

Product Interface:
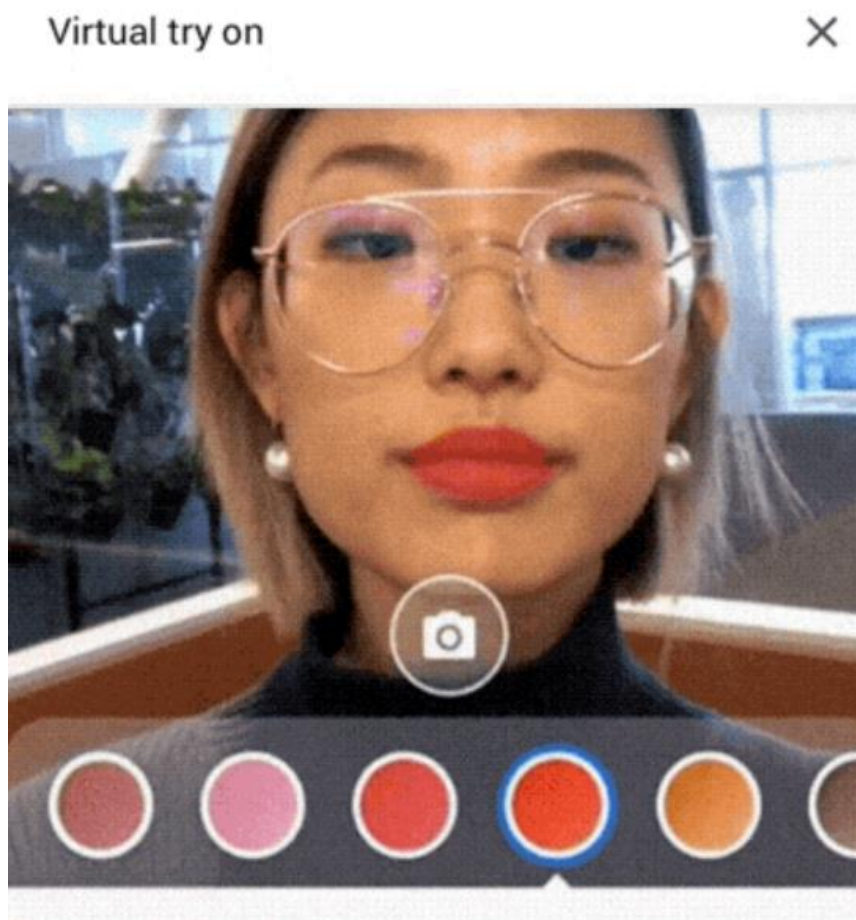
As aforementioned information, we have utilized, JavaScript face recognition API for the browser and NodeJS implemented on top of tensorflow.js core (tensorflow/tfjs-core) and as we have shown the detailed demo during the presentation.

Where the code be found:
https://github.com/yennguyenthihoang/real-time-face-detection-javascript

Following the tutorial to run our application.
https://github.com/justadudewhohacks/face-api.js?files=1 - tutorials

Looking into future:

- Expanding a PC screen to real environment like program windows & icons appear as virtual display in real space & are eye or gesture operated, by gazing or pointing.
- Replacement of cell phones: eye dialling, insertion of information directly into environment.
- It may allow computer-generated imagery to interact with live entertainers and audience.

- By 2020, AR will find its way in many more fields and it will come within the reach of common man.

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