Connected Culture

PART 1

How 5G transforms the landscape

	Internet	+	Medium	=	Platform
1980	1200 Kbps		mail		email
1990	14.4 Kbps		journal		newsgroups
	56 Kbps		newspaper		website
2000	4 Mbps		telephony		videophones
2010	40 Mbps		television		video sharing
	120 Mbps		sport		gaming
2020	**5G: 1 - 10 Gbps**		**architecture**		**virtual reality**

Next wave of convergence is architecture


Dutch Painting
See Also
POLYCHROME • 1640S
Landscape with a Windmill (1646)
Jacob van Ruisdael
ON VIEW IN GALLERY 213
SAVE ARTWORK

Architecture becomes an immersive telecommunications platform


EPIPHANY
CENTER
EPIPHANY
SR
EPIPHANY
SL

Immersion is multisensory

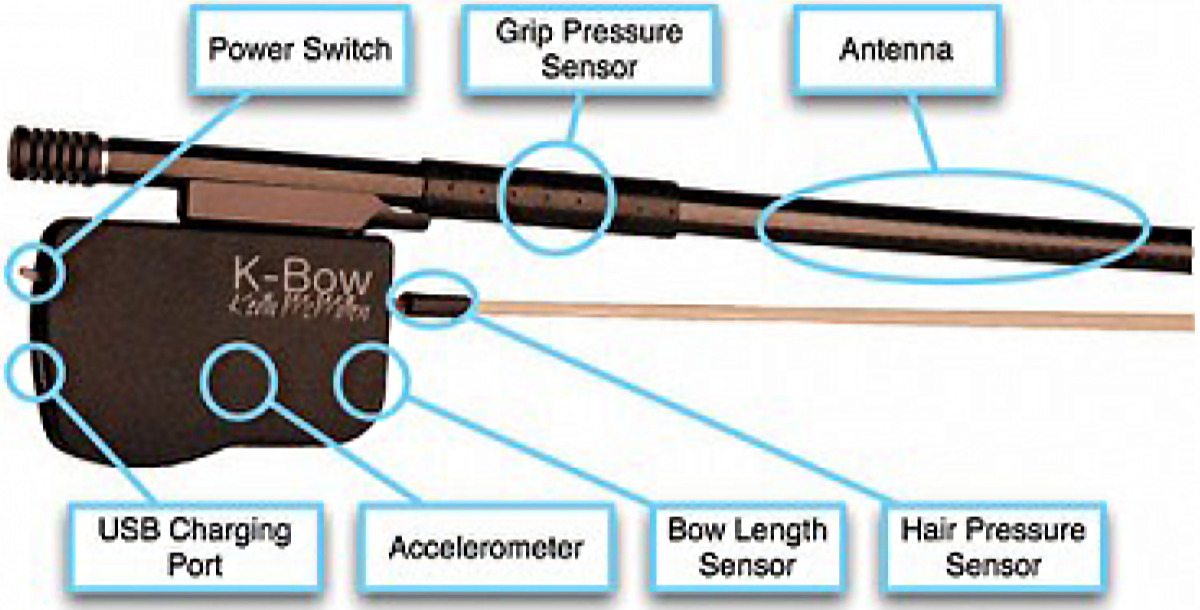
Vision

Hearing

Touch

Kinesthetic

Emotive


Power Switch
Grip Pressure Sensor
Antenna
K-Bow
USB Charging Port
Accelerometer
Bow Length Sensor
Hair Pressure Sensor

Immersion requires 5G

Vast data transfer rates

Enterprise latency

Mobile edge computing

Internet of Things

From media to immediacy

PART 2

What about wireless?

Connected Culture

http://money.cnn.com/2018/02/05/technology/business/5g-internet-of-skills/index.html

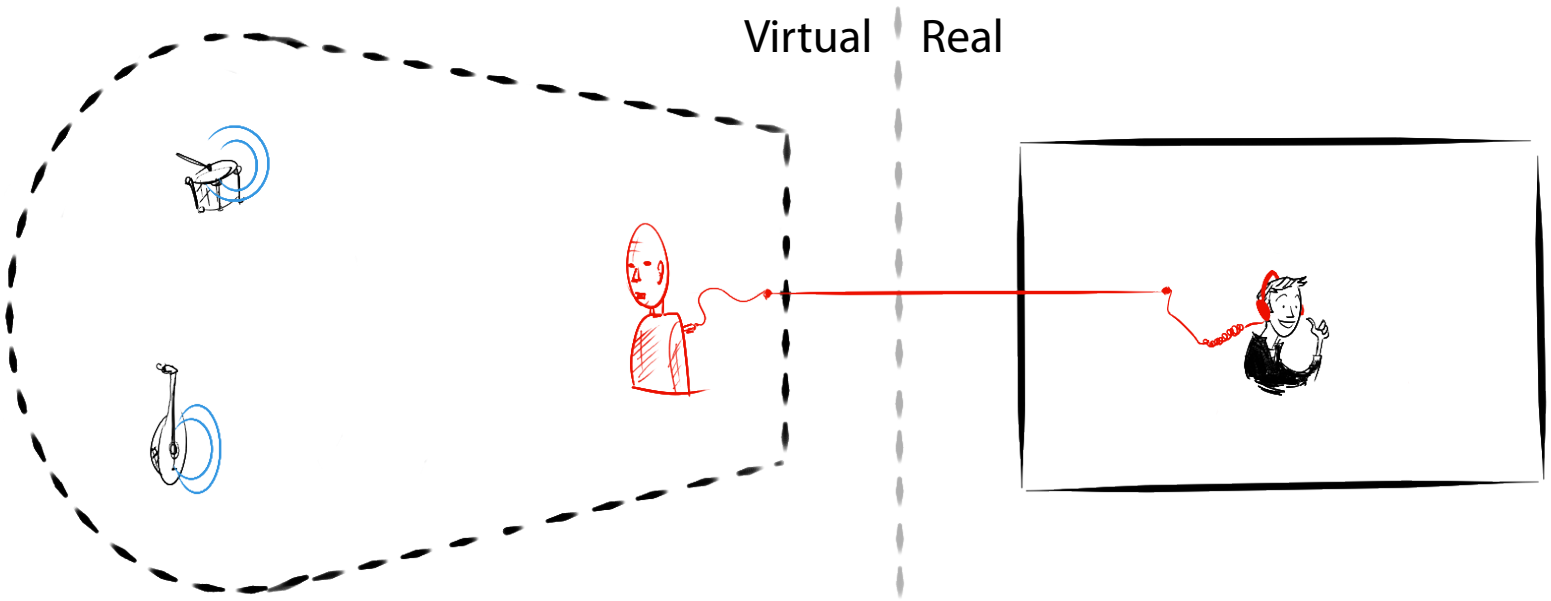
Start from 4:49

PART 3

Immersion with spatial audio

Audio for VR/AR

1. Record and acoustic even and render it elsewhere
2. Synthesise the sound field of an acoustic event



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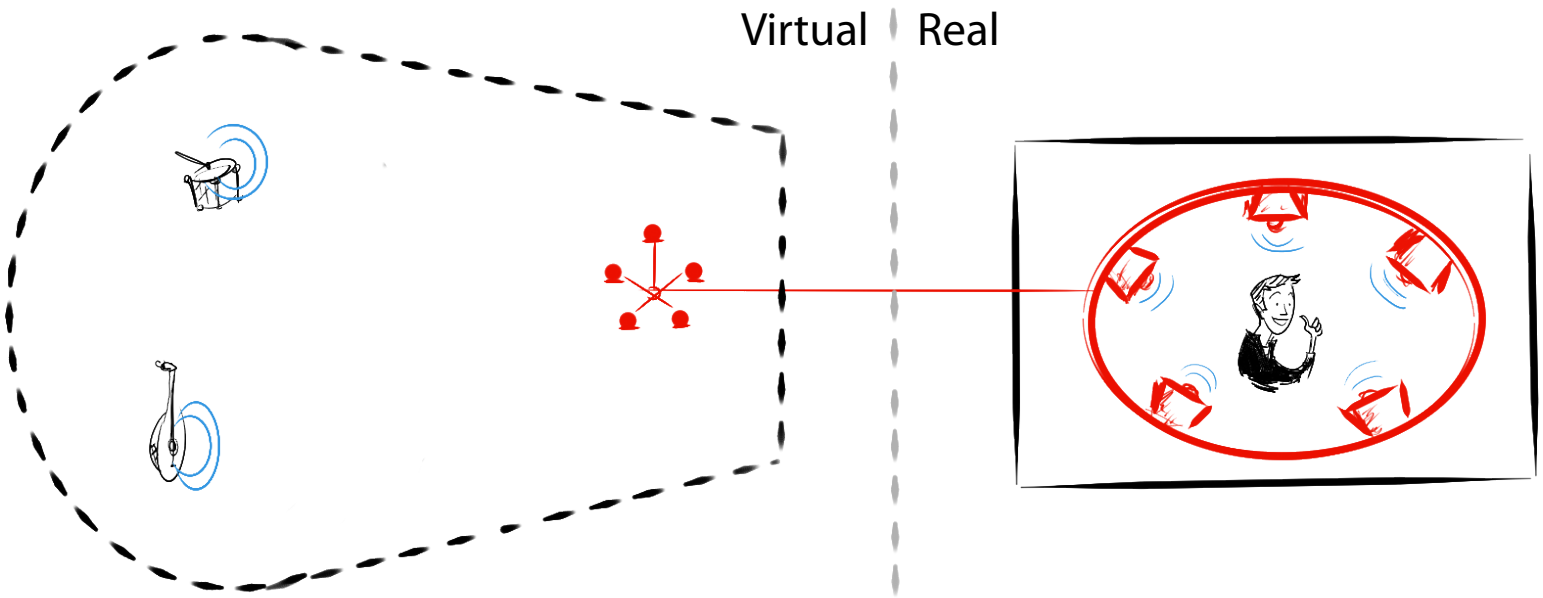

Aims and objectives

Overarching goal

Low-count multichannel systems capable of

- transposing a listener to the original space of an acoustic event
- providing a convincing illusion of an event in a desired virtual space

Specific objectives

- understand principles involved
- systematic scalable design framework
- practical solutions

State of the art

	WFS, HOA	Multichannel	Binaural
Channel count	50+	< 10	2
Equipment Load	High	Commercially viable	Low
Psychoacoustics	None	Required	Critical
Sweet Spot	Large	Medium	Small

Multichannel systems

yet to achieve spatial realism that is possible with the available channels

Commercial surround sound systems

- based on the legacy of sound production for the film industry
- focus on attention grabbing effects and a general ambiance feel

Drawbacks

- heavily mixed and inconsistent with the acoustics of a physical space
- complex empirical methods reliant primarily on tonmeister's skills

Ambisonics

- aims primarily at physical approximation in the centre
- very limited sweet spot

Towards achieving convincing spatial sound

Scientific challenge

- the sound field information that needs to be captured
- microphone array for acquisition of necessary perceptual cues

Playback scheme

- each channel plays back the signal of the corresponding microphone
- design choice

Johnston's solution

- Perceptual Sound Field Reconstruction [Johnston et al. 2000]
- 5-channel system

Departure from Johnston's original technology

- do not capture ITDs and ILDs, but required play-back

ICTD
inter-channel time differences

ICLD
inter-channel level differences

Generalization

- systems with more than 5 channels
- irregular circular configurations

Technical issues: perceptual sampling

- microphone polar patterns
- array diameter

Array radius

- given an arbitrary array radius, accurate auditory perspective is achieved by means of appropriate microphone polar patterns
- array radius is thus a free parameter
- it can be used to optimise some other qualities of reproduced sound or used in a creative manner to achieve some desired effects

Example

- many ICTD/ICLD pairs which render a given source direction
- not all of these pairs are natural
- array radius can be used to optimise a naturalness measure

Room simulators

Many methods – trade-off between complexity and accuracy

DSP effects	easy, fast, but inaccurate
Statistical	very fast, but not directly related to room properties
FDN	fast, but tuning is indirect and trial-and-error
Synth. Reverb.	fast, sounds good, but careful tuning of parameters
Conv. Reverb.	sounds real, but require actual recordings
Image Source	accurate, but heavy load (especially for later parts of RIR, which is also the less important perceptually)
DWM	wave equation solution, but very heavy load

Yuja Wang: The Piano

Collaboration with 59 Productions, Fidelio Arts

Ouroboros – 3D Immersive Intsallation

Collaboration with Ali Hossaini

Networked Performance

Next generation 5G connectivity for distributed performing arts, in collaboration with the National Theatre, Young Vic, BAC