

# VR/AR/홀로그램과의 융복합 그리고 산업에서의 응용

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## ● Hologram ??



Star Wars



## ● Hologram ??



Manchester and London Luton airports



Hologram Hatsune Miku concert

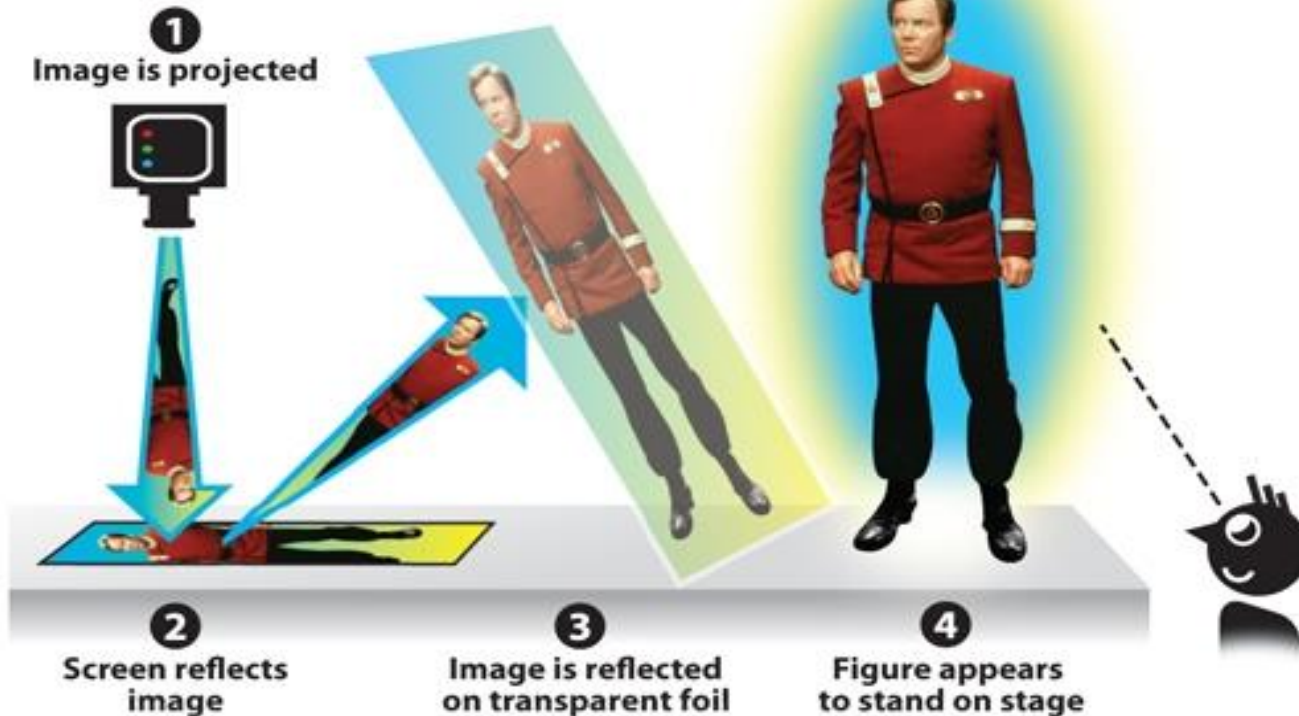


CNN's human 'hologram' on election night

## ● Hologram ??

### How 'holograms' work

While not truly 3-D, stage holograms use a high-tech spin on a 19th-century trick to make projections of celebrities look like the real thing.



Source: dailymail.co.uk

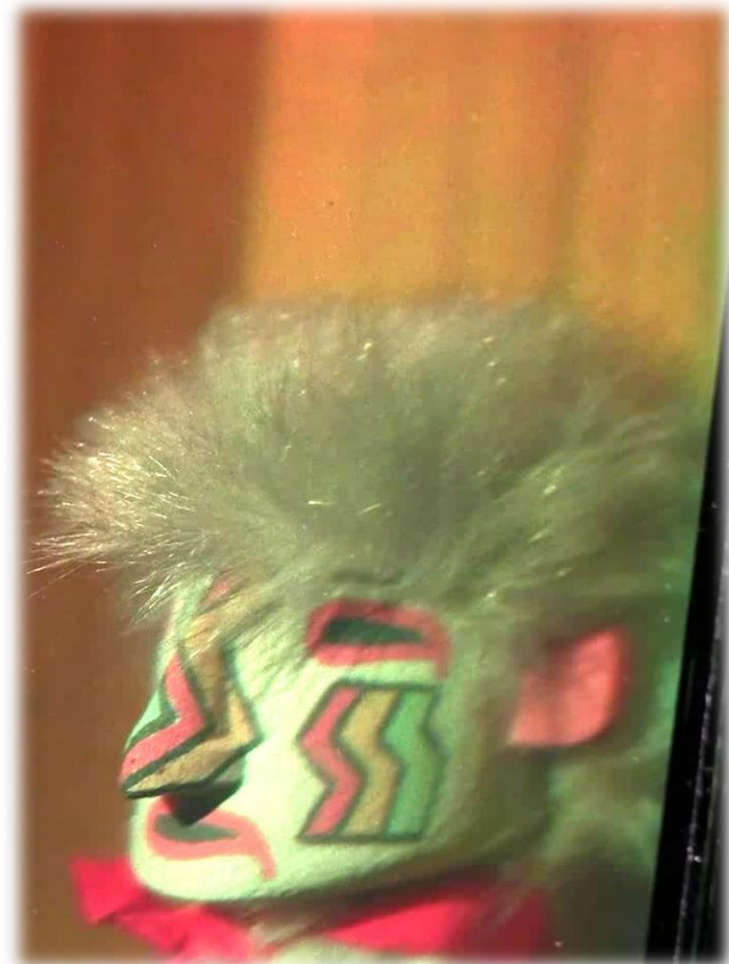
SCOTT WALLACE/STAFF

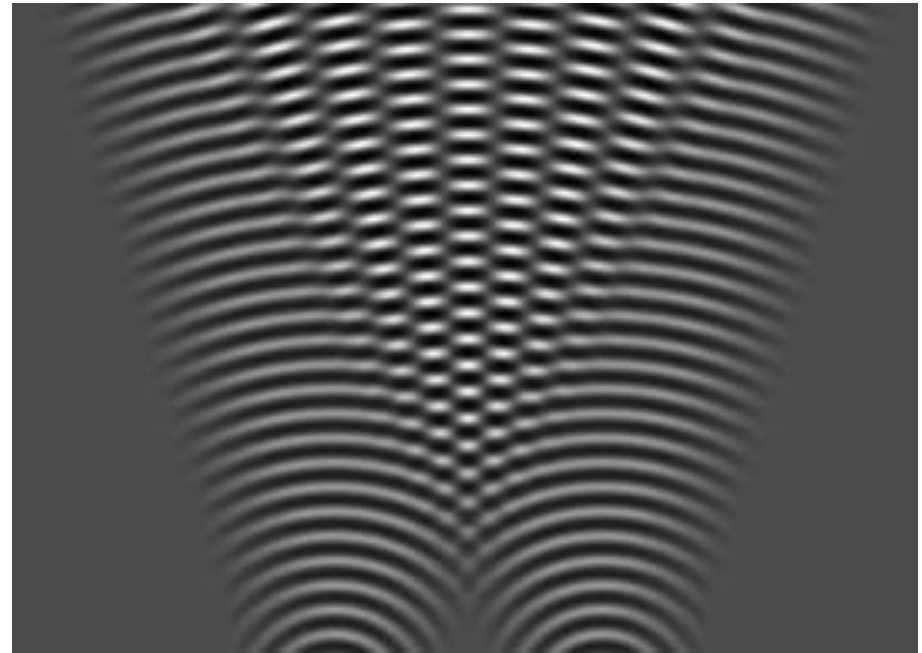
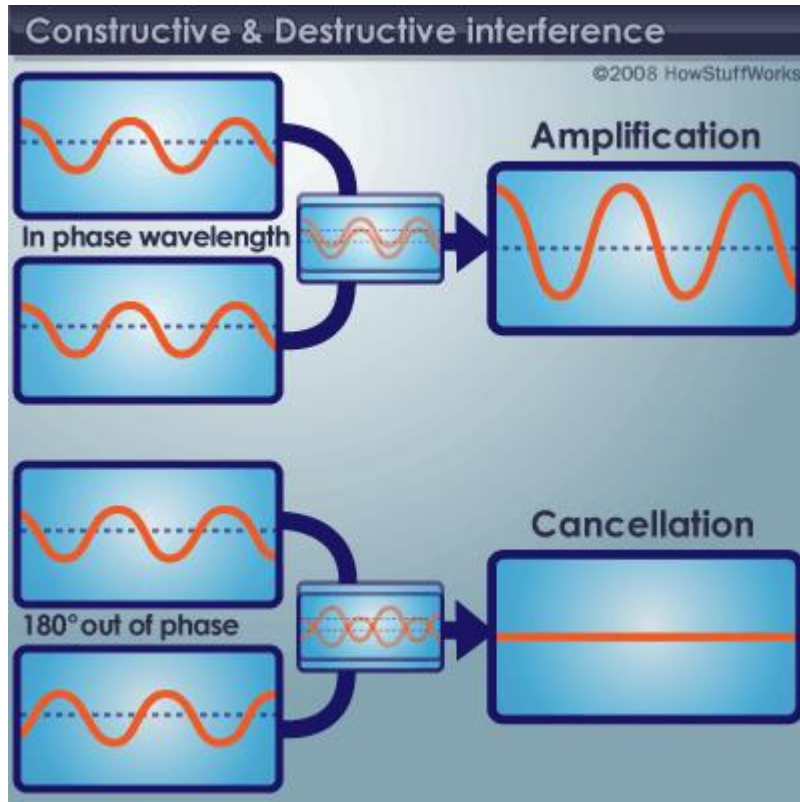


## ● Analog hologram

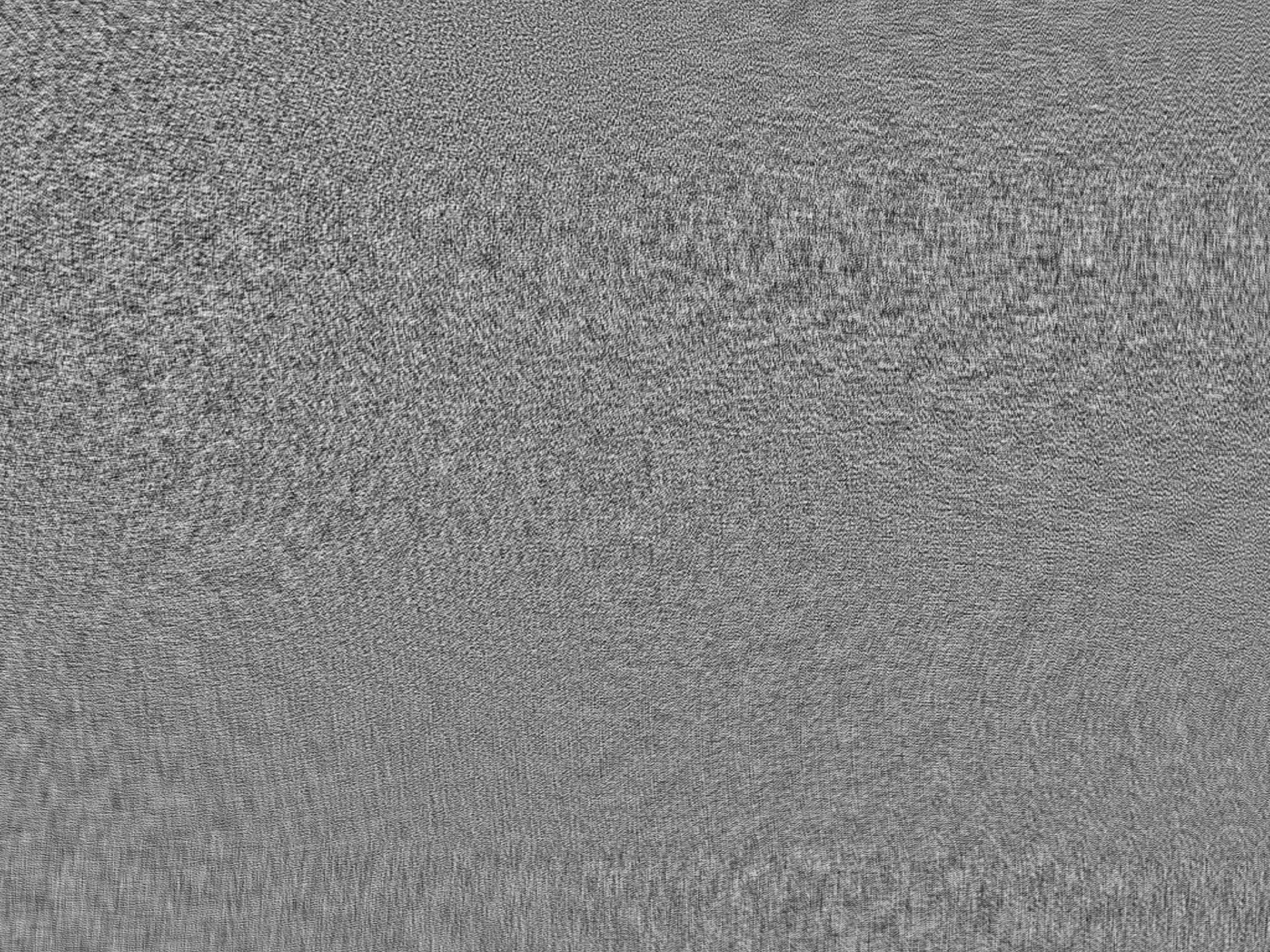


## ● 다양한 홀로그램







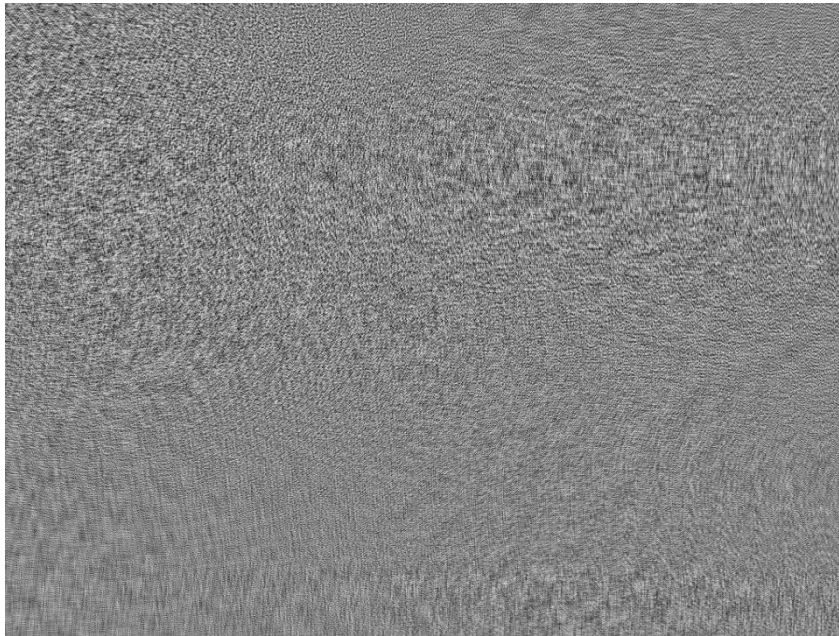




## ● Numerical reconstruction



## ● Point of view & information



**For light**



**For human**

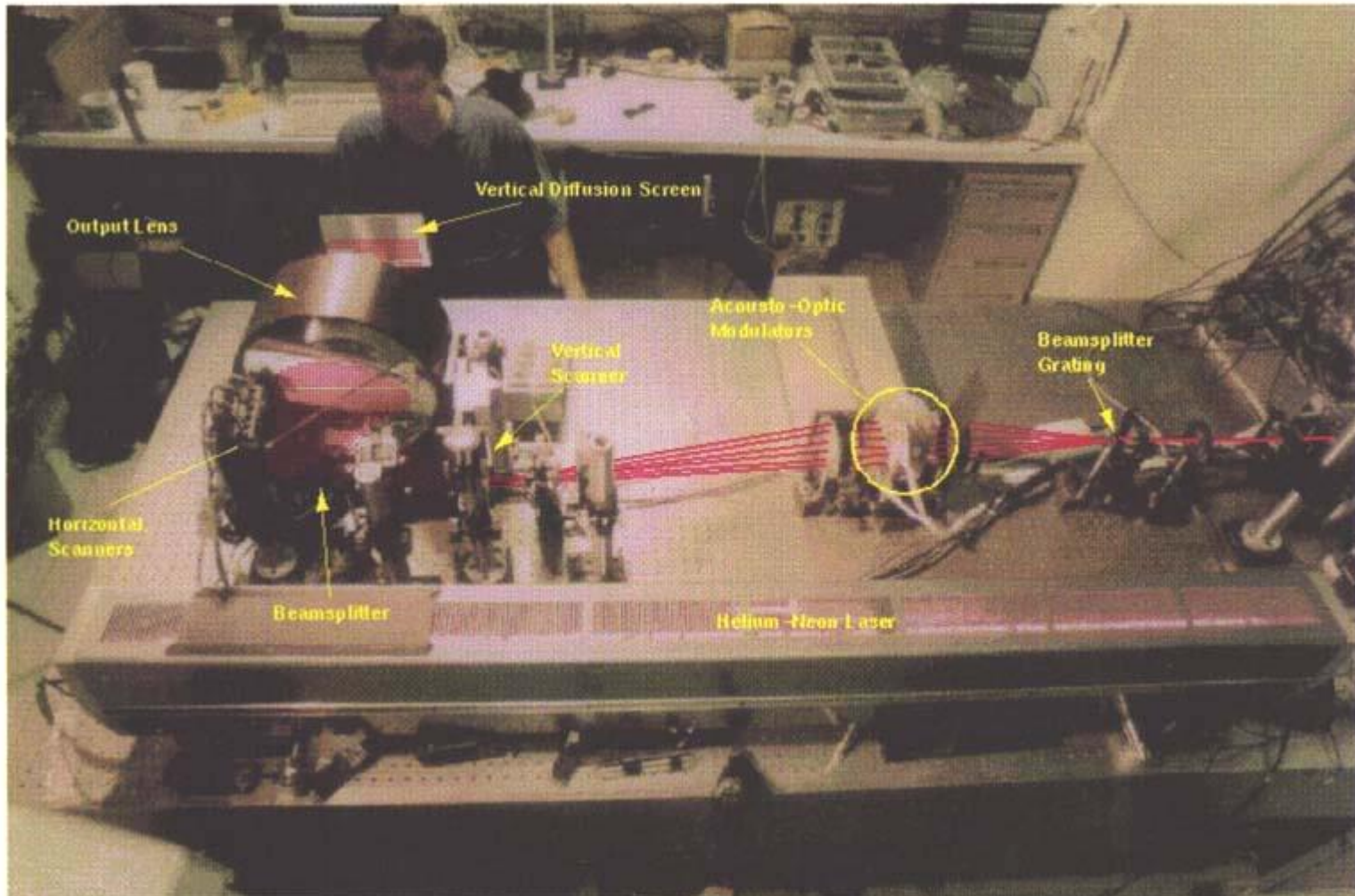
GPU 멀티코어 → 실시간 클라우드 포인트 추출, CGH 생성 기술(2K급)



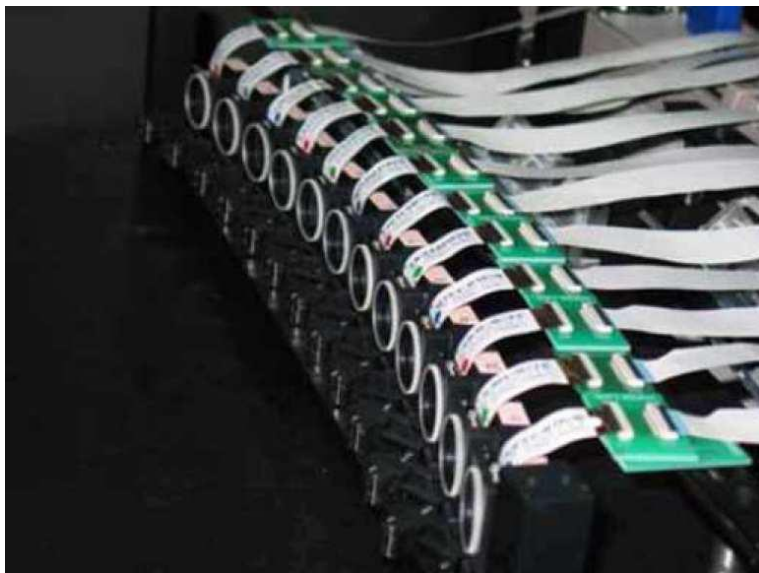
- 2K급 동영상은 KETI 보유기술(GPU&고속화알고리즘)로 실시간 가능
- 64K급 동영상은 클라우드 컴퓨팅(LG CNS) 환경 이용



## ● Holographic TV - AOD system



## ● 서울대학교 – 12 SLMs 다중화



- ✚ Circular configuration for holographic stereogram
- ✚ Viewing angle of about 22.8 degrees
- ✚ 12 SLMs

Seoul National Univ.

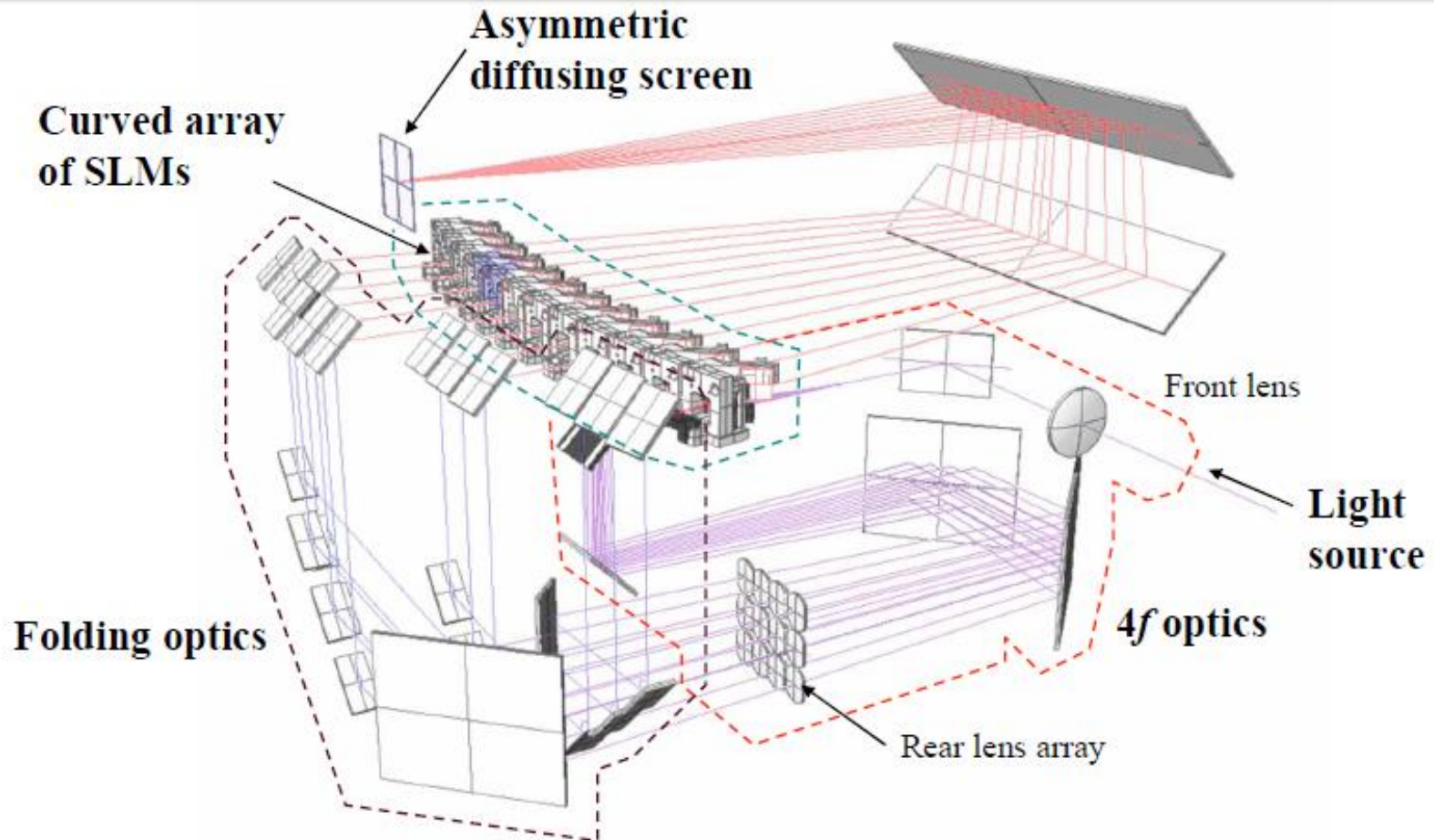


Fig. 10. Schematics of the proposed wide viewing angle dynamic holographic stereogram.



## QinetiQ

- Replay of a spatial-multiplexed, 3 x 8 billion-pixel, full-parallax, full-color, 3D image.
- These computer-generated holograms was calculated using a 102-node PC Linux cluster of dual IA-32 Pentium III 1.26-GHz Intel Tualatin-core 512-Kb cache CPUs.



## SeeReal

 20 inch Holography Technology Prototype



## ● Digital hologram applications

Conventional hologram

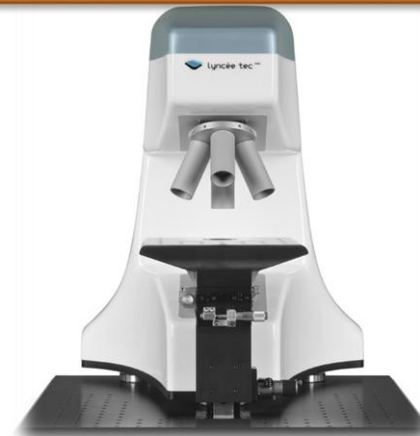


Digital  
processing

Holographic printer



Holographic microscope





## ● Digital hologram applications

Conventional hologram



**Not Yet!!**

**Digital  
processing**

Holographic TV

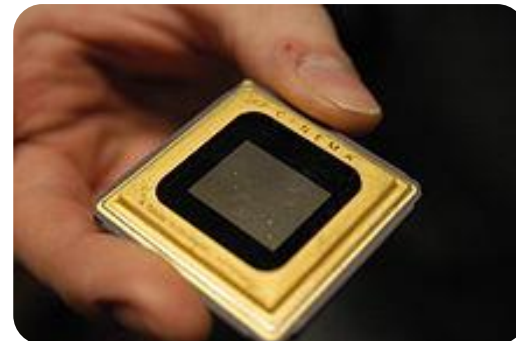


## ● Spatial light modulator

### ✚ Addressing method

#### ◆ Electrically addressed spatial light modulator (EASLM)

- Liquid crystal display
- Liquid crystal on silicon
- Digital micromirror device
- Acousto-optical Modulators



#### ◆ Optically addressed spatial light modulator (OASLM)

### ✚ Type

- ◆ Amplitude-only SLM
- ◆ Phase
- ◆ Amplitude



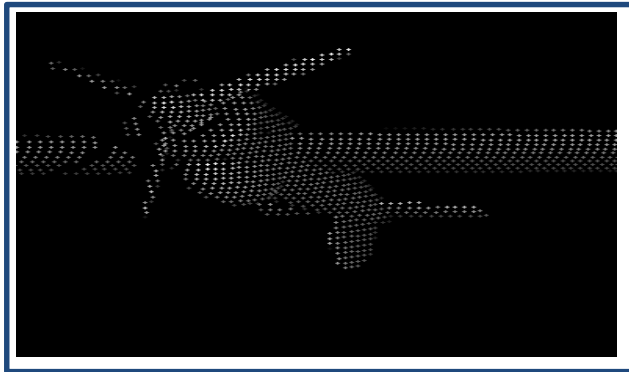
- 홀로그래픽 전용 디스플레이 패널?



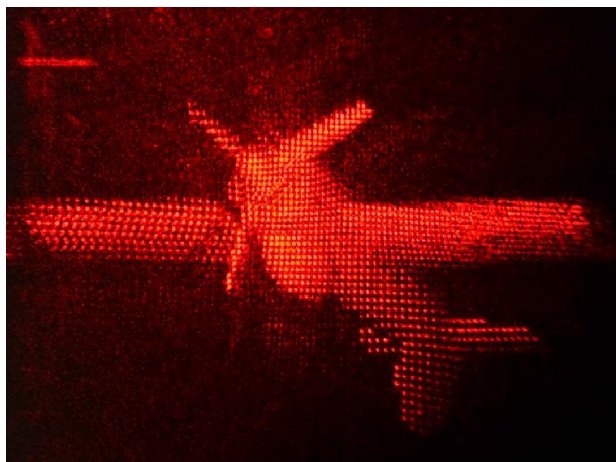
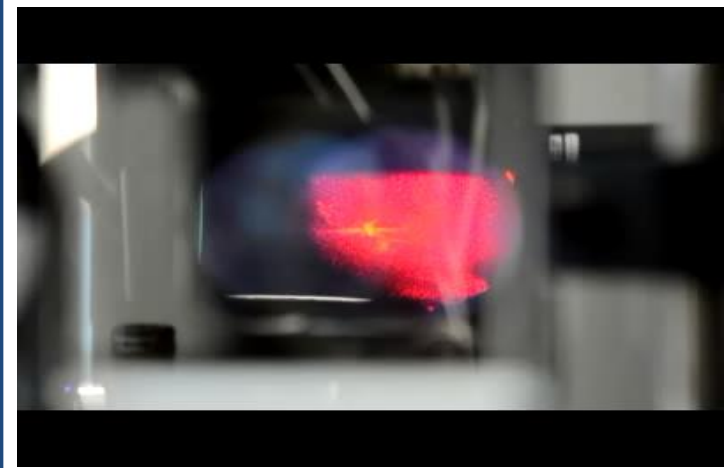
Micro display panel : 0.6 inch



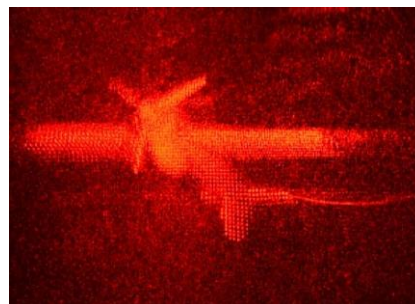
## ● Holographic display



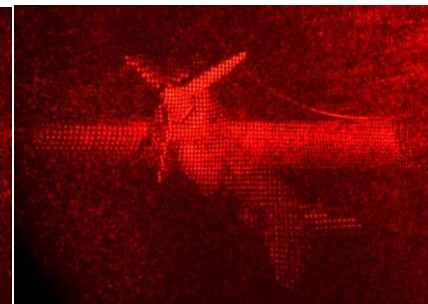
+ Numerical reconstructed image



-left-



-center-



-right-

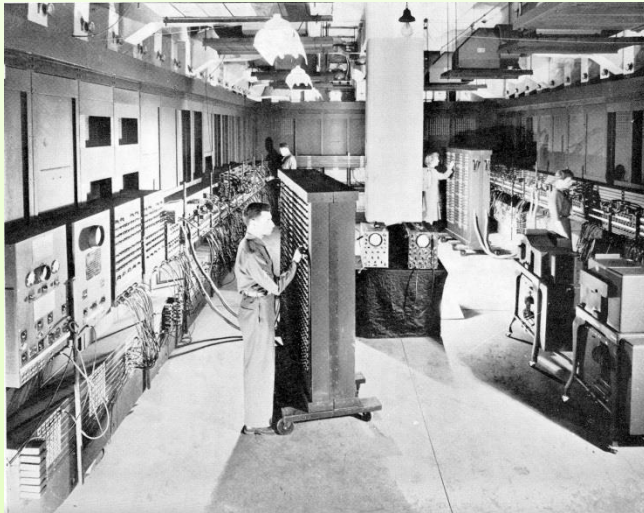
+ Optical reconstructed images

## ● ENIAC Computer



- 폭: 24 m
- 높이: 2.518 m
- 깊이: 0.945 m
- 총 중량: 약 30 t
- 진공관 갯수: 약 18,000개
- 릴레이: 1500개
- 작동 전력: 150 kw
- 개발비 총액: 49만 달러
- 1947년 7월 29일에 작동을 시작  
해 1955년 10월까지 10년간 활  
용
- 매초 5000회 가산 14회 곱셈을  
실행

## ● 컴퓨터의 발전



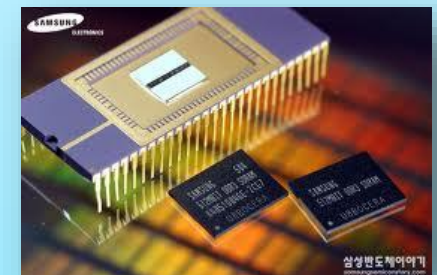
1947년 ENIAC computer



1954년  
Transistor computer



Super computer





# 디지털 홀로그램 기술 및 응용

사진



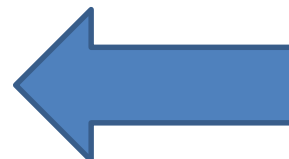
흑백 TV



컬러 TV



평면 & 3D TV



Holographic TV





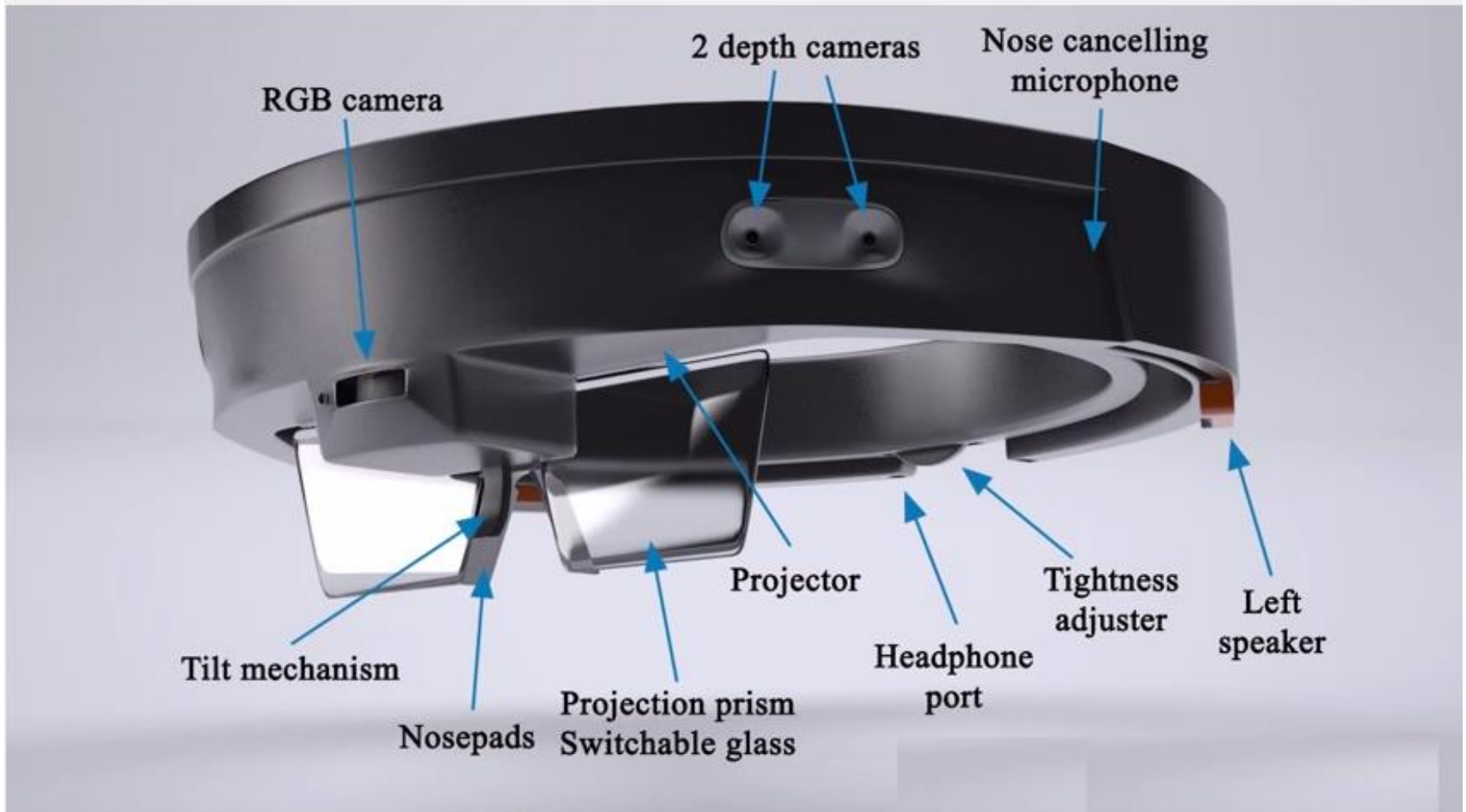
- Holographic head mounted display



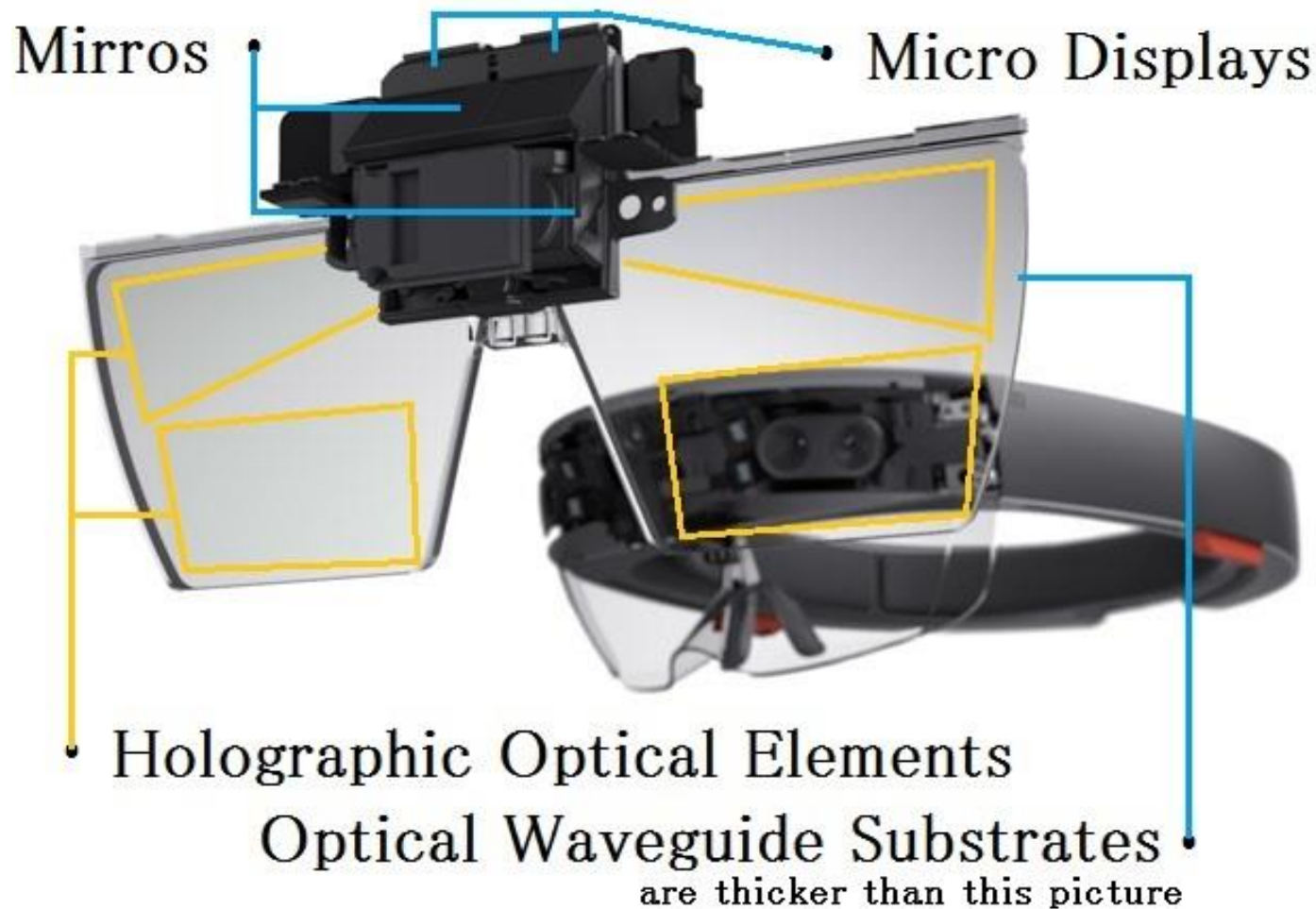
## Microsoft - HoloLens



## ● Holographic head mounted display



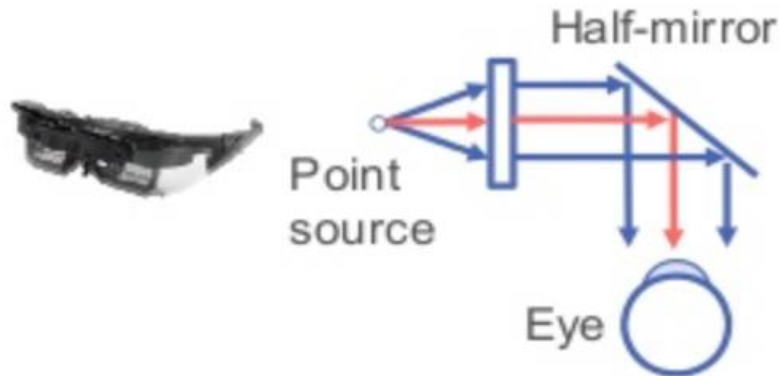
## • Holographic head mounted display



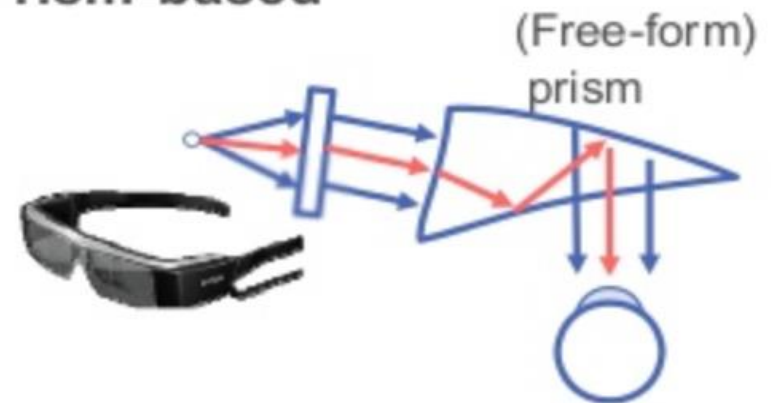


## ● Holographic head mounted display

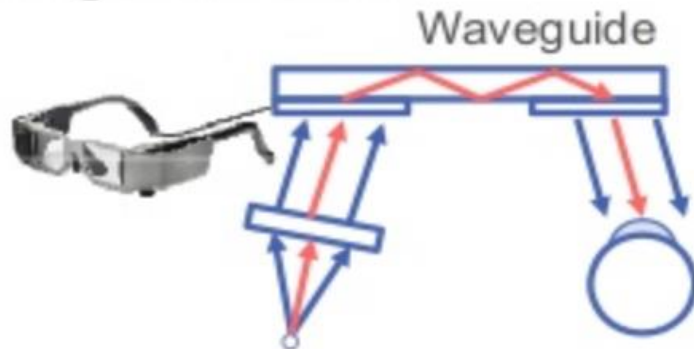
### Half-mirror



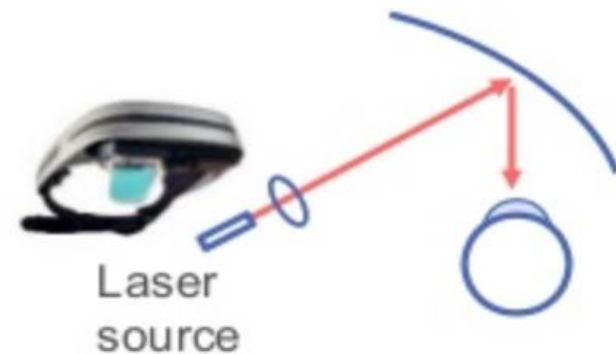
### Prism-based



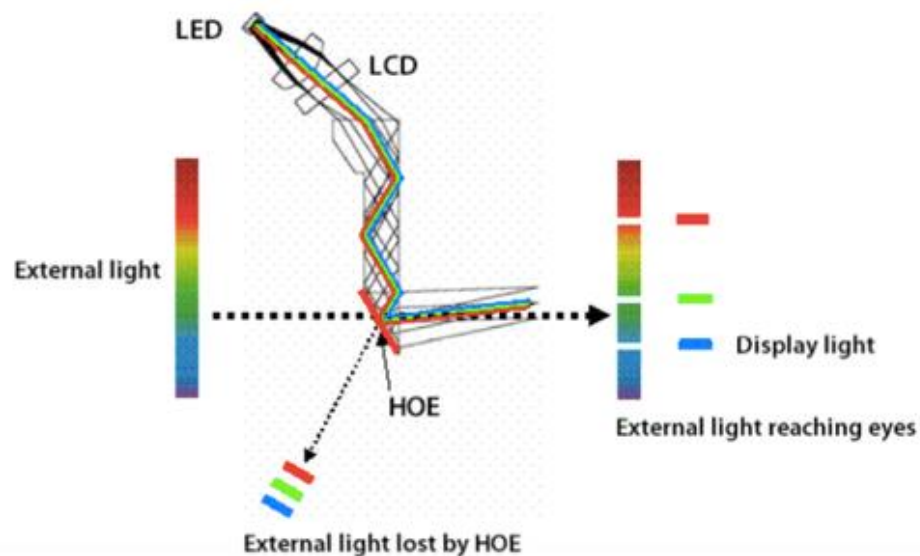
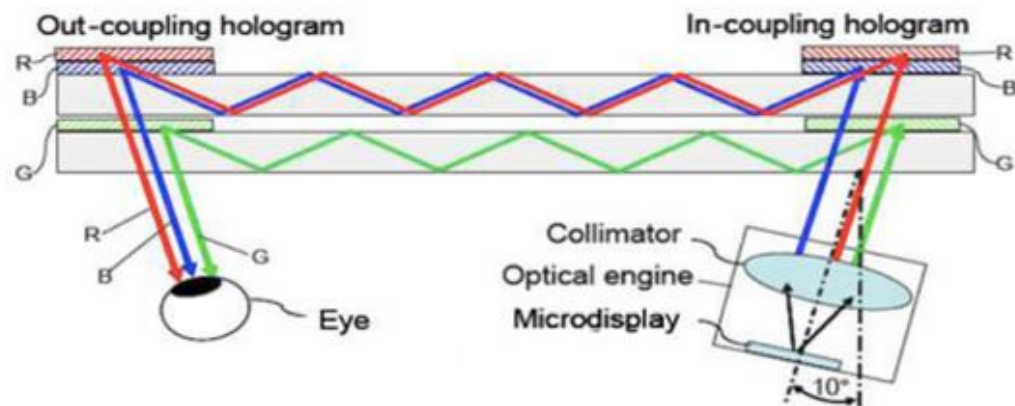
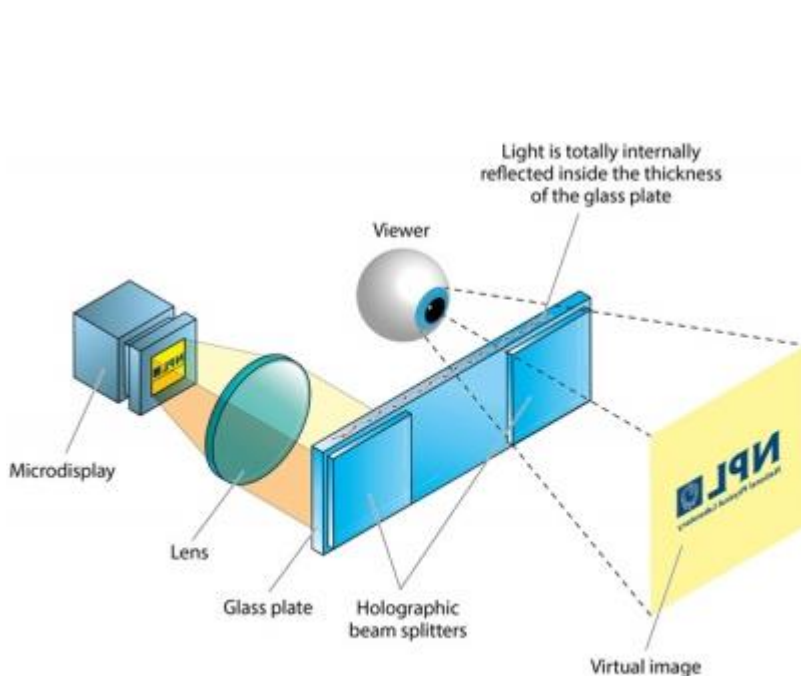
### Waveguide-based



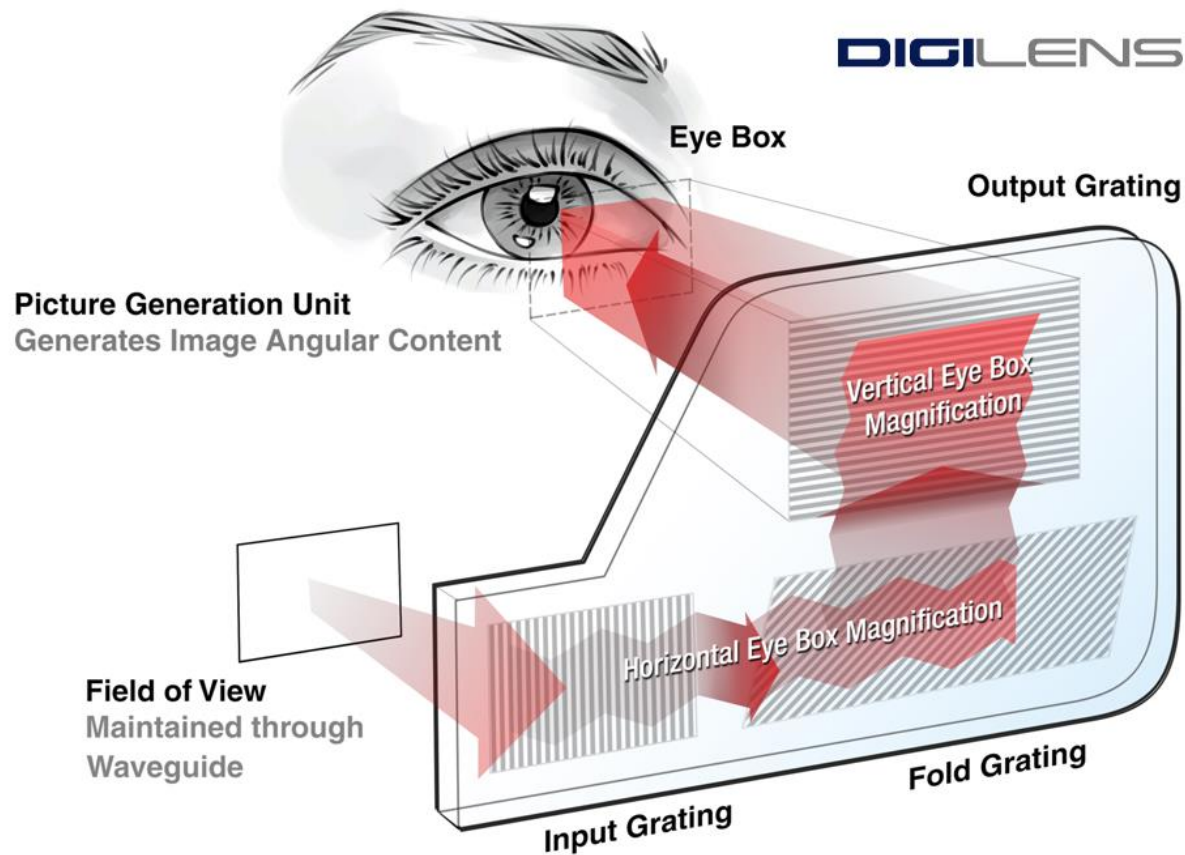
### Retinal Scanning



## Holographic head mounted display



## ● Holographic head mounted display



## ● Holographic head mounted display



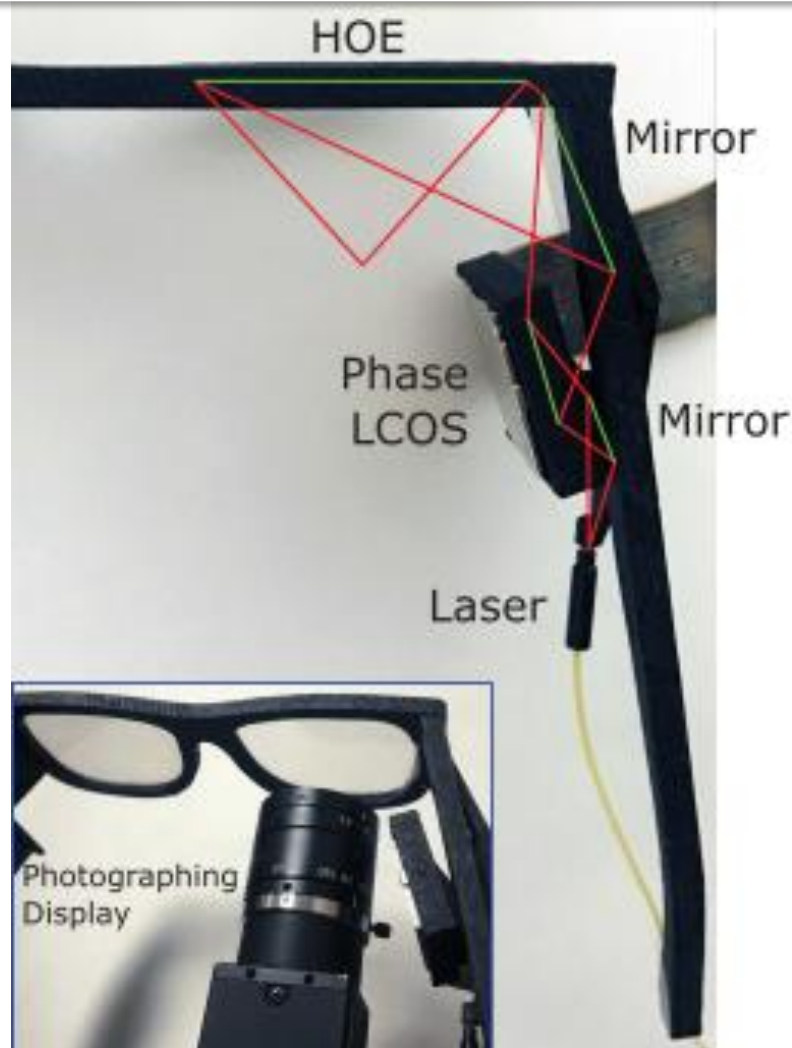
DigiLens & BMW partner on a Smart Motorcycle Helmet





## ● Holographic head mounted display

Microsoft  
Siggraph 2017

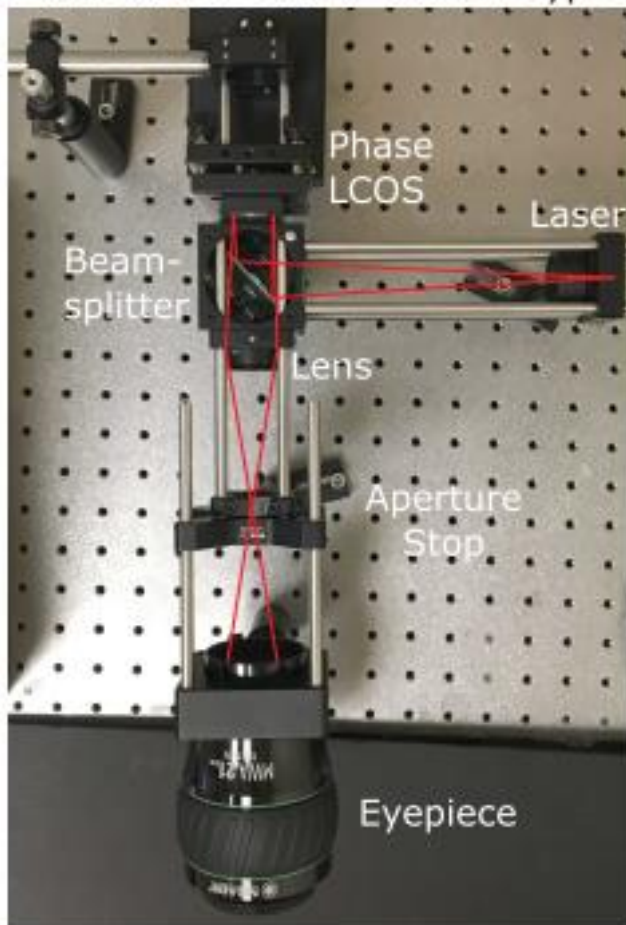


## ● Holographic head mounted display

Microsoft  
Siggraph 2017

FM: Microsoft's Siggraph 2017 paper

Wide Field of View VR Prototype

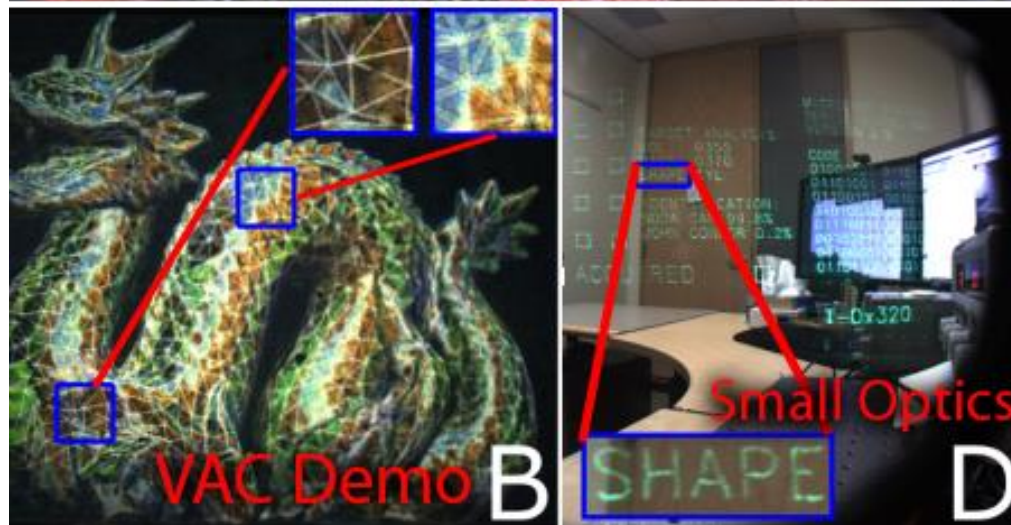


Multi-focal VR Prototype



## ● Holographic head mounted display

Microsoft  
Siggraph 2017



- **Holographic head mounted display**





- Holographic head mounted display



## ● Hologram in car



## ● Hologram in car





## ● Hologram in car

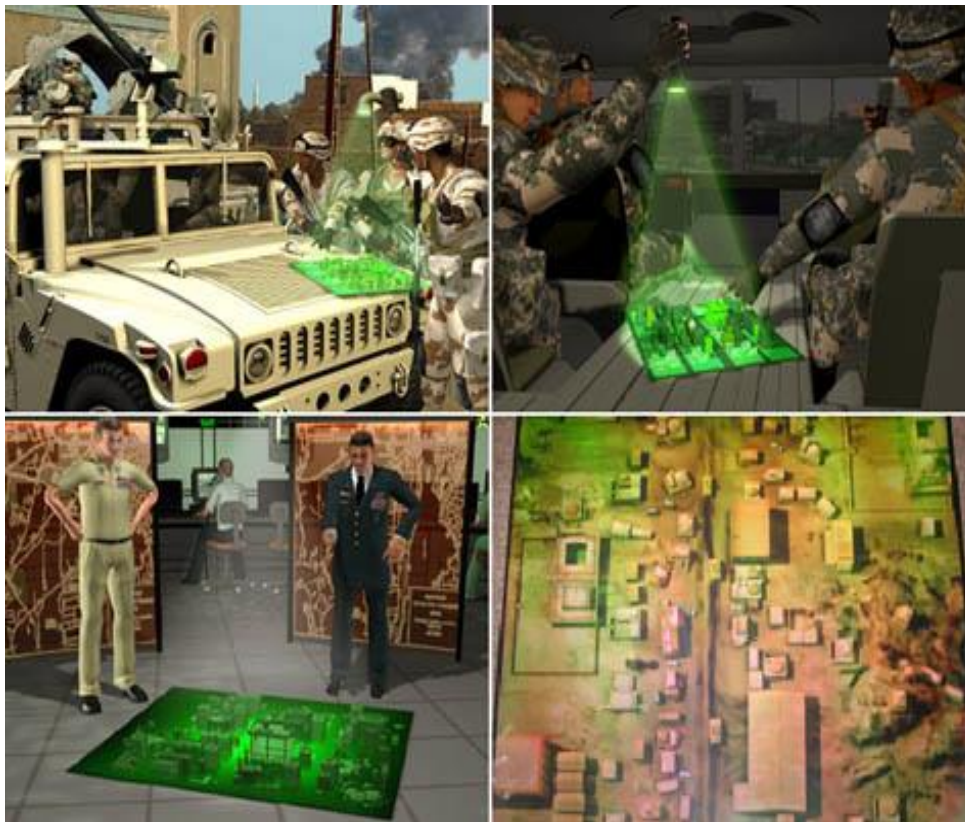




## Printed hologram



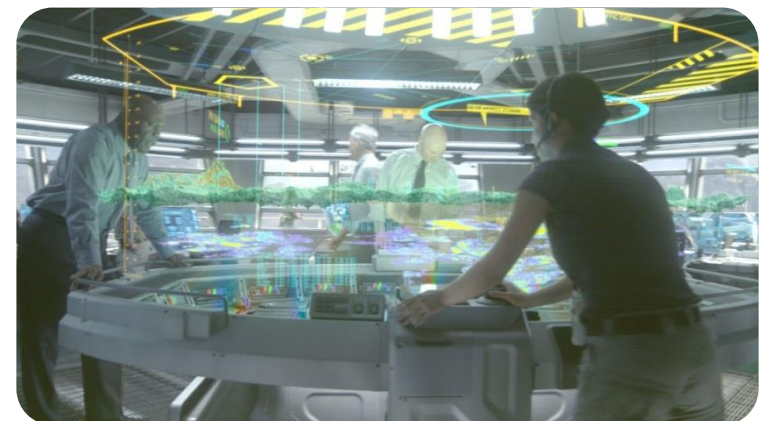
## ● Hologram Vision - 국방



군사 지도

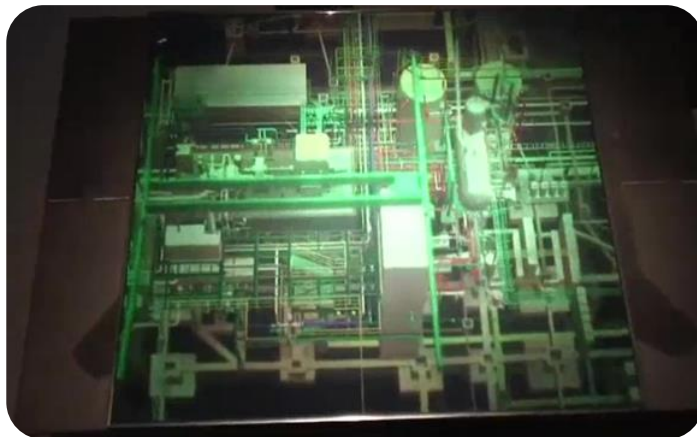


군사 지도



3D Hologram\_(Avatar)

## ● Hologram application



- **Holographic printer : Zebra Imaging**



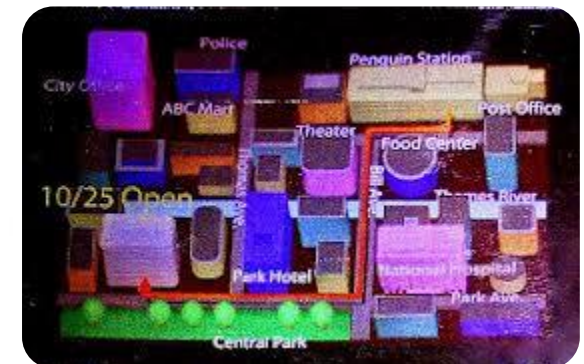
Zebra Imaging



- **Holographic printer : Rabbit Holes**



- Holographic printer : Pioneer



# 디지털 홀로그램 기술 및 응용

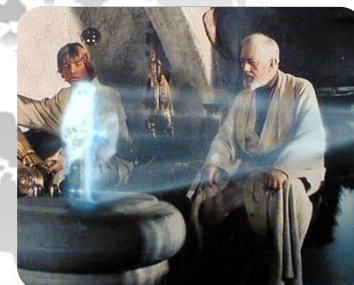




Holographic  
Techniques



NO!!



Only display ?

Holography industry

Display

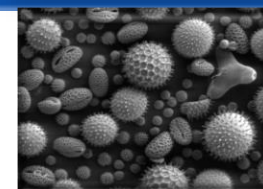
Broadcasting

Energy

Security

Medical

Education



향상된 인간의 삶 추구 / 인간 친화 적인 사회



NOW

FUTURE

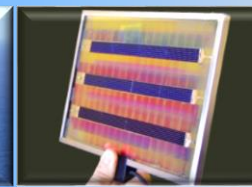
Display



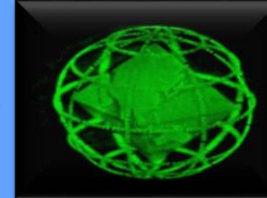
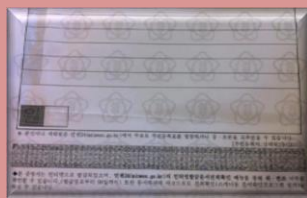
Broadcasting



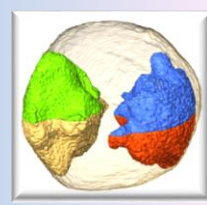
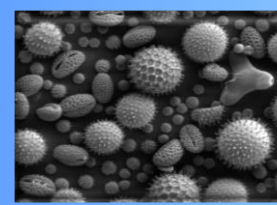
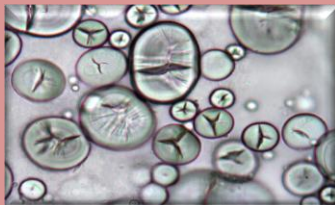
Energy



Security



Medical



Education



# 감사합니다.

## Q & A

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