

2021년 IT21

Global Conference

Human in SW, SW in Human

Session 2-6

XR 기기: 홀로그래姆

강훈종 교수 (원광대학교)



최근 IT 글로벌 선도 기업들은 VR/AR 서비스를 위해 콘텐츠, 플랫폼 및 wearable 디바이스 등을 개발하고 있습니다. 이 중에서 wearable device는 홀로그래姆 광학 소자의 발전에 따라 머리에 착용하는 head-up display에서 안경형태로 발전해 가고 있습니다.

본 발표에서는 이러한 안경형 VR/AR 기기에 관한 최근의 해외 동향을 소개하고, 이를 실현시키기 위한 홀로그래姆 광학소자와 이에 관한 관련 기술 개요에 대해 소개합니다.

또한 홀로그래姆 광학 소자를 활용한 다양한 응용 분야 등을 함께 소개합니다.

▶ 약 력

2001년	광운대학교 전자공학 석사
2001년~2002년	(주)3D코리아 연구원
2002년~2006년	ETRI 연구원
2008년	Nihon University 전자공학 박사
2008년~2010년	FP7 Real3D Project Researcher
2010년~2019년	KETI 홀로그래姆연구센터장
2019년~현재	원광대학교 교수(홀로그래姆연구소장)

▶ 관심분야

홀로그래姆, VR/AR/XR, 영상처리, 병렬처리



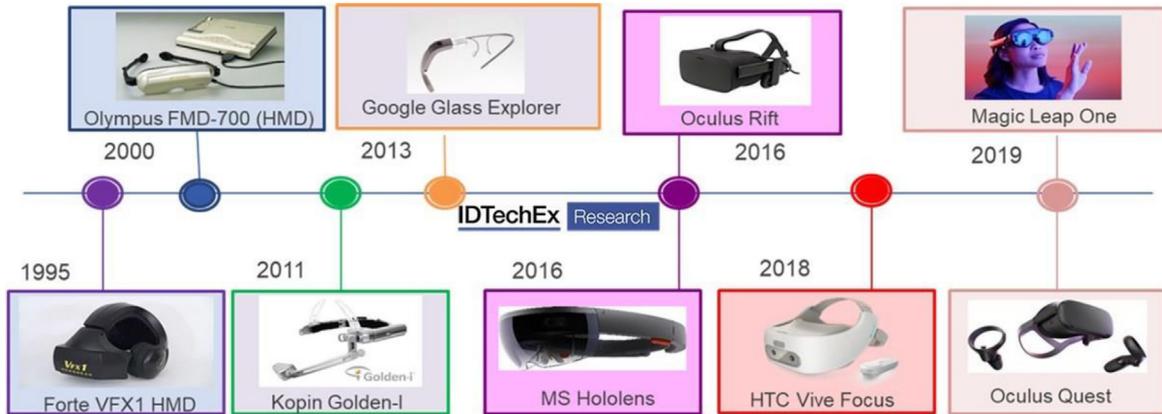
XR기기: 홀로그램

원광대학교 홀로그램연구소 강훈중 소장
(holowave999@wku.ac.kr)

History of VR, AR head mounted display



History of VR, AR head mounted display



History of VR, AR head mounted display

Qualcomm

Children Playing



Kids chasing virtual characters in more interactive and immersive games

Young Adults Exploring



A young man exploring Rome and seeing the Colosseum as originally built

Families Communicating



Families virtually brought together with life-like communication

Professionals Working



Architects collaborating on a shared design to improve efficiency

Fitness Enthusiasts Thriving



Group running with a virtual trainer to motivate them

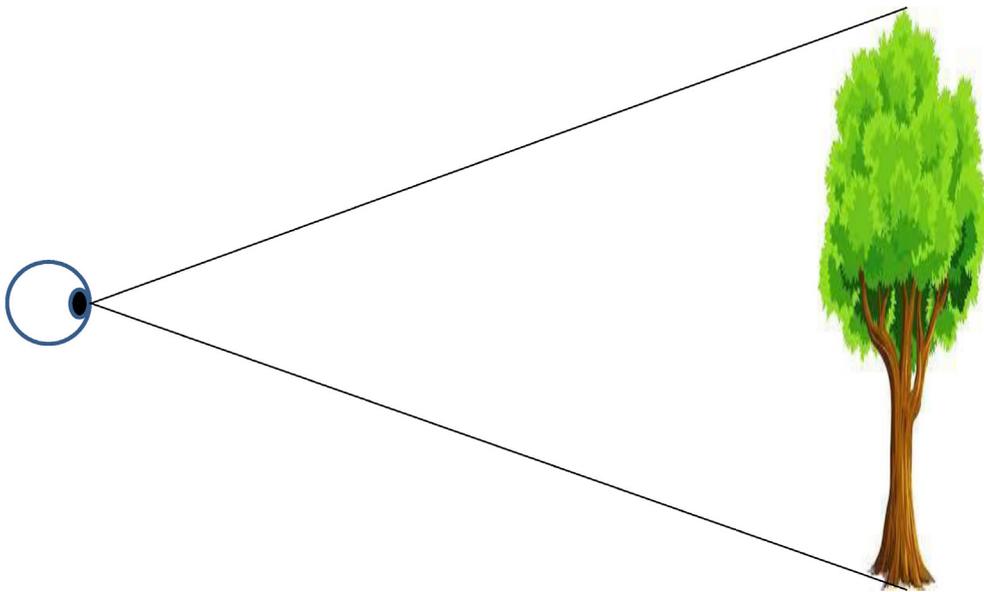
History of VR, AR head mounted display



Desired AR Smart Glasses

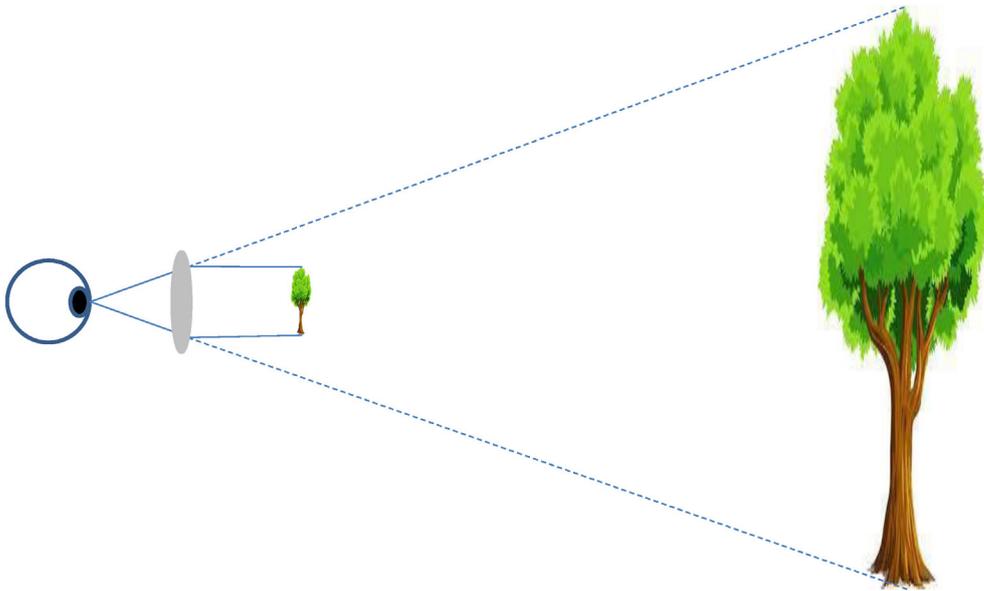
- 5 -

HMD optics



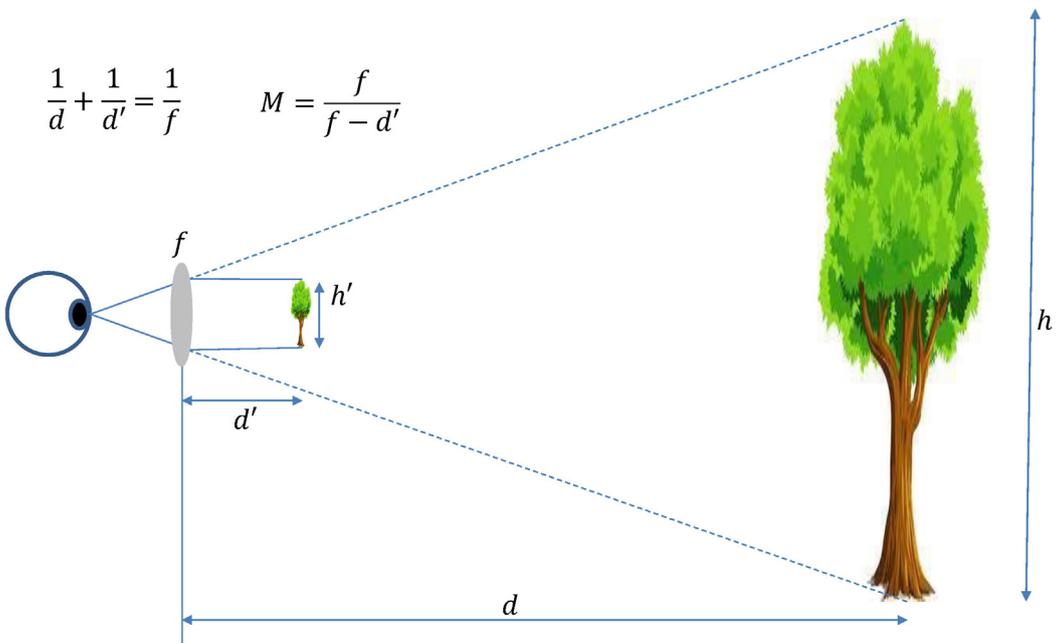
- 6 -

HMD optics



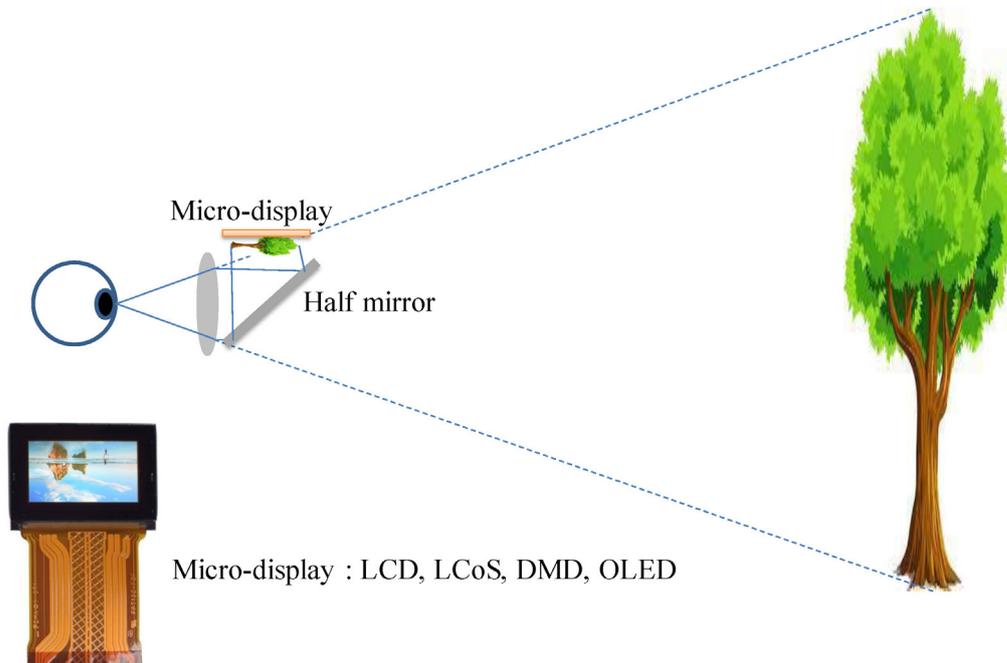
- 7 -

HMD optics



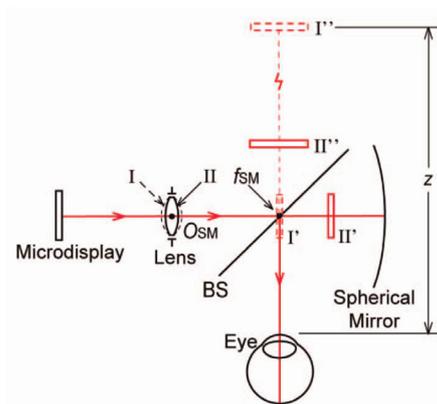
- 8 -

HMD optics

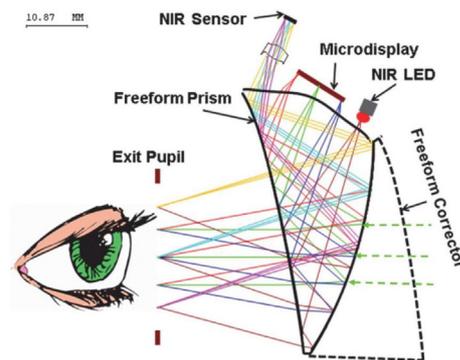


- 9 -

HMD optics



[Half mirror-based HMD]



[Prism-based HMD]

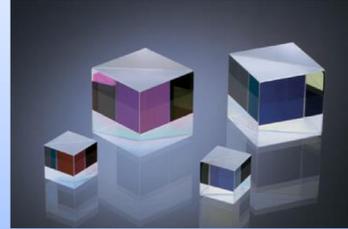
- 10 -

HMD optics

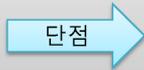
Lens



Beam splitter (half-mirror)



Lens
+
Beam splitter



무게 ↑
부피 ↑

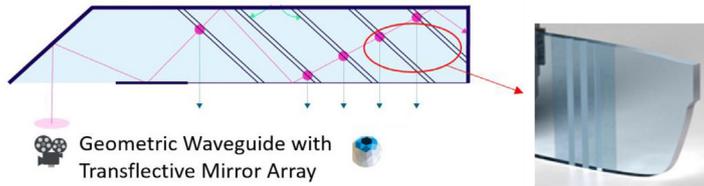


홀로그램 광학소자
or
Waveguide

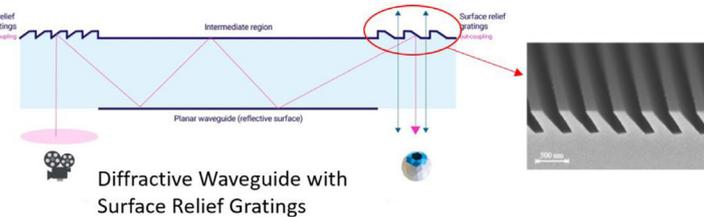
Holographic optical element

(a)

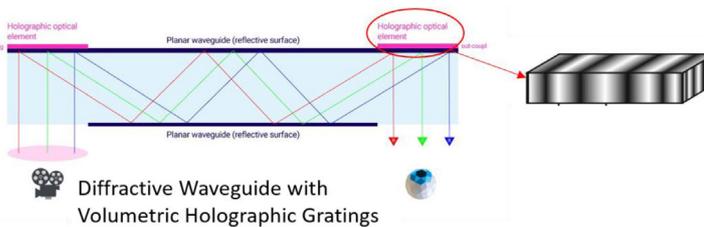
Transflective Mirrors



(b)



(c)



Holographic optical element

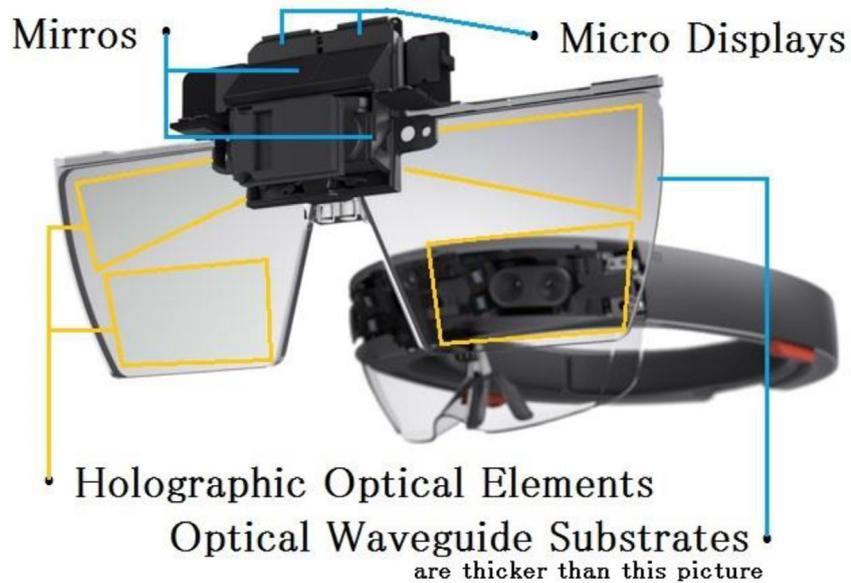
Microsoft - HoloLens



- 13 -

Holographic optical element

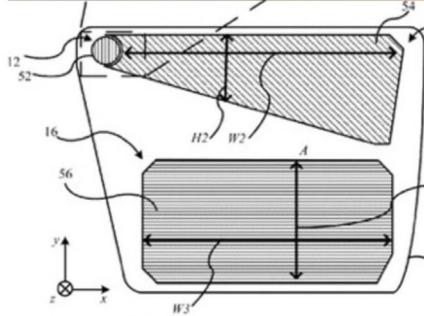
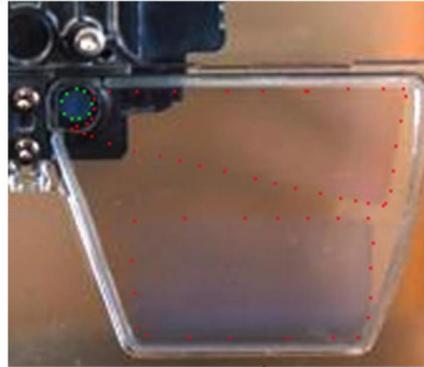
Holographic head mounted display



- 14 -

Holographic optical element

- Holographic optical element \rightarrow diffraction grating
- Field of view : 43×29 degrees



- 15 -

Holographic optical element

Holographic
optical
element



[Goggle Glass]



[Microsoft HoloLens]

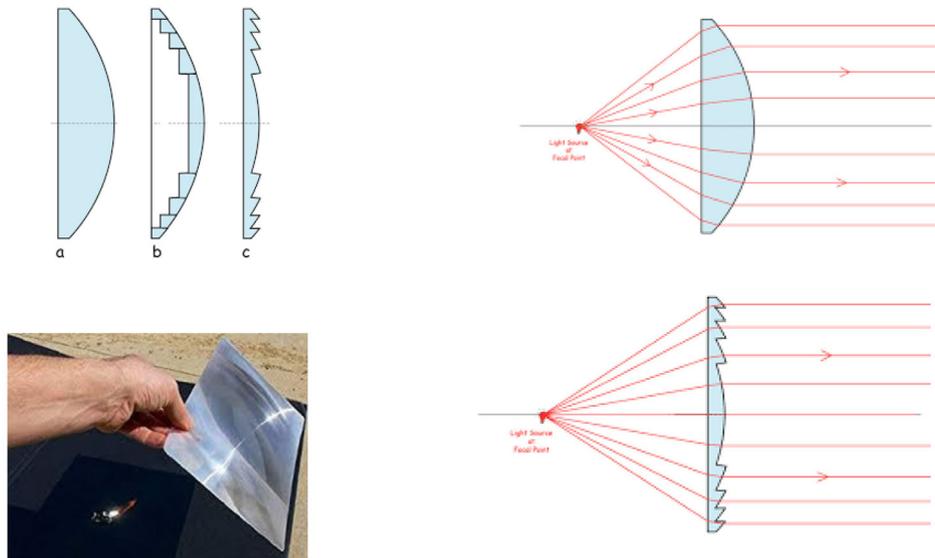


[Magic Leap]

- 16 -

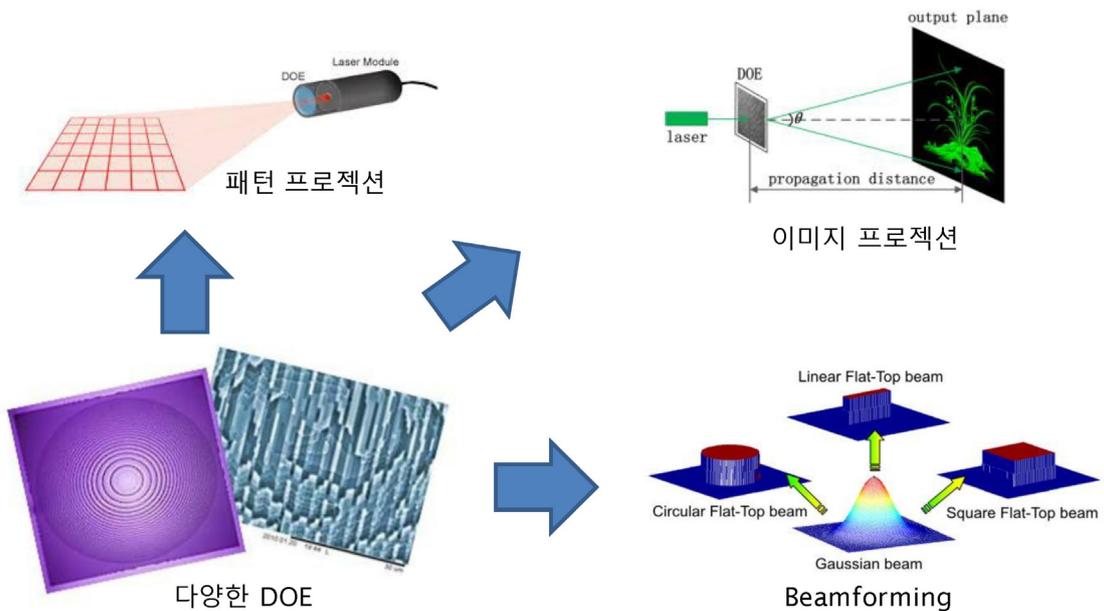
Holographic optical element

● Diffracted optical element (DOE)



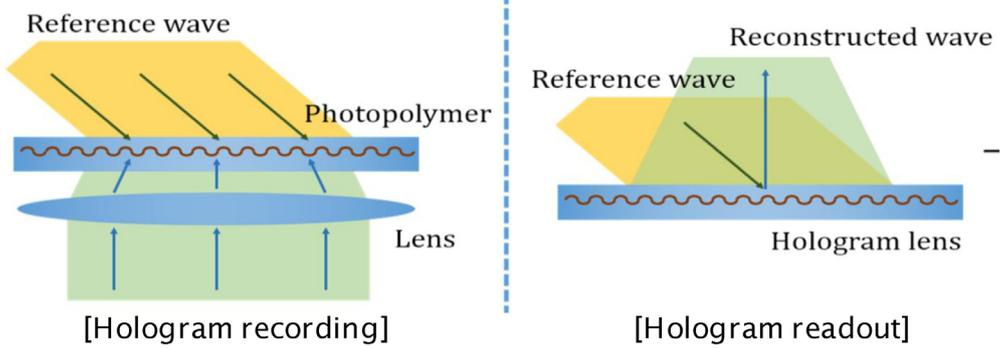
- 17 -

Holographic optical element

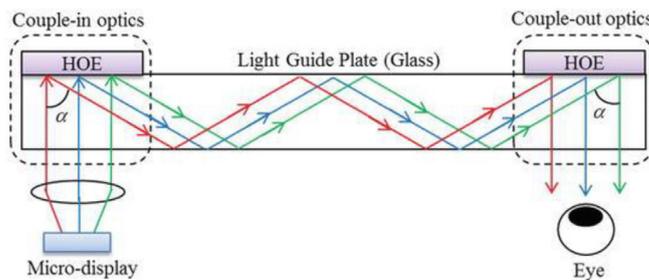
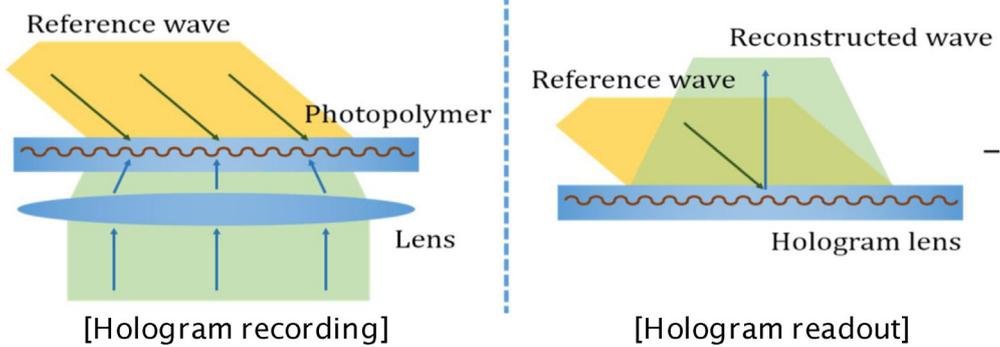


- 18 -

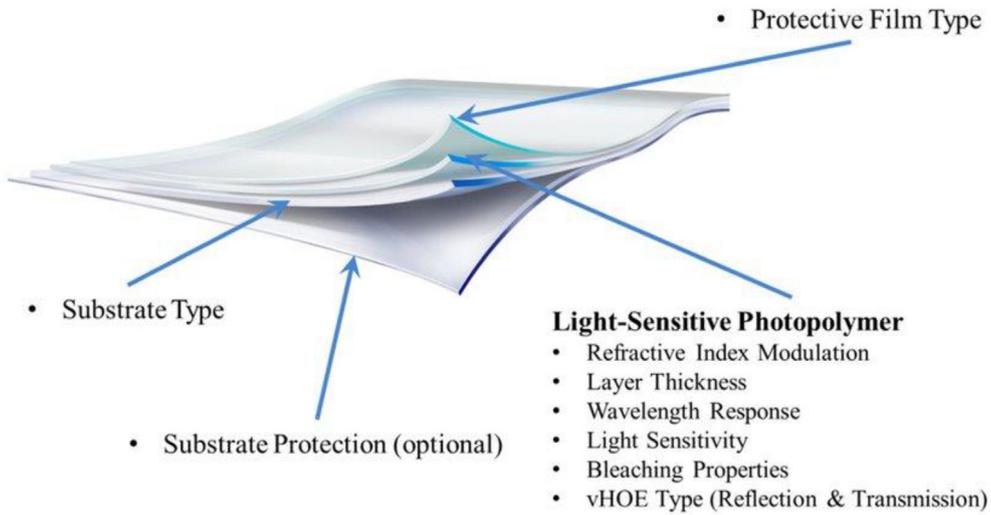
Holographic optical element



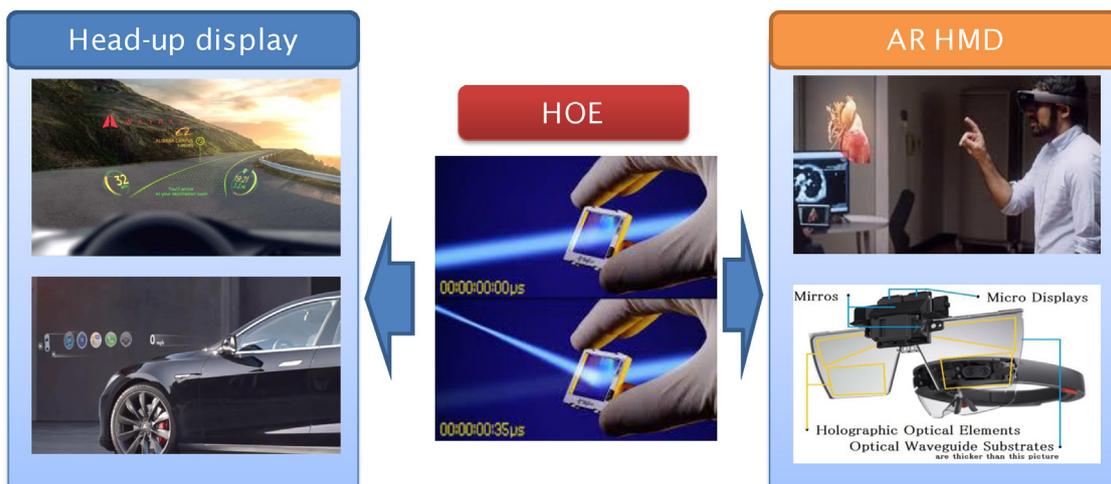
Holographic optical element



Holographic optical element

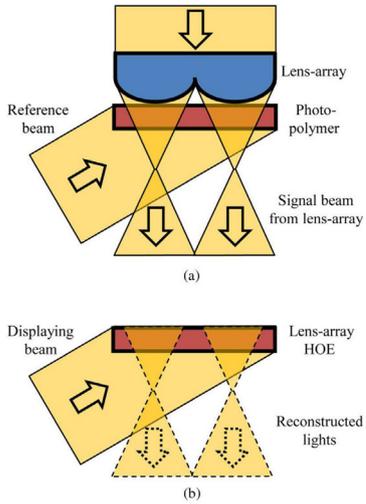


Holographic optical element



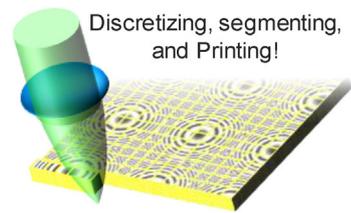
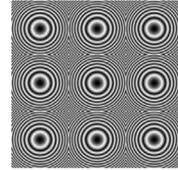
Holographic optical element

Analog HOE

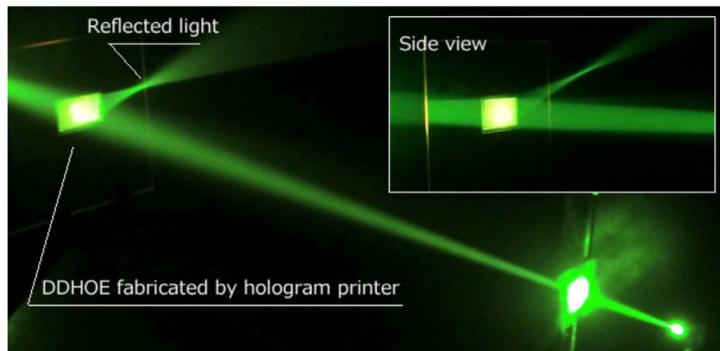
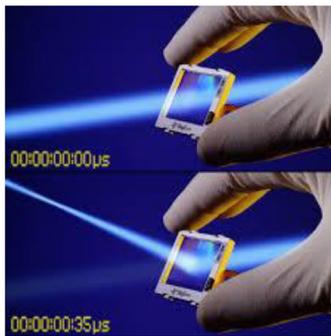


Digital HOE

Amplitude and phase of target optical component



Holographic optical element



* DDHOE : digitally designed holographic optical element

Holographic optical element

다양한 회절 소자에 대한 특성

특징	DOE	HOE	DDHOE
컬러재현	X (컬러 왜곡)	O	O
매질	Photoresist (no color selectivity)	Photopolymer (color selectivity)	Photopolymer (color selectivity)
영상 디스플레이	화질 저하	고품질	고품질
대량 생산	금형	1:1 복사	1:1 복사
Master 제작	리소그래피	실제 렌즈가 필요	프린팅
Freeform HOE 제작	설계 및 리소그래피	실제 렌즈 제작이 필요	설계 및 프린팅

- 25 -

Applications

Holographic head mounted display



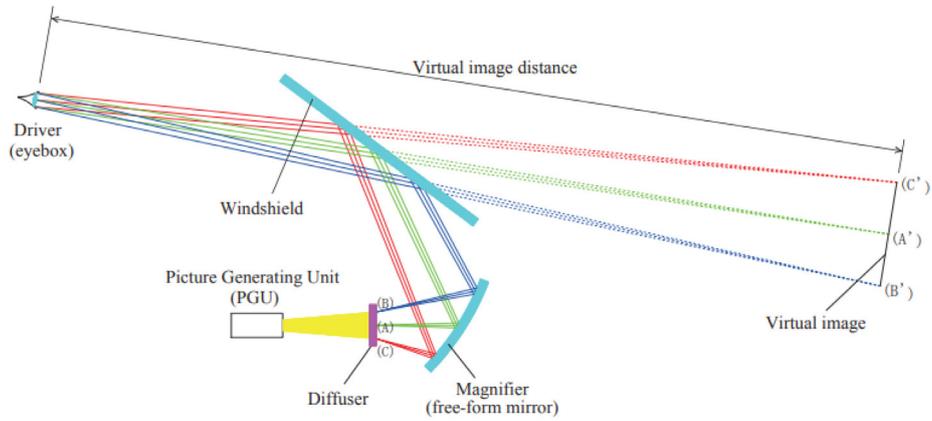
DigiLens & BMW partner on a Smart Motorcycle Helmet



- 26 -

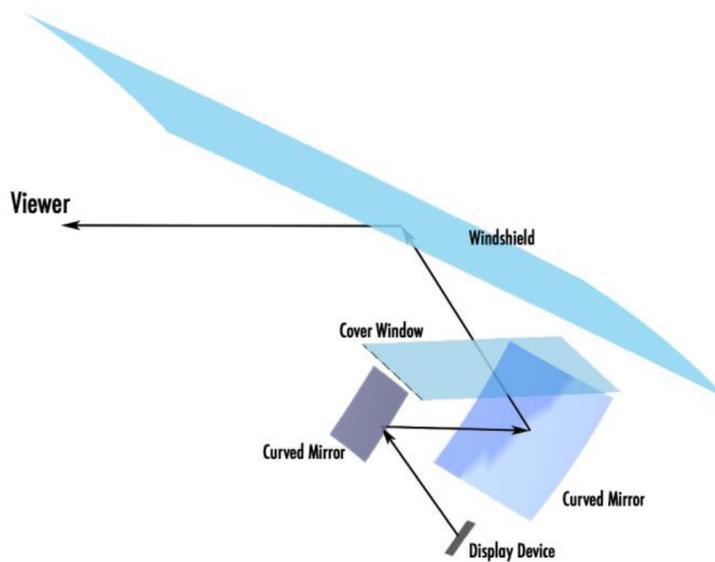
Applications

Conventional head-up display



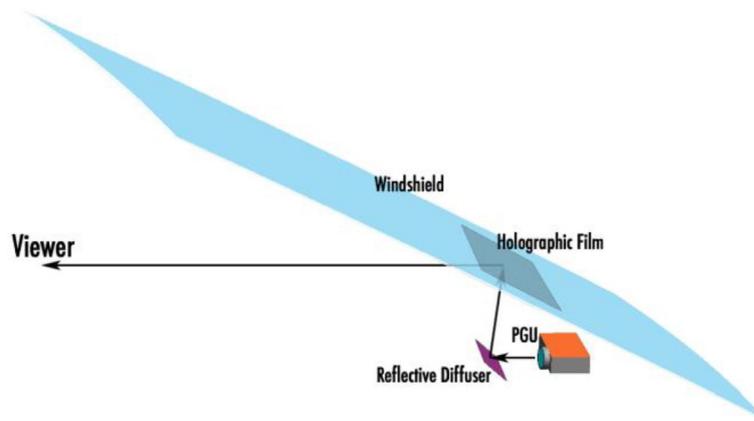
Applications

Conventional head-up display

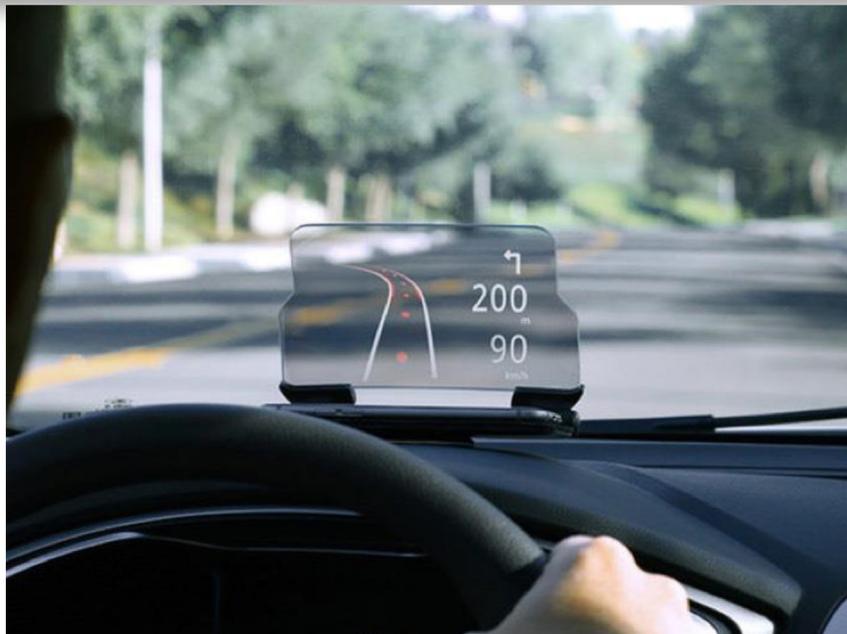


Applications

Holographic head-up display



Applications



Applications



Applications



Applications



- 33 -

Applications



- 367 -

감사합니다.

Q & A

Hoonjong Kang
E-mail: holowave999@wku.ac.kr

- 35 -