

microoled

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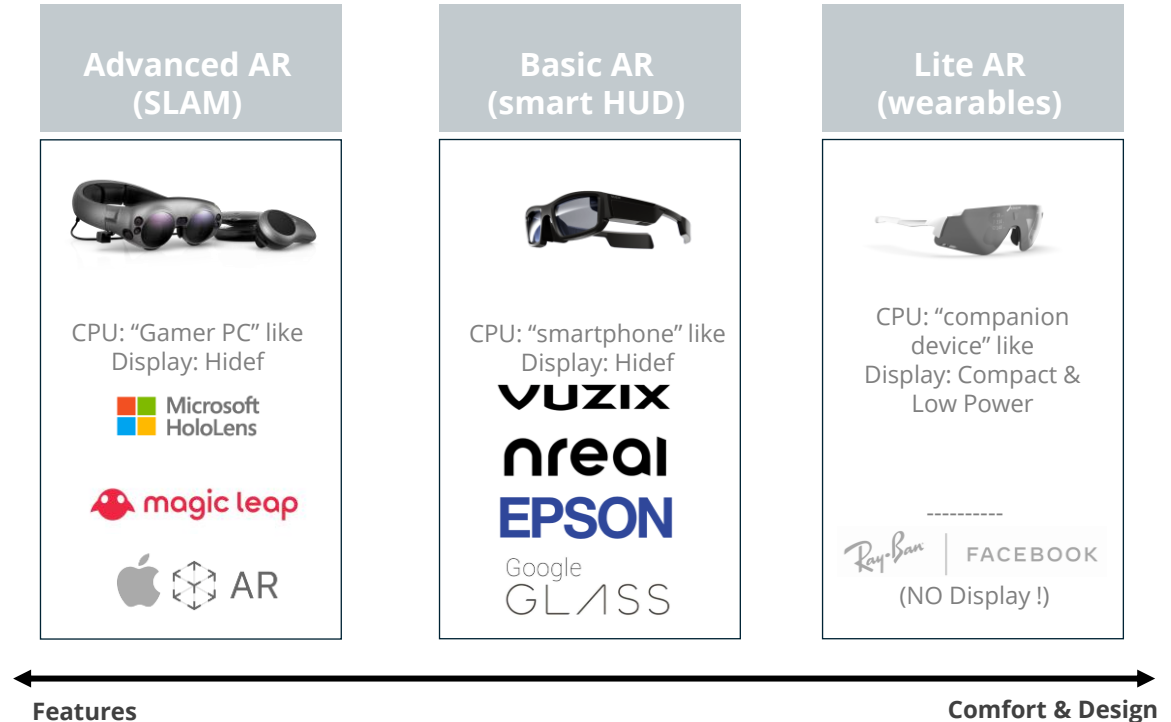


Smart AR Glasses: a Very Low Power Companion Device

EPIC Meeting on Photonics for AR/VR/MR, May 31st 2023

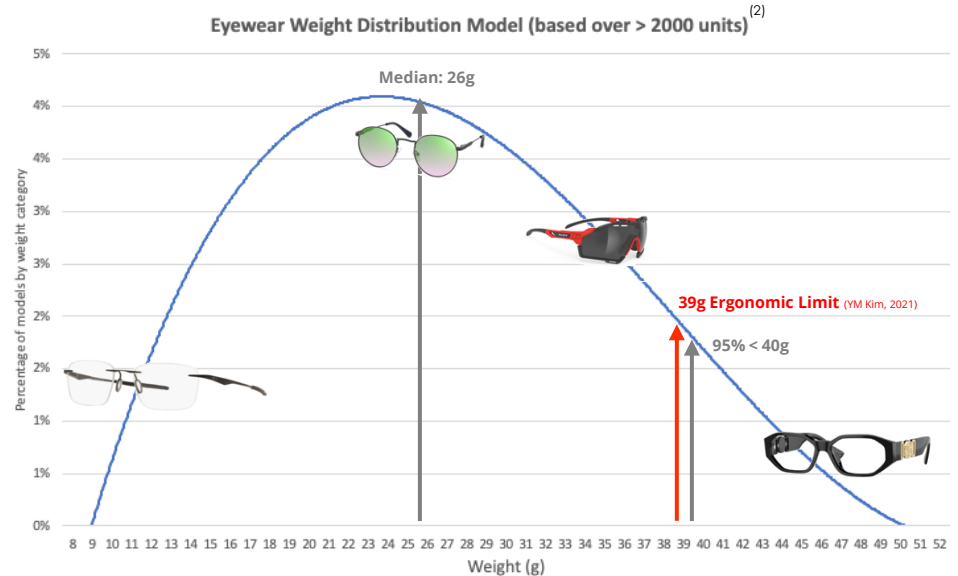
"Lite AR" : obvious demand, but ... difficult to address!

- AR has been and still is a **difficult engineering problem**: basic laws of physics make the the ideal weight / design / autonomy compromise conundrum difficult to solve.
- The industry has answered his problem by **making compromises** which resulted in 3 segments: Advanced AR, Basic AR and Lite AR.
- The basic **rules of engagement** in the Lite AR segment:
 - **Weight < 40g**
 - Autonomy of 1 day
 - Smart AR Glasses is a Fashion business



Lite AR glasses weight < 40g

- Glasses are susceptible to gravity, just like anything else. There is a force pulling down on them, and the heavier the glasses, the greater that force is.
- Eyewear needs to be light to be comfortable: glasses are worn ~18 hours a day.
- For that reason, the eyewear industry has endeavored to make the glasses as light as possible:
 - **Average glasses weight : 26g**
 - 95% of all glasses are < 40g
 - Glasses > 40g are pure “extreme” fashion model where comfort is clearly not the main focus of the design.
- Scientific studies⁽¹⁾ have shown that **beyond 39g, there are comfort and wearability issues.**
- We believe this limit is even lower when users are involved in physical activity.



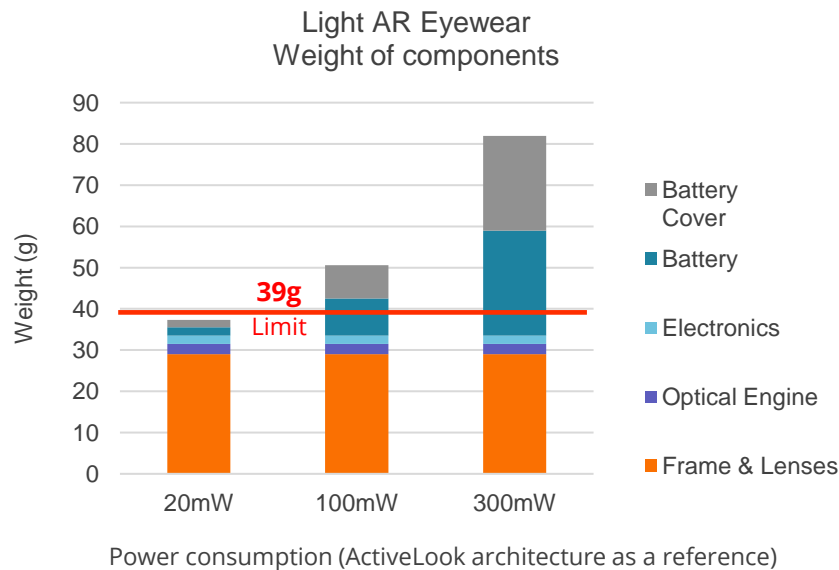
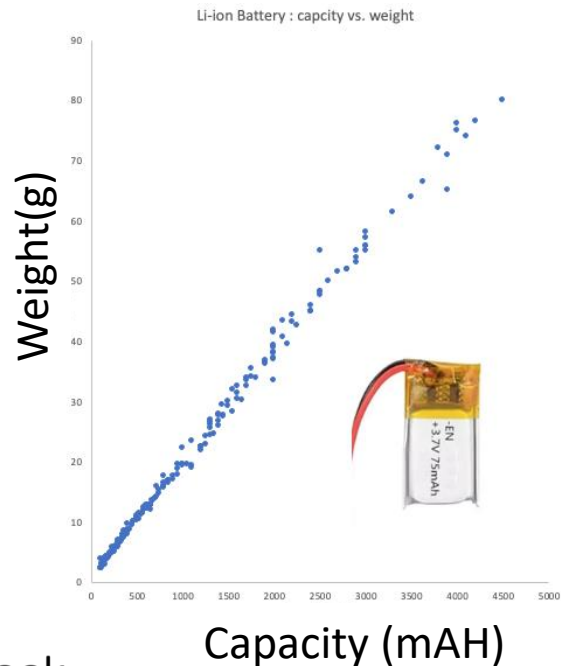
Sources:

⁽¹⁾ Wearing comfort and perceived heaviness of smart glasses, YM Kim, 2021; Expected to be less than 40g for “dynamic” activities.

⁽²⁾ Eyewear Weight Distribution model from Microoled internal sources and undisclosed eyewear partner database.

Lite AR : Autonomy, Weight, & Battery Size

- The bigger the power consumption, the bigger the battery.
- The bigger the battery, the more material (weight) is needed to cover it.
- Battery time > 18 hours => Power consumption is a major issue for "Lite AR" because of the ergonomic weight limit beyond which it starts to feel uncomfortable: 39g



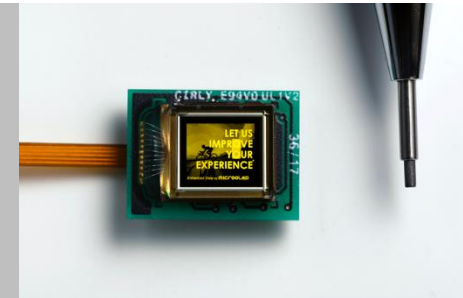
Low Power AR Glasses Design implications

- **Battery Life requirement (> 12 h)**
 - Industry : 8 h shift -> 12h battery life
 - Consumer : 18-24 hours (ex. Apple Watch)
- To meet the battery weight budget of only a few grams, **power consumption needs to be less than 10mW**
- Low Power Smart Glasses Design implications:
 - “Companion Device” architecture: minimize computation in the glasses with low power CPU (5 mW)
 - Minimize Radio traffic (BLE TX & RX : 15 mW) with low bandwidth data protocol.
 - **Minimize Display Power consumption (<5mW)**



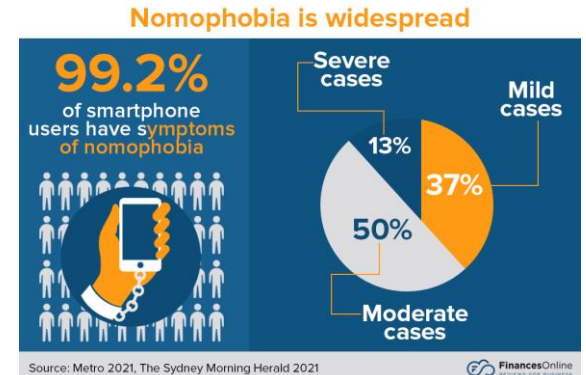
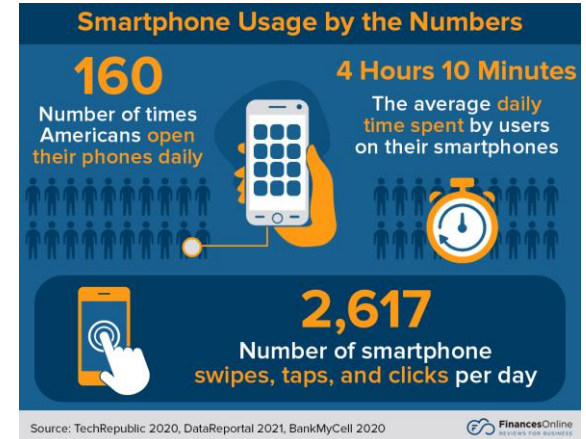
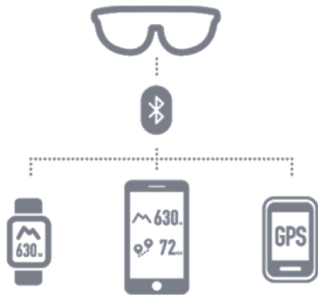
**Companion Device
Architecture
with low
radio traffic
and
Open API**

**Low Power
1 mW
OLED μ Display**



Lite AR glasses are a companion device

- Do we expect to smart glasses to replace smartphones with smart AR glasses ?
- Actually, we expect users to keep their smartphones:
 - {behavior} Smartphone addiction !
 - {behavior} Smart phones companion devices are well accepted (smart watches, earbuds, ...)
 - {system} Leveraging the external resources (CPU, memory and battery) of an external device helps to solve the very difficult problem of smart AR glasses weight and autonomy compromise.



ActiveLook® : a 6g heads-up display module

- Provide **an integrated solution that focuses on “Low Power”** AR, hence solving weight, autonomy, design, and use case at the same time.
- Position the platform as a **companion technology** of other devices to minimize the functions (and power consumption) to be embedded in the glasses.
- Facilitate the technology adoption and create an ecosystem of content stimulated by an **Open & Free API**
- Focus on mission critical use case: real-time visual information in hands-free or mobile activity use cases.

Unique Microoled display

- **Low power: typ. 1mW** , made possible because of “memory pixel” design to avoid need for refresh scanning
- **High Brightness:** Efficient “Yellow” OLED compound (10 000 nits). Super high brightness option (Tandem Architecture => 20 000 nits).
- Resolution: 304 x 256 pixels enabled by extremely high pixel density, 16 “grey” levels.

BATTERY

12 -24 hours battery life
with display always on.
(~1 week with few hours per day)

SEE-THROUGH OPTICAL SYSTEM

2 SENSORS

Ambient Light
Gesture

LENSES

ActiveLook
Design

ELECTRONICS MODULE (BLE)



MICRO-DISPLAY MICROOLED



ActiveLook®

by microoled



Thank you!

