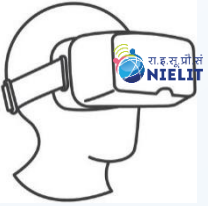


A virtual tour to

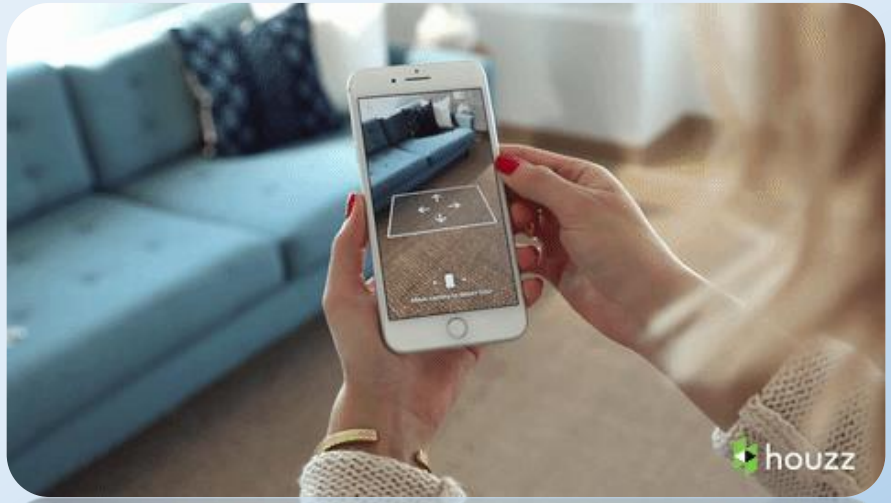
Augmented and Virtual Reality

Dr. Sarwan Singh

NIELIT Chandigarh

Agenda

- Marker based AR
- Marker-less AR
  - *Location-based AR*
  - *Projection-based AR*
  - *Superimposition-based AR*
  - *User-Defined Marker-less AR*



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- developers.google.com/ar,
- dev.to/arunkumarvallal, mobidev.biz, gerardfriel.com/ar/the-history-of-ar
- Harvard Business Review – *"Managers-Guide-to-AR"*
- "Virtual Reality/Augmented Reality White Paper" CAICT, Huawei Technologies Co.

Books

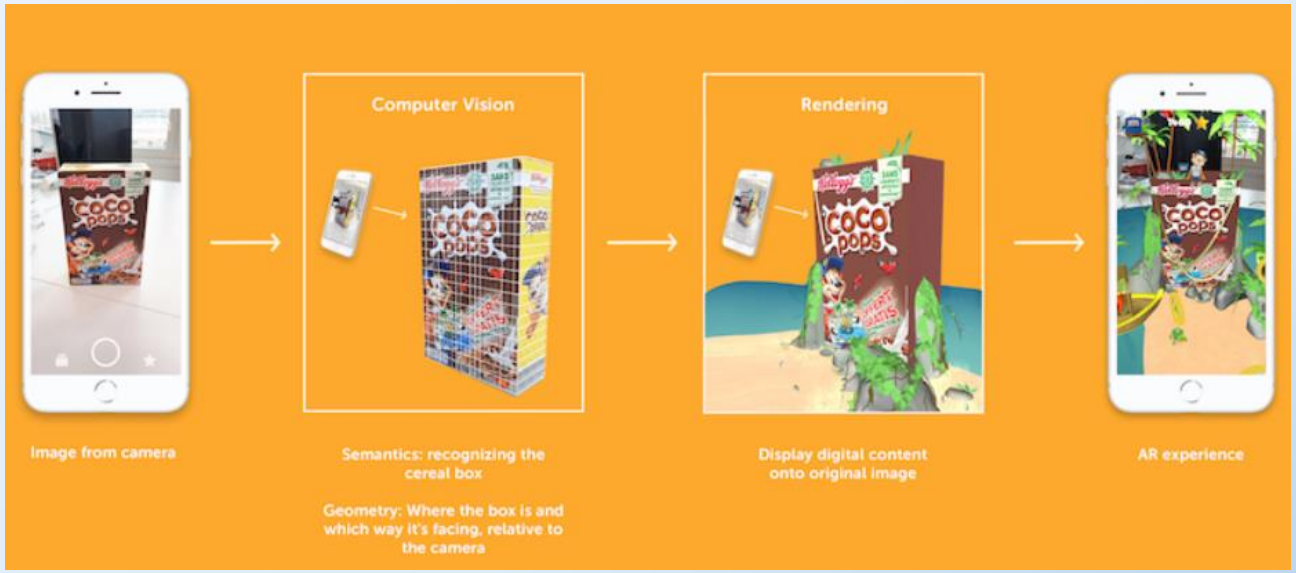
- "Theory and applications of marker-based augmented reality" – Sanni Siltanen
- "Computer graphics"- Hearn and Baker

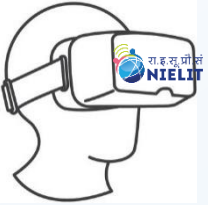
Augmented Reality Trigger

"Augmented Reality trigger is whatever activates an AR experience"

The most common triggers are:

- Marker based AR
- Marker-less AR
  - *Location-based AR*
  - *Projection-based AR*
  - *Superimposition-based AR*
  - *User-Defined Marker-less AR*





Marker-based tracking

- Augmented reality presents information in a correct real world context. In order to do this, the system needs to know where the user is and what the user is looking at.
- Normally, the user explores the environment through a display that portrays the image of the camera together with augmented information.
- Thus in practice, the system needs to determine the location and orientation of the camera. With a calibrated camera, the system is then able to render virtual objects in the correct place.
- The term *tracking* means calculating the relative pose (location and orientation) of a camera in real time. It is one of the fundamental components of augmented reality.

Marker-based tracking

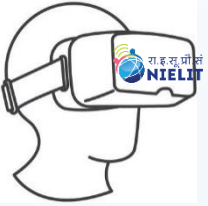
- This type of AR, also known as recognition-based AR or image recognition, relies on identification of markers/user-defined images to function.
- Marker-based AR requires a marker to activate an augmentation.
- Markers are distinct patterns that cameras can easily recognize and process, and are visually independent of the environment around them; they can be paper-based or physical objects that exist in the real world.
- Maker-based AR works by scanning a marker which triggers an augmented experience (whether an object, text, video or animation) to appear on the device.
- It usually requires software in the form of an app, which enables users to scan markers from their device using its camera feed.

Marker-based Augmented Reality

- Marker-based Augmented Reality uses a designated marker to activate the experience. Popular markers include Augmented Reality QR codes, logos, or product packaging. The shapes or images must be distinctive and recognizable for the camera to properly identify it in various surroundings.
- There is another important factor of marker-based Augmented Reality. The marker-based AR experience is tied to the marker. This means that the placement of digital elements depends on the location of the marker. In most cases, the experience will display on top of the marker and move along with the marker as it is turned or rotated. You'll see exactly what we mean in the following three examples.

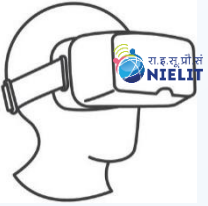
Marker based AR

- Eg,
- https://vimeo.com/254903931



Maker-less AR

- Marker-less AR offers the most control to the user as it allows the user to choose where they would like to place the content. It also allows real-life scale placement of the virtual augmented objects. These AR experiences are highly reliant on smart phone features such as sensors, camera, and processors. Marker-less AR can be split into:
- *Location-based AR*
- *Projection-based AR*
- *Superimposition-based AR*
- *User-Defined Marker-less AR*



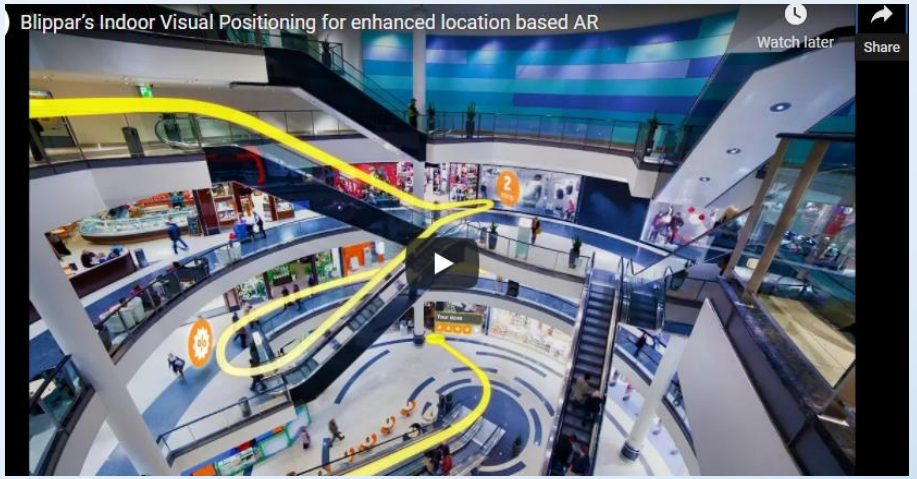
Location based AR

- Due to the availability of smartphone features that provide location detection, location-based AR ties augmentation to a specific place and works by reading data from a device's camera, GPS, digital compass, and accelerometer while predicting where the user is focusing as a trigger to pair dynamic location with points of interest in order to provide relevant data or information.
- Information and virtual objects are mapped on specific locations then displayed when a user's device data matches the location.
- The reliability of marker-less AR on positional information gathered from a device's camera, GPS, digital compass, and accelerometer makes it more adaptable than marker-based AR as it does not need an image or object cue to deploy.

Location based AR

- https://youtu.be/qujpsJS_JnI

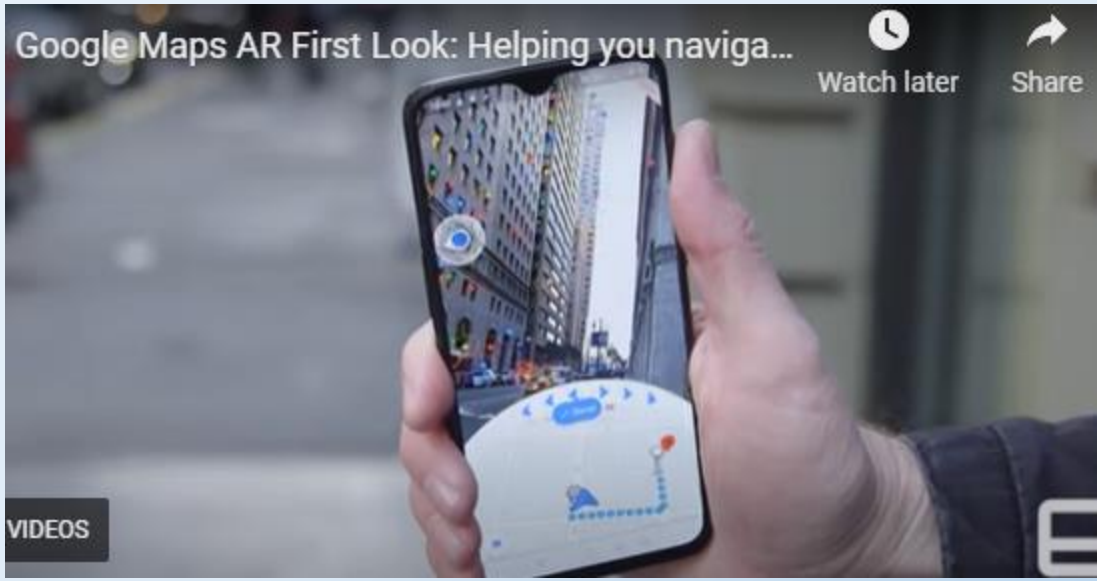
- https://youtu.be/X7IqAHgZlCs



Google Maps location-based AR

- Google Maps location-based AR, users can see directional prompts overlaid on their travel path. Google AR Maps is still in its early stages, but it has clear potential as a useful and informational resource. It’s also very likely that they’ll start adding digital elements for famous landmarks and businesses. For instance, you’ll likely see historical information and a business’s star ratings hovering above the locations as you pass by them.

- https://youtu.be/XWbY5jdJnHg



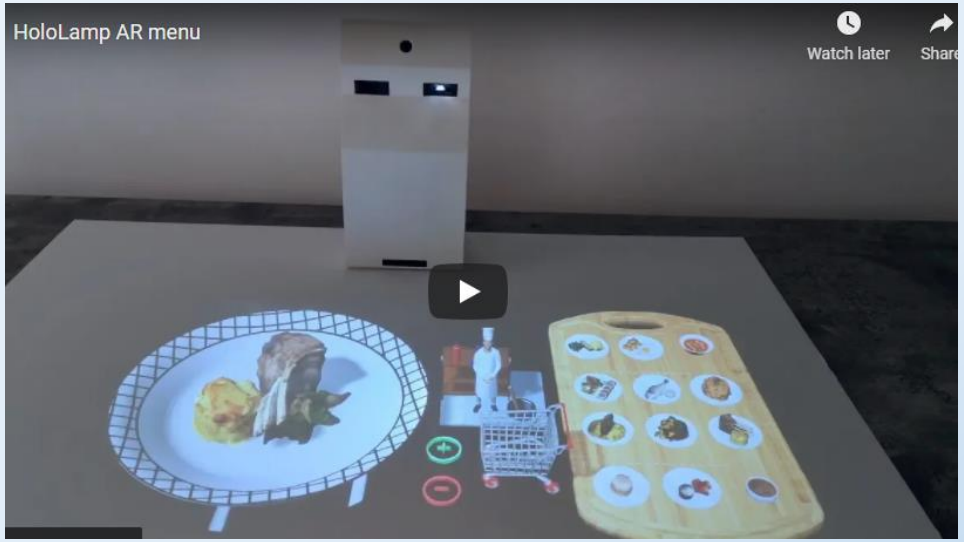
Projection-based AR

- Projection AR, sometimes also referred to as spatial AR, is a method of delivering digital information within a stationary context. It focuses on rendering virtual objects within or on a user's physical space. It is one of the simplest forms of AR where light is projected onto a surface. The interaction occurs by touching the projected surface physically.
- In projection AR the user is not limited to any device as virtual objects are integrated directly into the environment; users and target objects are also able to move around the environment within a specified zone, in which both the fixed projector and supporting camera for tracking are placed. Projection-based AR methods may be used to create illusions about depth, position, and orientation of an object.

Projection-based AR

- https://youtu.be/bA4uvkAStPc

- https://youtu.be/LQY5AvRwCN8

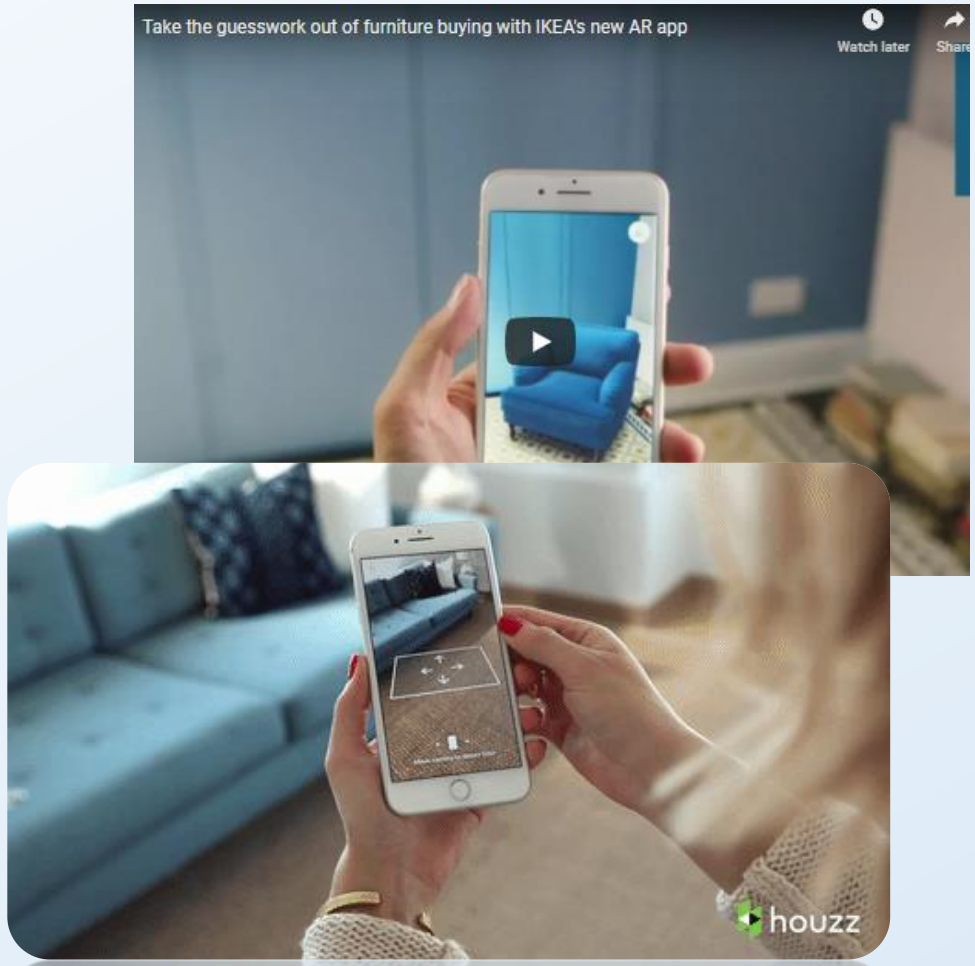


Superimposition-based AR

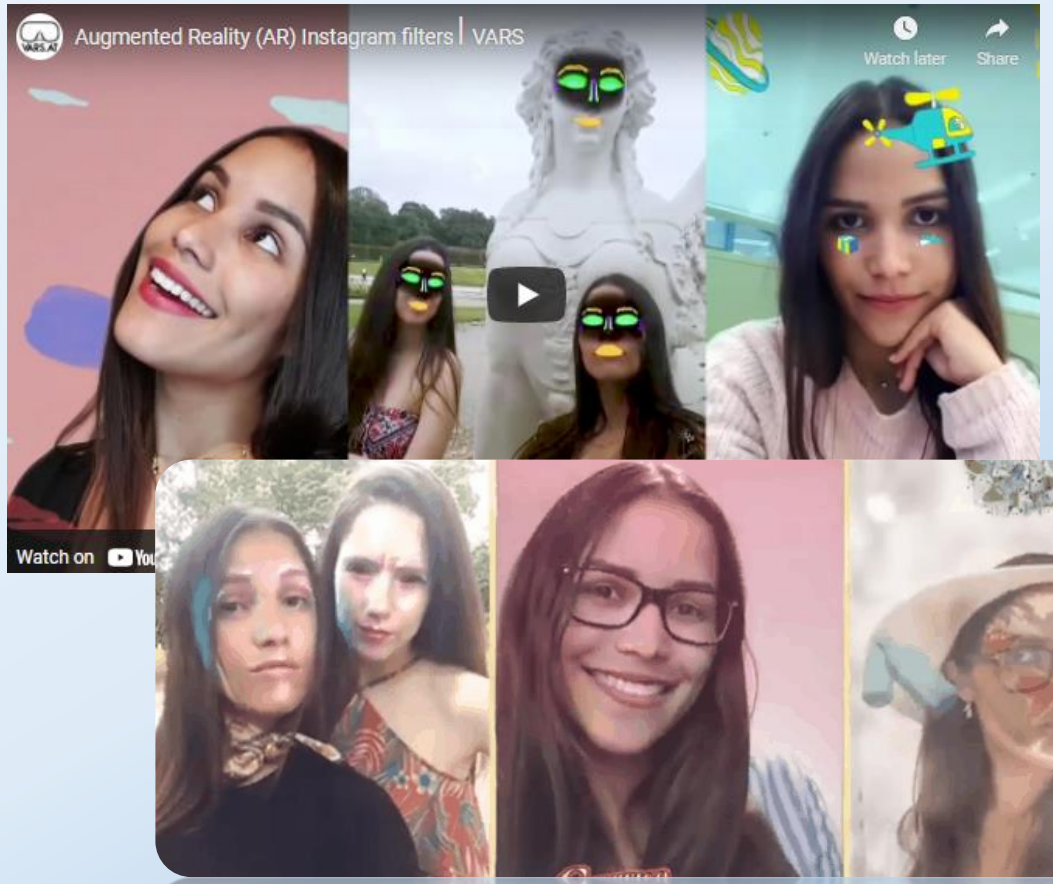
- Superimposition AR involves either partial or full replacement of an original view of an object with an augmented view of the same object.
- In this type of AR, object recognition plays a vital role because an app cannot replace an original object with an augmented one if it cannot identify the original object.
- This type of AR has been popularized by social platforms such as Instagram, Facebook, and Instagram using filters.

Superimposition-based AR

- https://youtu.be/4jrhw_ZRjV4

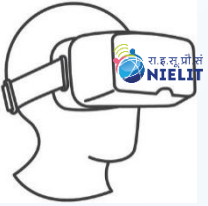


- https://youtu.be/3Fc1nNjCXRk



marker-less experiences

- The interior design tool, Myty.
- https://youtu.be/9wu2UmLgQfk



User-Defined Marker-less AR

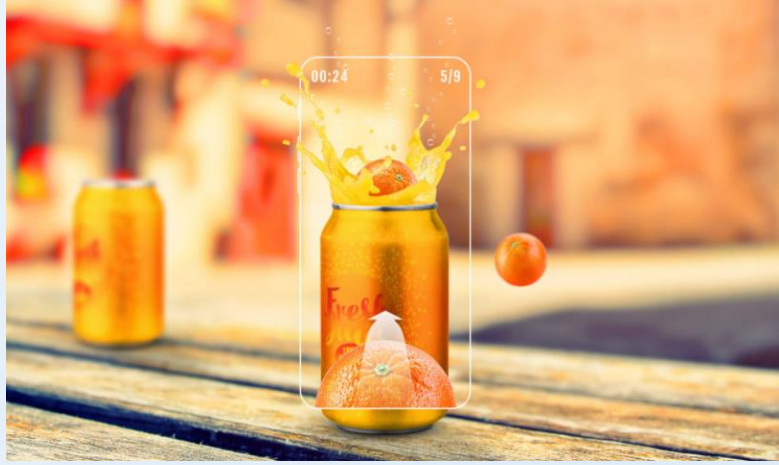
- These experiences are characterized by non-mainstream apps built by developers to solve problems in their daily lives or their clients. The content is usually custom, having user-defined interaction points.
- It involves using AR libraries and existing technology to achieve different kinds of visualizations and interactions.

User-Defined Marker-less AR

- https://youtu.be/HbLe4rHQI_I

- https://youtu.be/HbLe4rHQI_I

WebAR



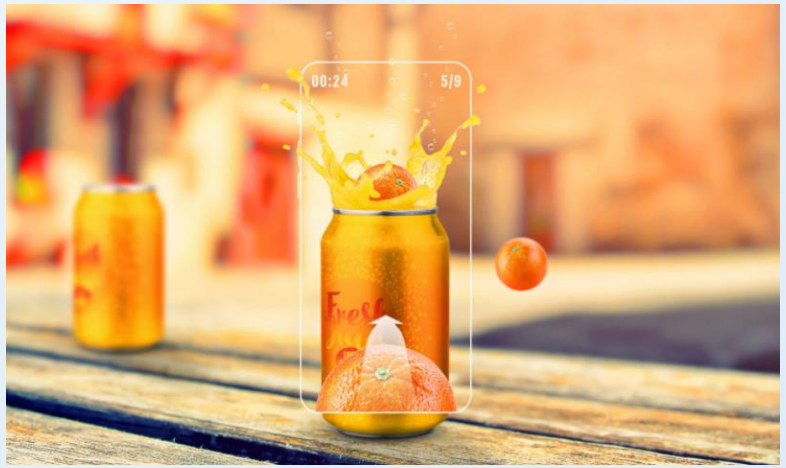
What is **WebAR** –

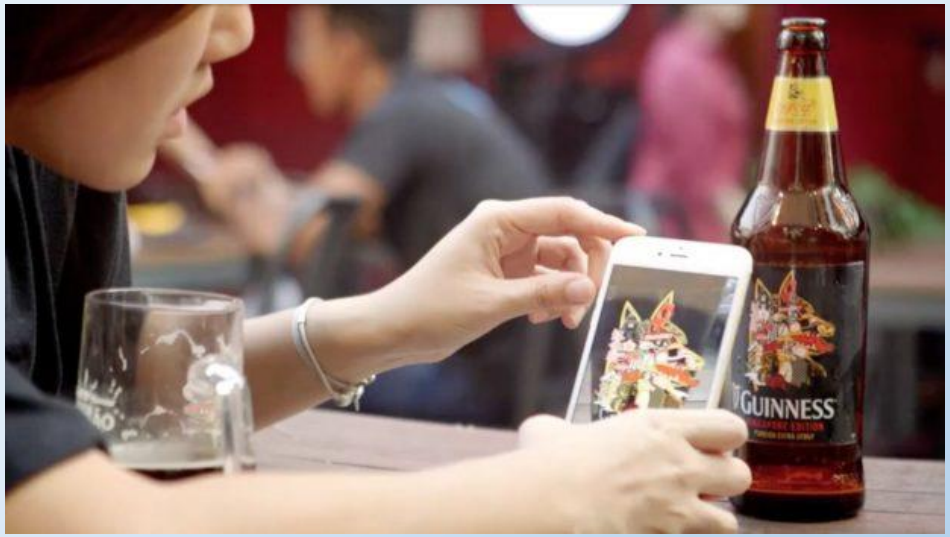
When users scan the QR code, Augmented Reality experiences are immediately launched through a web browser.

Virtual Event – in this WebAR example, attendees of a virtual event could place new Samsung products on their desk or floor. The markerless Augmented Reality recognized the flat surface and places a scaled virtual product in the real environment.

Accessing new customers

- We created an augmented reality game for Juice Burst. Customers scanned their bottle to enter ‘Juice Wars’, where they had to fire at falling fruit in AR to score points.
- Customers could share their scores with friends on social media and return to the game to win daily prizes.
- Acc. to blippar - AR experiences for Juice Burst have attracted **over 800,000 interactions**, and **increased purchase intent by 67%**. A study by Marketing Sciences found people who interacted with the AR intended to share it with **five other people**.





Source: blippar.com

Web AR

- Web AR is also a hugely effective way of reaching and engaging new audiences -- our web AR campaigns have generated engagement rates as high as 30%.
- With web AR you can bring augmented reality to all kinds of web-based experiences, including banner ads, websites, and social media ads. Users simply tap a link to launch the AR experience without the need for an app.