Video formats for VR

A new opportunity to increase the content value…

But what is missing today?

MPEG workshop on Immersive media
Jan. 18th 2017

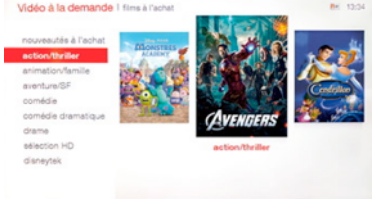
Consumption models have dramatically changed

Content offer

- *From* Historical national TV channels
- Pay-TV bouquets
- VOD and SVOD portals
- UGC platforms

Consumption model

- *From* Live
- On demand, EsT
- Catch-up TV, replay
- Fast viewing



Access network

- *From* Free to air Broadcast
- Satellite
- IP (xDSL, Fiber…)
- Cellular (3G, 4G…)

Display device

- *From* TV set
- PC, laptops
- Video projectors
- Smartphones and tablets

Despite this revolution, one constant remains…

- **Content is king!**

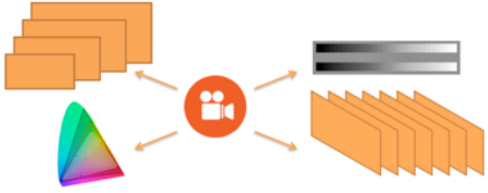
- Offering content in quality and/or quantity is the key driver of innovation around TV and video services
- The success of a media format is conditioned by the clear identification of its business opportunity.

A new format (Added value) + Relevant business model = Success !!

What has been done so far?

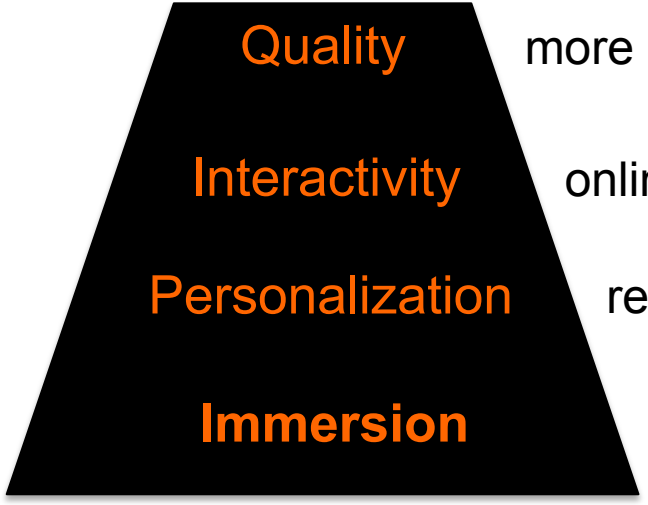
- Focus on the increase of content quality
- Extensions of representation formats for a higher fidelity model:

– Increased resolution, frame rate,
bit depth, color gamut, dynamic range…



- MPEG has always provided a technical answer to a business case:
  - **MPEG-2** (and TS) for first digital TV services and DVDs
  - **MPEG-4 part 2** for mobile TV
  - **MPEG-4 AVC** for HDTV and Blu-ray (and MVC for 3DTV)
  - **HEVC** for Ultra HD

Different ways to increase the value of content



more definition, more colors, more contrasts…

online voting, multi-angle viewing, Social TV...

recommendation, profile-based ads...

360°,VR, AR, wide screens…

- **Immersion** can be seen as a merge of the 3 first axes.
  - **Interactivity** with the content like in real life, navigation in a content
  - **Personalization** where each viewer can define his own experience
  - **Quality**, the default requirement for guarantying immersion

The VR opportunity

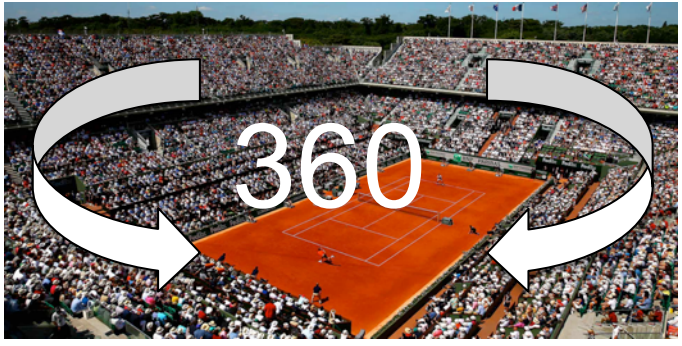
- The promise:
  - Connect people to what they like the most by creating an immersive experience
- With cardboards and HMDs a first virtual experience has been introduced
  - Wow effect: expectations around new revenue model opportunities
- Orange takes part of this adventure by offering HMD, apps and investing in VR content creation (wevr).

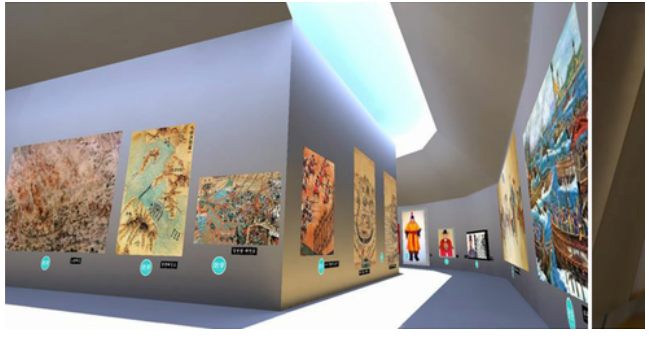
Wevr

Some relevant use cases for VR

Virtual seating: (e.g. Stadium)

- 3-DoF experience
- **Live** content broadcast/multicast
- Different pricing depending on the location in the event venue





Virtual visit: (e.g. Museum, apartment…)

- Content could be preloaded on the rendering device
- Controllers may enable navigation
- Kind of 6-DoF experience by navigating in the recorded 360 video

1st person narrated movie

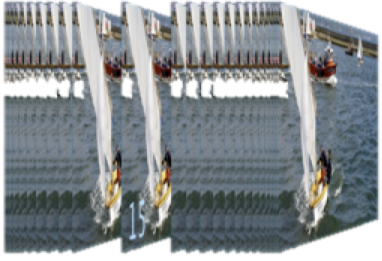
- 3-DoF experience
- Translations in the content controlled by the producer

Today's HMD-based systems' limitations

System resolution

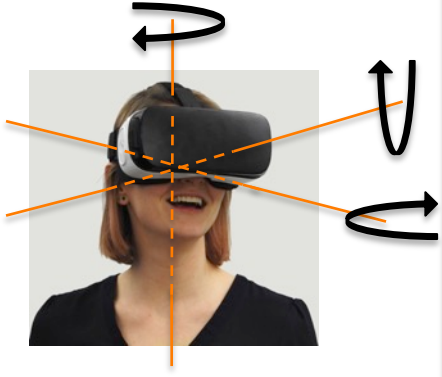
Due to the distortion introduced by the lenses the perceived resolution is poor

Video frame rate



The combination of video source limited frame rate with motion-to-photon latency may result in flickering effects, particularly noticeable on bright areas

3-DoFs QoE



Most of the HMDs do not support translational movements with the consequence of only offering a fixed point experience

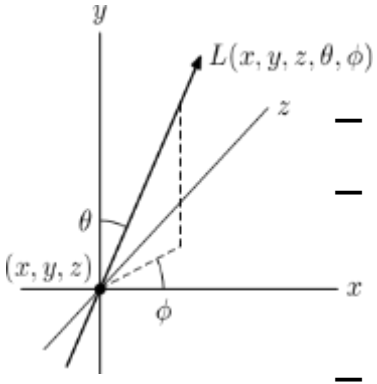
Depth perception

By moving his head, the viewer quickly realizes that no depth is perceived (no parallax effect) and the experience is limited to a 2D-projected image.

Going beyond for a **better** quality of experience

Better = more immersive and realistic

- Light Field scene representation is the ultimate target
  - *Light Field is defined as all the light rays at every point in space travelling in every direction.*
  - Immersion requires the best possible restitution of the Light Field
  - If the data from a Light Field is known, then views from all possible positions can be reconstructed, even with the same depth of focus by combining individual light rays.
  - Multiview, freeview point, 360° are subsampled versions of the Light Field representation

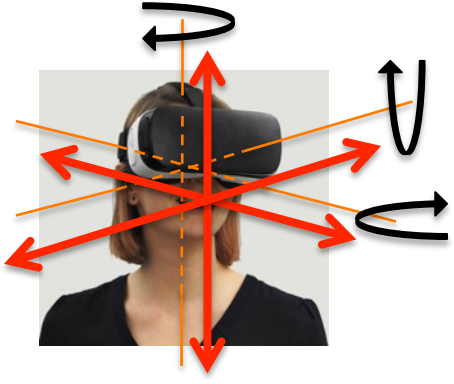


Next challenge in immersive video formats
Short term requirements - by 2018

- Define a full eco-system ensuring compliance over an end-to-end distribution workflow enabling massive service deployments
  - We must integrate the currently available equipment for VR
- Solve some of today's limitations:
  - Provide a better 3 DoF experience
  - Consider bitrates in the range of **10-50 Mbps** in order to enable live content distribution over 4G and fixed networks.
  - Optimize the content delivery (e.g. tiles approach, projection mapping optimization…): **please, keep things simple !**
- In this context, no technology breakthrough is expected (i.e. still rely on HEVC, DASH…)

Next challenge in immersive video formats
In a longer term target - by 2022

- *Under the assumption that devices will be improved over time*



- Introduce translations interactivity with content (6DOFs)
  - Not with the same extensibility as rotations (3DOFs)
  - But enough for integrating the natural body movements at a fixed position

- Enable lateral and frontal translations
  - May be captured by a camera matrix and/or plenoptic camera

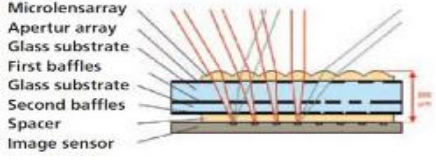


Image credits: Technicolor

Some bitrate considerations

- Fixed networks
  - Fiber optic access networks now offer bitrates around **100-500 Mbps**
- Cellular networks

  - 3GPP SA1 has defined 5G service requirements for high data rate and traffic density scenarios (in TS 22.261) with the following download bitrates per user:
    - Indoor hotspot: **1 Gbps**
    - Dense urban: **300 Mbps**
    - Broadcast like services: **200 Mbps** per channel
    - Urban macro, high speed vehicle/train: **50 Mbps**

In conclusion

- The first VR experiences have been introduced so as to educate on immersive possibilities

- **Short-term need, within a year or two:**
  - A standard on top of existing technologies (extension or profile of DASH, HEVC…) for VR including codec and delivery optimizations (e.g. Tiles, SRD…)
- **Within 5 years:**
  - VR will need a generalized 6 DoF experience capability. Due to the amount of data, a technological breakthrough is expected (new codec).

- In each case, low delay modes must be considered for live streaming and conversational services.

thank you

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mèsi

ありがとう

cảm ơn bạn

grazie

gracias

merci

obrigado

謝謝

danke

감사합니다

tack

спасибо

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