

KISTEP 수요포럼 (Dec. 7, 2016)



AR/VR

가능성:

현황, 미래 전망 그리고 정부의 역할



Woontack Woo (禹雲澤)
ARRC/UVR Lab.
GSCT, KAIST

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VR/AR as a DigiLog Medium

◆ Gear VR : Roller Coasters

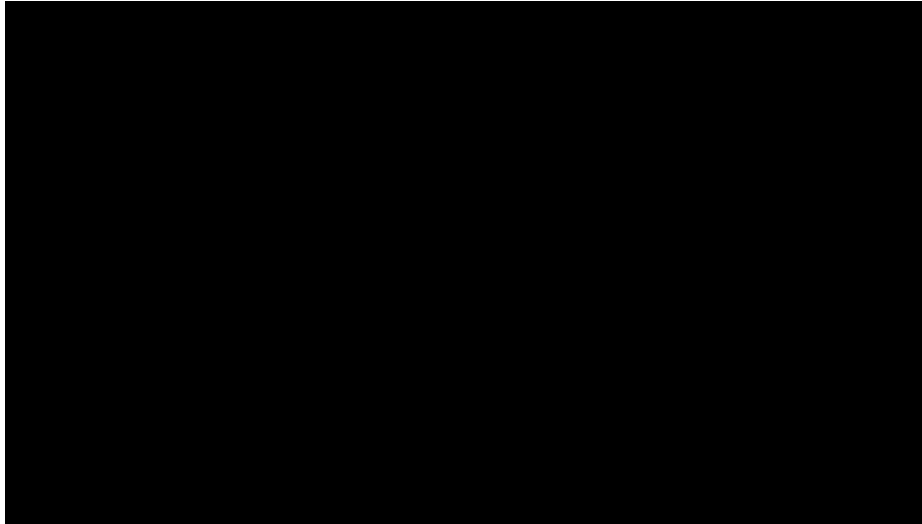






VR/AR as a DigiLog Medium

◆VR with Hands



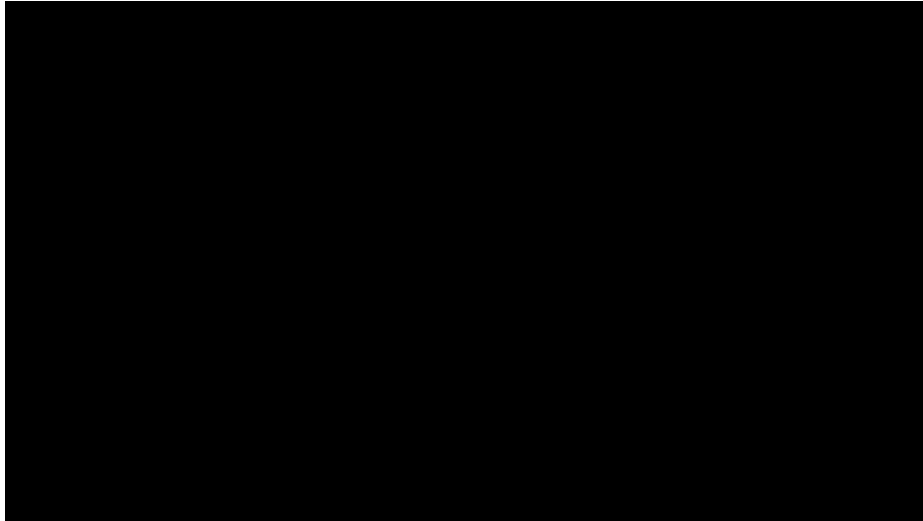
VR/AR as a DigiLog Medium

◆VR with HTC Vive



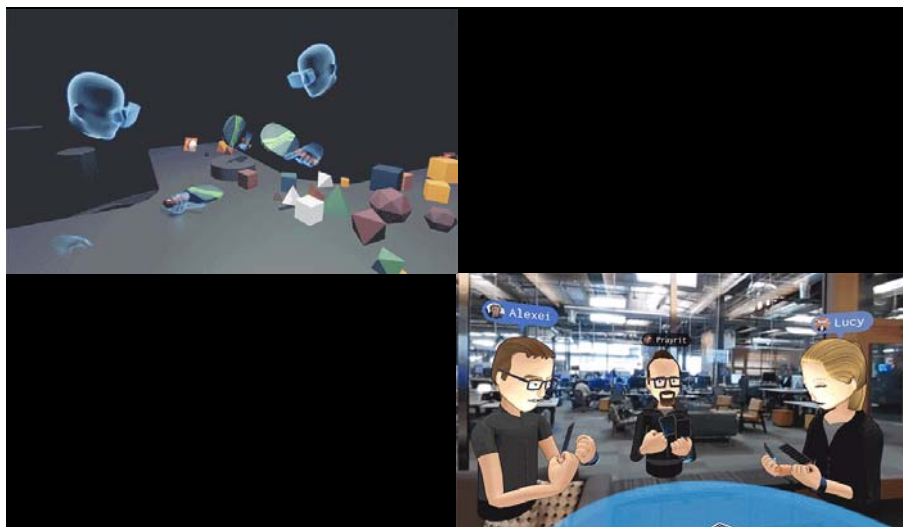
VR/AR as a DigiLog Medium

◆VR with SLAM



VR/AR as a DigiLog Medium

◆Facebook : Social VR



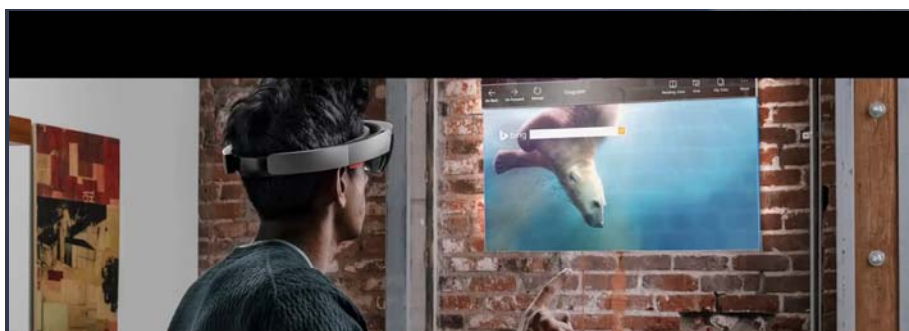
VR/AR as a DigiLog Medium

◆ Magic Leap : InfoViz



VR/AR as a DigiLog Medium

◆ MS HoloLens : Collaborations



Apps built for mixed reality.

The first apps for Microsoft HoloLens showcase the promise of mixed reality and share a purpose to inspire developers. Start creating and interacting with holograms in relation to the world around you.



VR/AR as a DigiLog Medium

◆MS HoloLens : Augmented Social Robot



VR/AR as a DigiLog Medium

◆Meta 2 hand-based Interaction



Content

Q1

- Some delusions about VR/AR
- Is **VR/AR Hype?** **VR** vs. **AR?** **3D CG** vs. **Platform?**

Q2

- What are possible examples of 'reality-virtuality coexistence' in our daily life?

Q3

- What are key technologies? What should do we now?

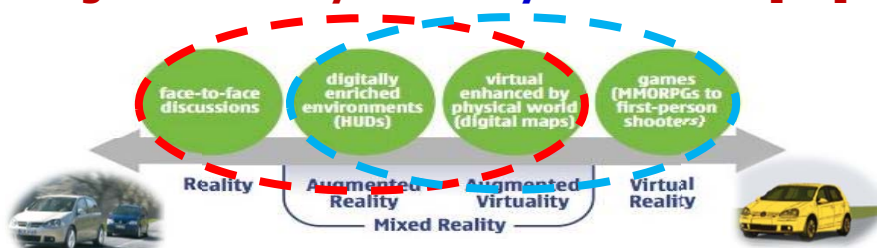
Q4

- How can we make the coexistence become more humanized and sustainable?



Where are Media going?

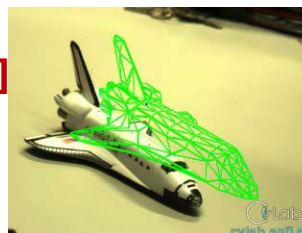
◆ Milgram's Reality-Virtuality Continuum [94]



P. Milgram and A. F. Kishino, Taxonomy of Mixed Reality Visual Displays, IEICE Trans. on I&S, E77-D(12), pp. 1321-1329, 1994.

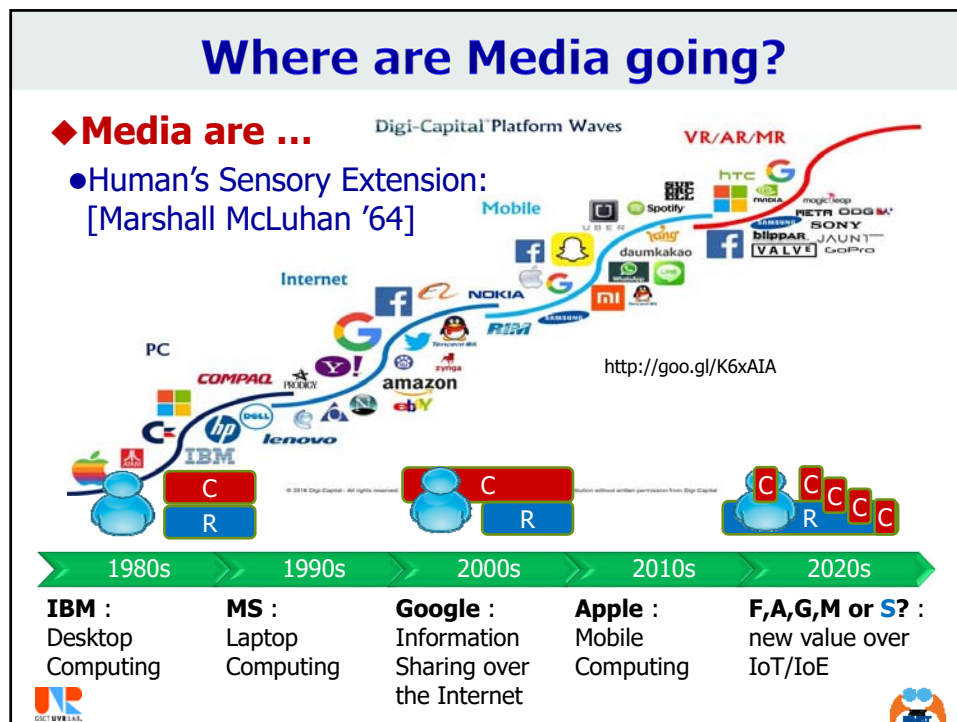
◆ Azuma's definition on AR [97]

- combines real and virtual
- is interactive in real time
- is registered in real 3D world



R. Azuma, A Survey of Augmented Reality, Presence, Vol.6, No.4, Aug. 1997, pp. 355-385.



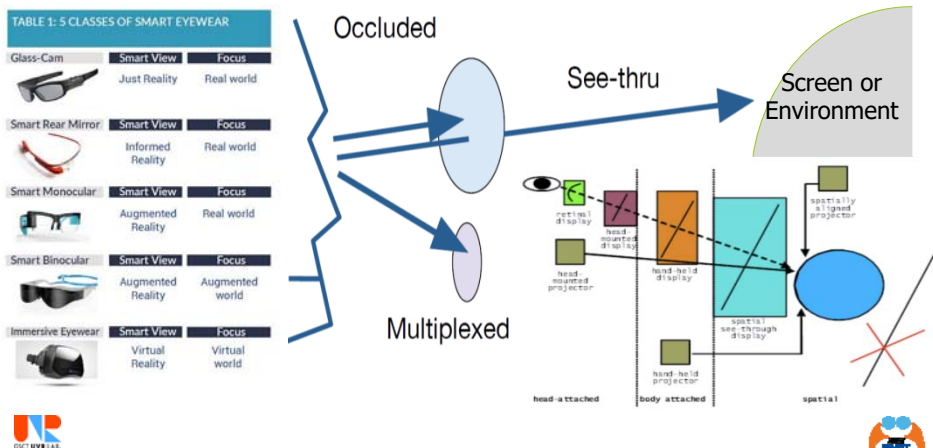


Smart Glasses: DigiLog Platform

◆ What are Smart Glasses?

- Wearable displays for JIT information or VR/AR content

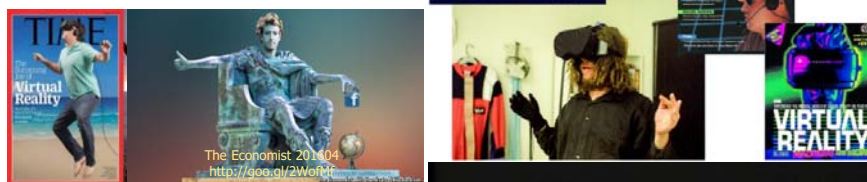
◆ Types of Display & Smart Glass



VR/AR comes Back!

◆ VR was Hot in 1990s!

◆ VR-AR is Hot Again!



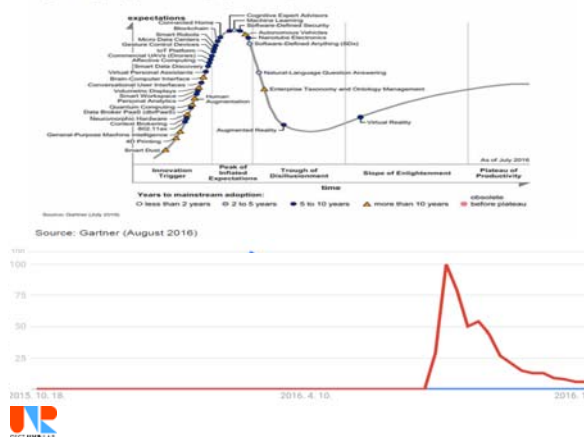
Zuckerberg's 3 predictions for what SNS will look like in 10 years

1. There will be (a lot) more people on the **Internet**. We'll be more likely to message people through **photos or SMS** than the old web interface.
2. The future of computing is **AR/VR** (in 10 years) : distraction-free, heads-up communication, etc.
3. The **smart phone** is probably going to be the (first) mainstream **consumer platform**.

VR/AR, 몇 가지 오해?

- ◆ Hype 인가? Sustainable 한가?
- ◆ VR vs. AR, 선택의 문제인가?
- ◆ (3D) Content vs. Platform?

Figure 1. Hype Cycle for Emerging Technologies, 2016



정부의 '9대 국가전략 프로젝트'

성장동력 확보

인공지능(AI) 차 산업혁명 대비 핵심
기반기술 확보 전 산업 파급

가상증강현실 교육, 문화, 게임 등 다양한
콘텐츠 집적 신산업 창출

자율주행차 자동차-IT 기업 협력,
융합기술 개발로 자율차
상용화

경량소재 선도국 수준 핵심 원천기술
확보

스마트시티 첨단도시 실증 및 글로벌
시장 선점

삶의 질 향상

정밀의료 맞춤형 의료 서비스로
국민 건강 증진

신약 4대 중증질환 치료제 개발
통한 국민 건강 실현

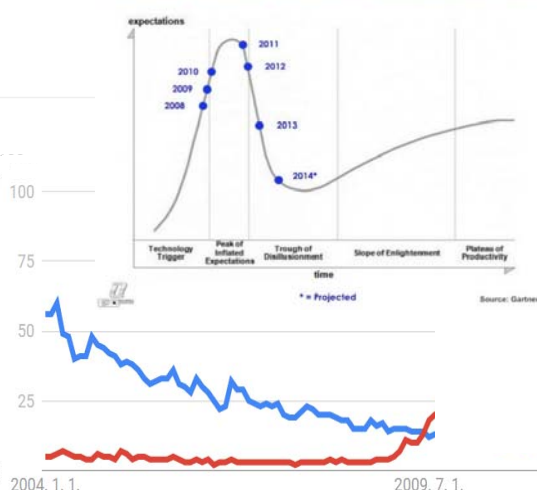
탄소자원화 국가 온실가스 감축 목표
달성, 탄소시장 선점

미세먼지 과학기술 기반 근본적 해결
기술 확보

Where are We Now?

◆ Is VR/AR Hype? (Google Trend)

Gartner Emerging Technology Hype Cycle - Augmented Reality - 2008 - 2014



Google Glass (Apr. 2012)

Facebook-Oculus \$2B (Mar. 2014)

Google Cardboard (May 2014)

Samsung Gear VR (Sep. 2014)

Google-Magic Leap, \$0.54B (Oct. 2014)

MS Hololens (Jan. 2015)

Sony Morpheus (Feb. 2015)

HTC Vive VR (Mar. 2015)

MINI (Apr. 2015)

Apple-Metaio (May 2015)

Google Jump with Go-pro (May 2015)

VR in E3 show (Jun. 2015)

Intel-Recon (Jun. 2015)

Samsung \$99 HMD (Sep. 2015)

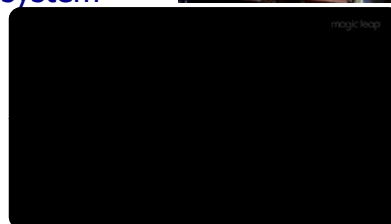
VR in MWC (Feb. 2016)

Pokemon Go (Jul. 2016)

Where are We Now?

◆ Is VR/AR Hype?

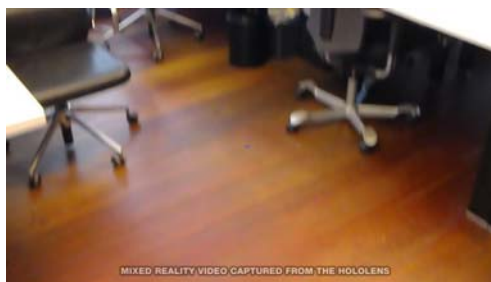
- Huge amount of investment in VR/AR
 - 2.3B\$ (0.8B for Magic Leap) in '16 (0.7B\$ in '15)
- Inexpensive hardware platforms
- New devices for input and output
- Easy to use content creation tools
- Proven use cases – no more Hype!
- Most important: UX and Eco-system



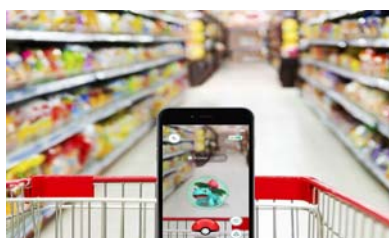
Where are We Now?

◆ Pokemon Go

- People are tire of... But,
 - Generational juxtaposition
 - Community & Platform
 - Behavior changes
- What's next?
 - Glass? Interactive?
 - A-commerce?



MIXED REALITY VIDEO CAPTURED FROM THE HOLOLENS

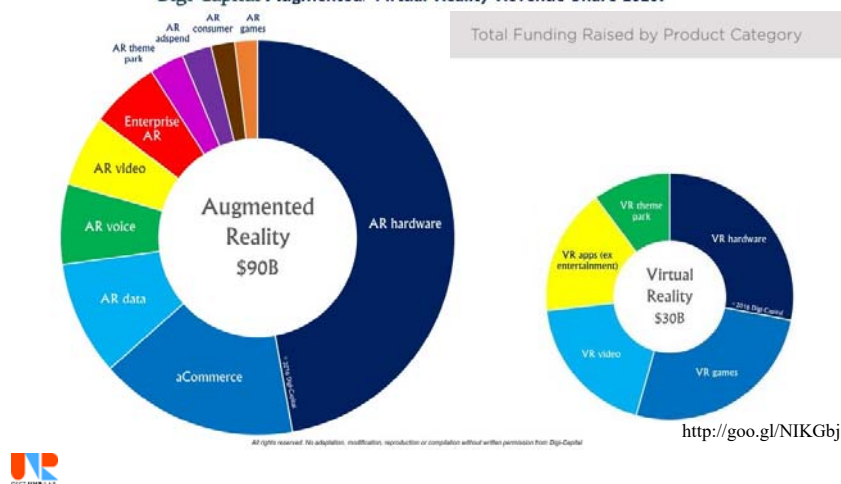


What Should We Do?

◆AR/VR, It's Here Right Now!

- AR/VR could hit \$120B (90B/30B) revenue by 2020

Digi-Capital Augmented/Virtual Reality Revenue Share 2020F



Content

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Q2

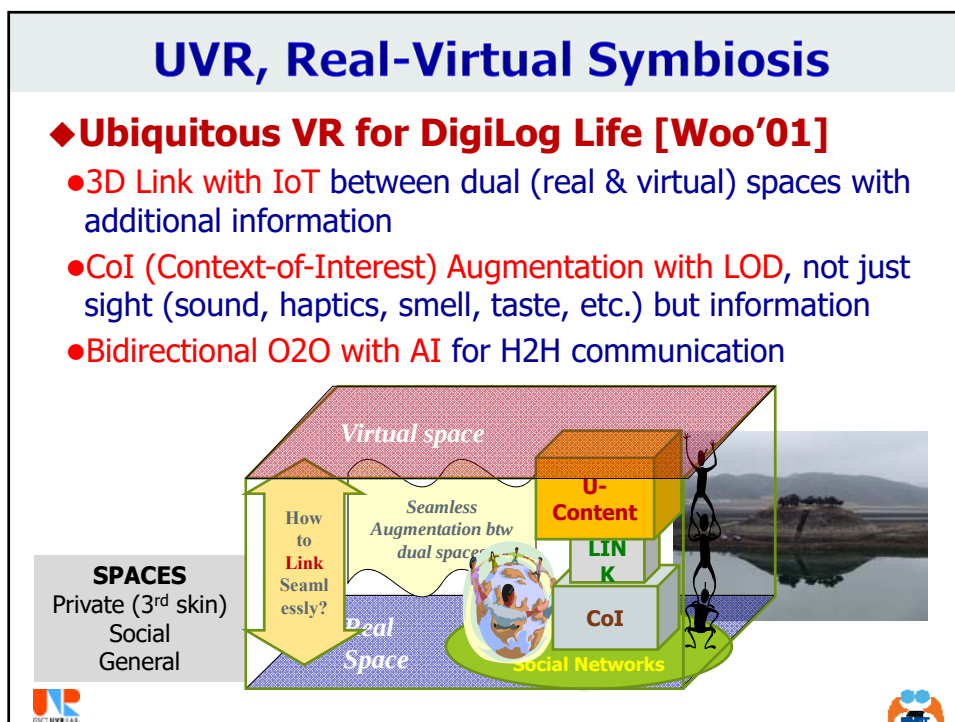
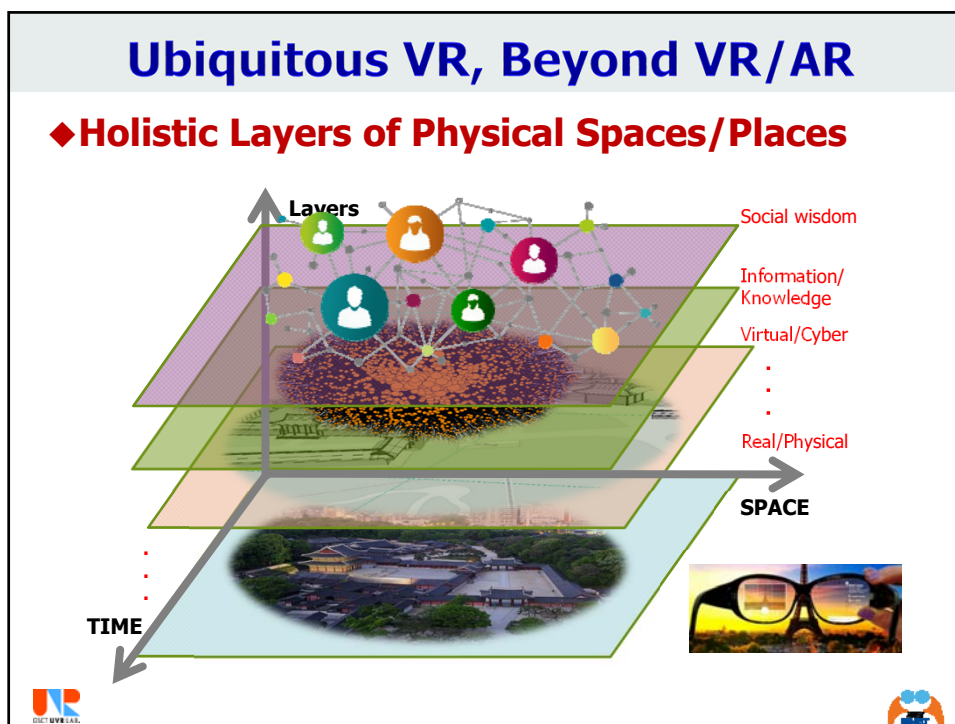
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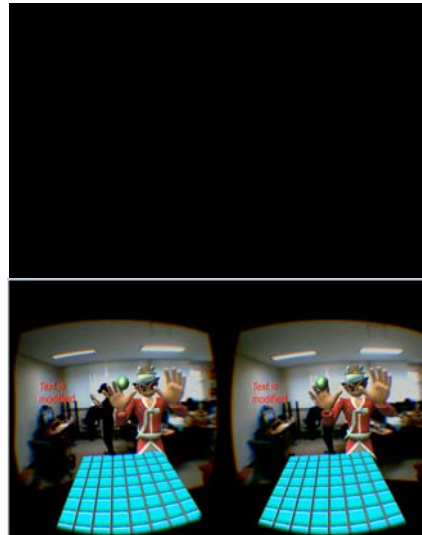
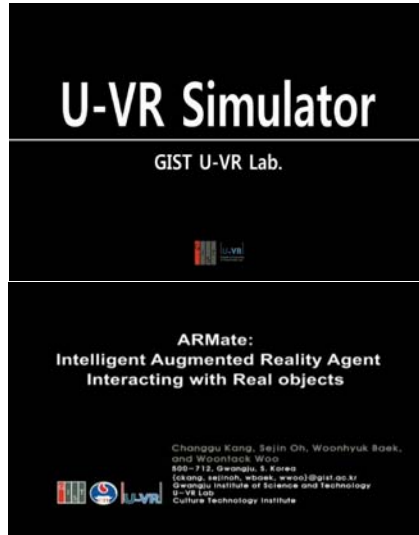
Q4

- How can we make the coexistence become more humanized and sustainable?



UVR, Real-Virtual Symbiosis

◆What I have Worked... since 2001



Future Scenarios

◆KISTEP 기술영향평가 2016

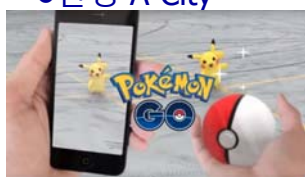
경 제	산업	생산 및 유통 효율화, 신산업 및 신시장 창출
	소비	O2O 유기적 연계
사 회	평등	정보접근의 민주화, 지역별/계층별 격차 해소
	교육	교육의 질과 효율성, 사고력 및 응용력, 교육 평등
	안전	훈련 및 시뮬레이션을 통한 안전 시스템 강화, 재난 대응의 효율화
	건강	새로운 의료 서비스 (의료 교육 및 훈련 포함)
윤 리	윤리 의식	실생활과의 혼동, 과몰입, 정체성 혼동, 인권 문제, 윤리적 행위 유도
	AR 정보 윤리	프라이버시, 저작권, 제조물 책임, "시야전쟁"
문 화	VR 성적 콘텐츠	음란물 문제
	간접체험	새로운 라이프 스타일, 관광/비디오/라이브 이벤트/스포츠/게임 등
	맞춤형 정보	AR 맞춤형 정보의 전달과 공유로 삶의 편의성 증대
	사회성	새로운 커뮤니티의 형성, 공동체 의식의 변화



Possible Applications

◆What about AR Applications?

- 경제 A-Commerce
- 사회 A-Edutainment
- 문화 A-Heritage
- 환경 A-City



Possible Applications

◆Commerce with AR



Augmented reality apps

Augmented reality apps provide similar functionality as virtual fitting rooms do, but with the help of a smartphone. Apps can be used to:

- See products in real life. For example, IKEA and Amazon pictures from the virtual catalogue and interactive virtual furniture home can use a smartphone.
- Receive more product information while in store. Augmented reality apps can provide additional information after scanning a smartphone camera on certain products.
- Try specific products. For example, Sephora and L'Oréal customers try on thousands of lip colors using a smartphone camera.

Shopping on the go
Augmented reality devices will allow the experience to shop on the go. No need to visit brick-and-mortar stores and waste your time.

Enhances brand recognition
Using VR and AR technologies can help brands increase brand awareness through specific and producing associated content.

Empowers advertising campaigns
Virtual and augmented reality will breathe a new life into advertising process. Almost all advertising techniques used in modern world can be projected on virtual and augmented reality. From drawing targeted ads while surfing the Internet to virtual reality, in displaying board which advertisers hold in your hand or a series of ads as you look in a shop window. Facebook became one of the biggest advertising platforms in the world and acquiring Oculus VR technology opens new prospects in terms of Facebook advertising.

Better customer support
Virtual and augmented reality brings customer support services to the brand new level. Along with face-to-face that, customers can get more detailed information on how certain products should be utilized or fixed.

Enhanced post-purchase experience
In addition to improved customer support, VR and AR technologies can enhance current post-purchase experience by bringing traditional experiences to the brand new level and implementing new ways to engage with customers to ensure only the best shopping experience.



Possible Applications

◆ Edutainment/Training with AR

- Maintenance AR manual
- NASA's HoloLens in Space
- Surgeries at a Distance
- Medical Education



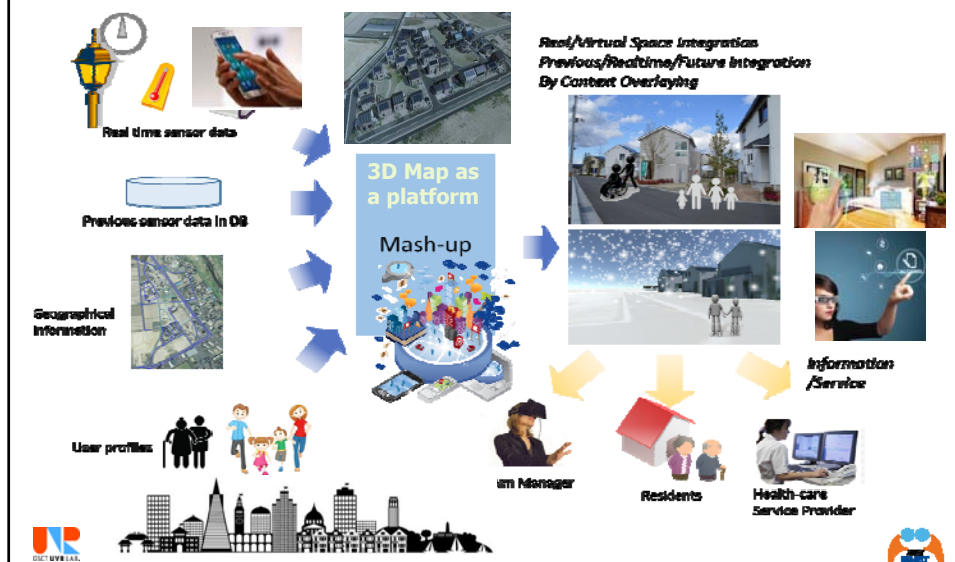
Possible Applications

◆ Heritage with AR



Possible Applications

◆ Smart Town with IoT, Big Data, AI and AR



Possible Applications

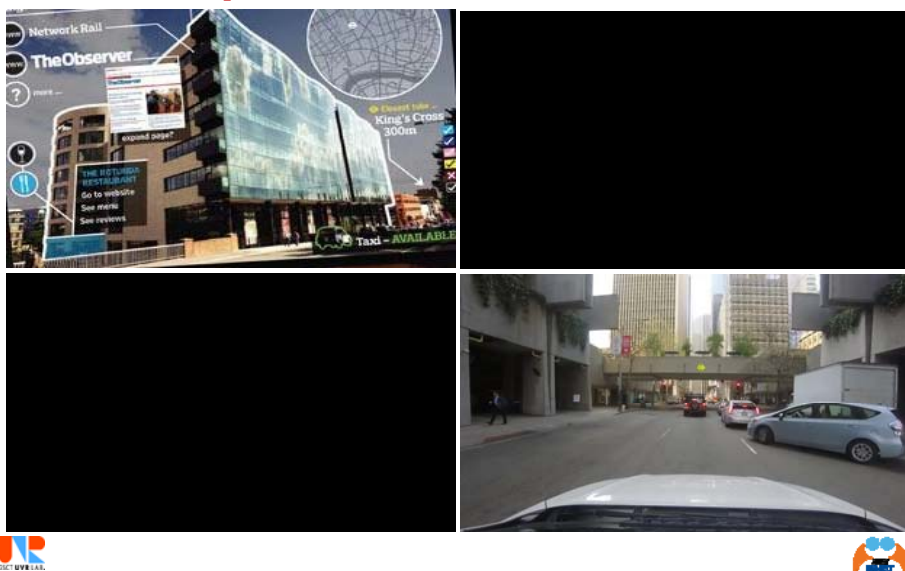
◆ Smart Home with IoT, AI, AR & Social Robot

- Charger
- Speaker
- Home station



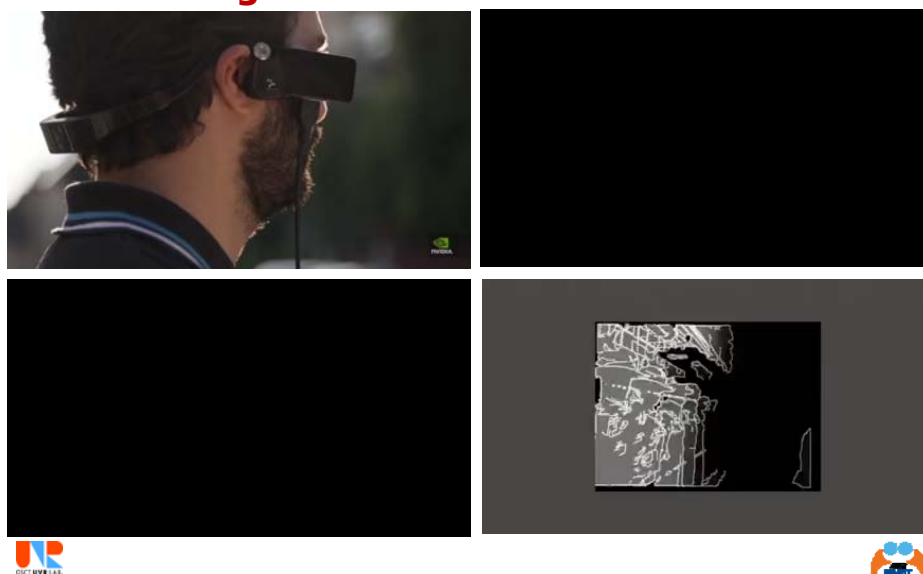
Possible Applications

◆ Smart City with AR



Possible Applications

◆ Life Changer for the Blind



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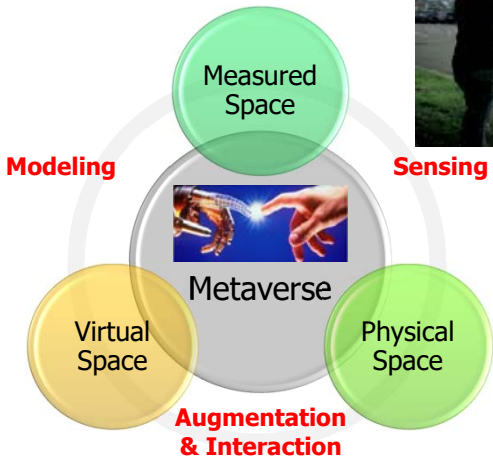
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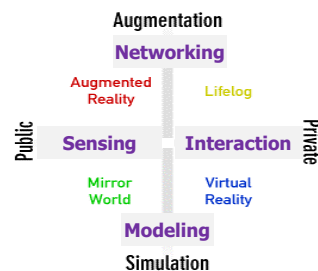

AR, Real-Virtual Symbiosis

◆ **AR as Metaverse**





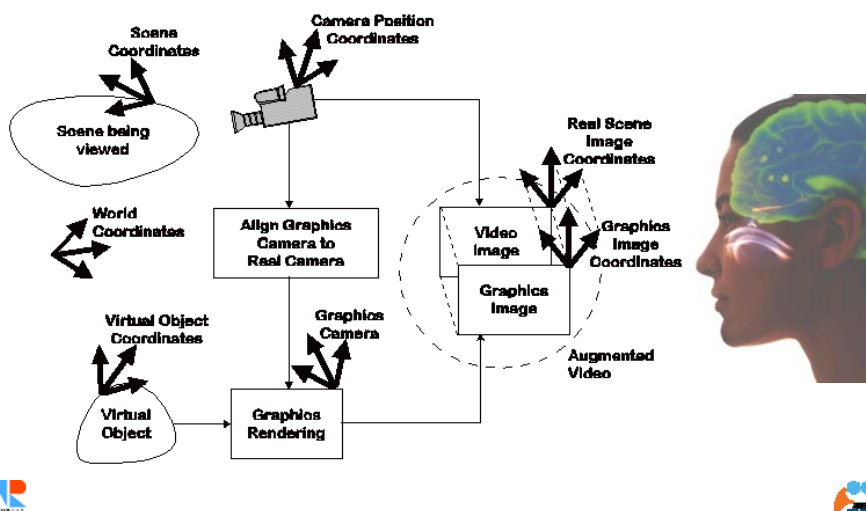


How does AR Work?

◆ Components of an AR System

- Fusing CG models with real environment



VR/AR Core: Tracking

◆ Environment Modeling

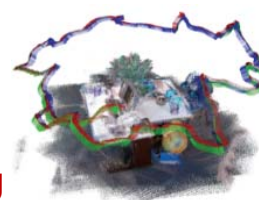
- Real-time SLAM

◆ Objects Recognition & Tracking

- Detection & Recognition of objects/PoI
- Tracking: continually locating the OoI/PoI
 - Position (x, y, z) , Orientation (r, p, y)
- Registration: virtual object w.r.t. real world

◆ Modeling/Tracking Technologies

- Active vs. Passive
- Hybrid Tracking



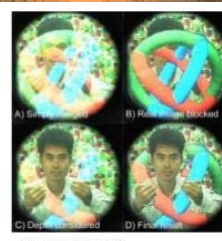
2012-2015 © Woo, KAIST GSCT UVR Lab., Daejeon 305-701, Korea



VR/AR Core: Rendering

◆ Augmentation

- Real-time deformable object rendering
- Real-time realistic multimodal rendering
- Optical-see-through HMD display
- JIT information augmentation with LOD



2012-2015 © Woo, KAIST GSCT UVR Lab., Daejeon 305-701, Korea



VR/AR Core: Interaction and UI

◆ Interaction, Collaboration and Natural UI

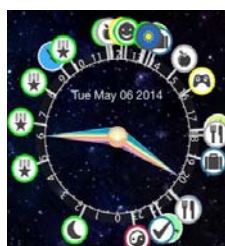
- Hand-based Interaction/collaboration for Ego-centric AR
- Multimodal interaction and collaboration
- Organic UI & Empathy UI



VR/AR Core: Context-aware

◆ Context-awareness and Social Agent

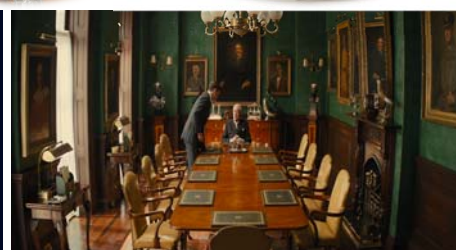
- Context-awareness and Visualization
- Quantified-self for Augmented Human
- Social agent for Quality of Social Life



VR/AR Core: Teleport

◆ Telepresence

- "Being There without Really Being There (or Then)"
 - Education & training, corporate communication
- Reach a wider audience
- Reduce travel costs



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VR/AR Core: Standard

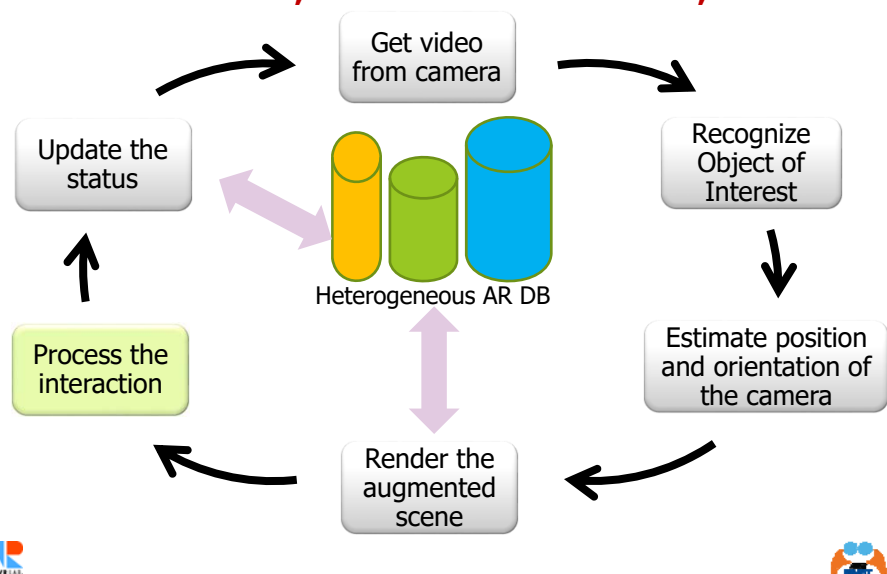
◆ Interoperable VR/AR Content

- Metadata for MAR Services with Linked Open Data
- 5W1H-based MAR Entity, Anchor, Content



UVR, What Should We Do?

◆ How does UVR, Context-Aware MAR, work?



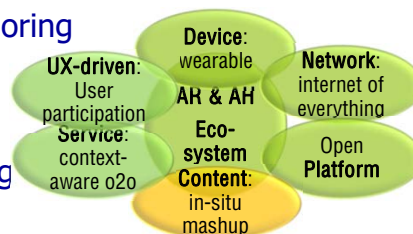
UVR, What Should We Do?

◆ 콘텐츠 Content is King : more than P-N-D

- Immersive AR/VR content authoring

◆ 맥락 Context is Queen

- VR/AR-based o2o with IoT/IoE
- Cloud-based storage/processing
- Smart with Open Linked Data



◆ 사용자 User is God

- Natural UI for AR & Augmented Human
- In-situ user participation
- Emphasis on UX and social acceptance



UVR, What Should We Do?

◆ Staffs with AR Experience [LinkedIn]

- Microsoft (~500),
- Google (~350),
- Intel (~225),
- IBM (~220),
- Amazon (~200),
- Apple (~190),
- Facebook/Oculus (~120)
- ...



Tim Cook said:

"AI & AR are core technologies in Apple's future"

"AR will be an essential part of our daily life, like the iPhone"

"A significant portion of the population... will have AR experiences every day, almost like eating three meals a day"

◆ What about Korea?



Tech Trader Daily <https://goo.gl/5KjgrX>



UVR, What Should We Do?

◆SWOT of AR/VR in Korea

SWOT	STRENGTH • ICT Infra (5G, IoT, Smart phone, etc.) • Global companies (Samsung, LG, KT, SKT, Naver, Kakao, etc.) • Quality of Content & ND	WEAKNESS • Ill-prepared: few experts • Core Technologies • Weak CPND eco-system (e.g., SW platform) • Loose collaboration
OPPORTUNITIES • Big global investment • Reasonable HW/SW price • Growing potential market	KAIST AARC Global Open Research Initiative ➢ Industries support 'open R&D platform for CPND eco-system' ➢ KAIST educates 100 VR/AR experts for 5 years ➢ AARC provides open R&D opportunities for AR experts	
THREATS • Too high expectation • HW-driven: few proven acceptance • Social appearance		



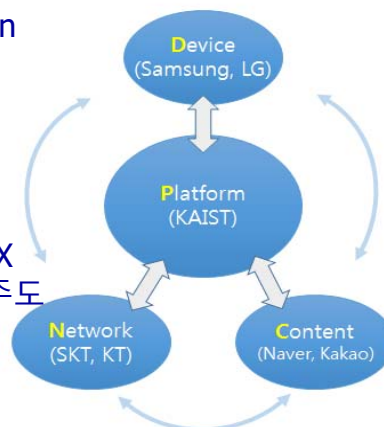
UVR, What Should We Do?

◆What are the Keys?

- 지도 from AR-VR to Context-aware Mediated Reality
- 지능 from AI to Intelligence Augmentation
- 지혜 from PC to Social Companion

◆What should We do?

- 인재: 핵심인력 확보 및 육성으로 핵심 UVR/AH IP 확보
- 융합: IoT, BD, AI, DB, AR, HCI/UX 융합형 R&BD로 신시장 선점 및 주도
- 생태계: 산학연 협력으로 CPND 동반성장 선도



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Augmented Human, Beyond UVR

◆ iOptik - a Glimpse into the Future

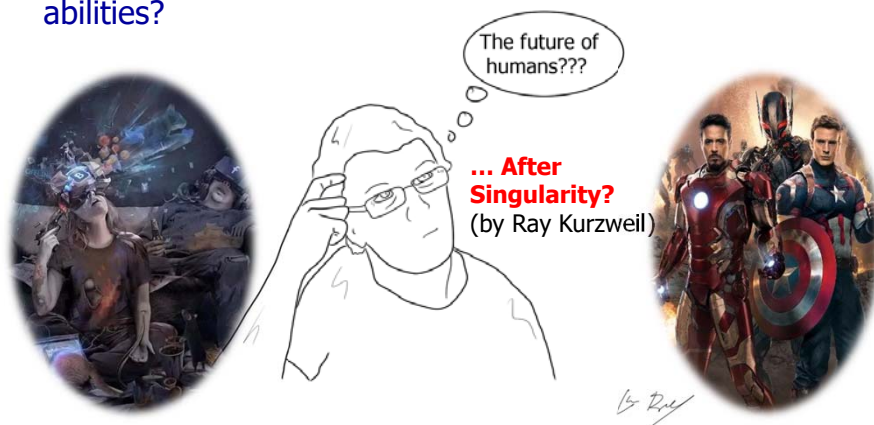
- Could this be the future of augmented reality glasses?



Augmented Human, Beyond UVR

◆ Future Human in UVR era?

- AR: extended space-time
- How to extend human's **physical, intellectual, social** abilities?



<http://goo.gl/yJPDtC>

Augmented Human, Beyond VR/AR

◆ Quantified Self, Tracking Person

- Smart agent incorporating many sensors CAN
 - provide a window into our health status, feelings, and warn us of oncoming conditions
 - aid our memory using location and context based reminders
 - provide alerts to sight impaired of oncoming traffic, light changes, etc.
 - manage our moods
- With the personal knowledge, sensing, and activities,
 - people will develop a symbiotic relationship with their personal device
- These devices could be with people most of their life and develop an intimate knowledge of the user
 - Can compensate for diminishing capabilities in later life



Augmented Human, Beyond VR/AR

◆ Applications of Quantified Self

- Personal AR Guardian (healthcare, life coach/guard, etc.)
- Sustainable self-management with game-like competition
- Personal black-box for protecting self from criminal



Augmented Human, Beyond UVR

◆ From Quantified Self to Quality of Social Life:

- 사회적 관계 형성: Human-to-Human Social Networking
- 경험의 공유와 공감: Empathy
- 타인 가치의 존중과 협상: Negotiation
- 추천과 결정: Deliberative decision-making



AH, Where should We Move?

◆AH Augments or Obsoletes Human?



Q&A: Summary

VR/AR,
몇 가지
오해?

- Hype 인가? Sustainable 한가?
- AR vs. VR, 선택의 문제인가?
- (3D) Content vs. Platform?



UVR,
what are
the Keys?

- **지도** from VR/AR to Context-aware Mediated Reality
- **지능** from AI to Intelligence Augmentation
- **지혜** from PC to Social Companion

What
should
We do?

- **인재** 핵심인력 육성 & 핵심 UVR/AH IP 확보
- **융합** 융합형 R&BD로 신시장 선점 및 주도
- **생태계** 산학연 협력으로 CPND 동반성장 선도



Welcome to AH in Ubiquitous VR!

◆ *"The future is already here. It is just not uniformly distributed"* by William Gibson (SF writer)

New Opportunities,
Augmented Human Platform
with Holistic Quantified Self
for Quality of Social Life

◆ More Information

Woontack Woo, Ph.D.

FB @wtwoo

wwoo@kaist.ac.kr

<http://uvr.kaist.ac.kr>

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