CIS373 - Pervasive Computing Wearable Computing

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Adapted from materials provided by Xiang Cao

Business

In 2013, investors poured $458 million into 49 wearable company deal (*CB Insights*)

$50 Billion Industry by 2017 !! (*Credit Susse*)

Major tech companies like Apple, Google, Samsung and Intel investing heavily in wearables, with non-tech giants like Nike, Under Armour, Adidas, etc.

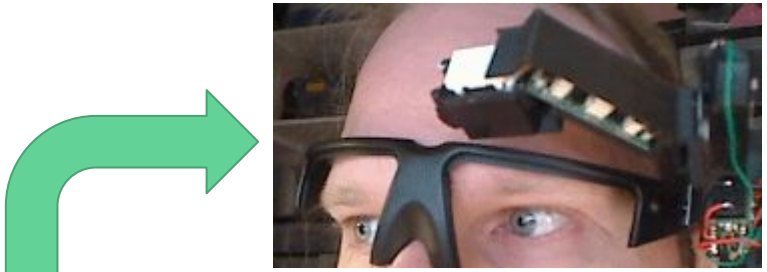
"The global **wearable computing market size** was valued at **USD 59.34 billion in 2022** and is expected to grow at a compound annual growth rate (CAGR) of 20.2% from 2023 to 2030."

https://www.grandviewresearch.com/industry-analysis/wearable-computing-market-report

What is wearable computing?

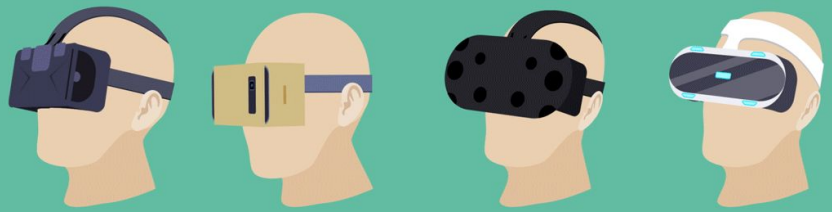
A distributed, multi-sensor system architecture designed to provide a wearable computer with a wide range of complex context information

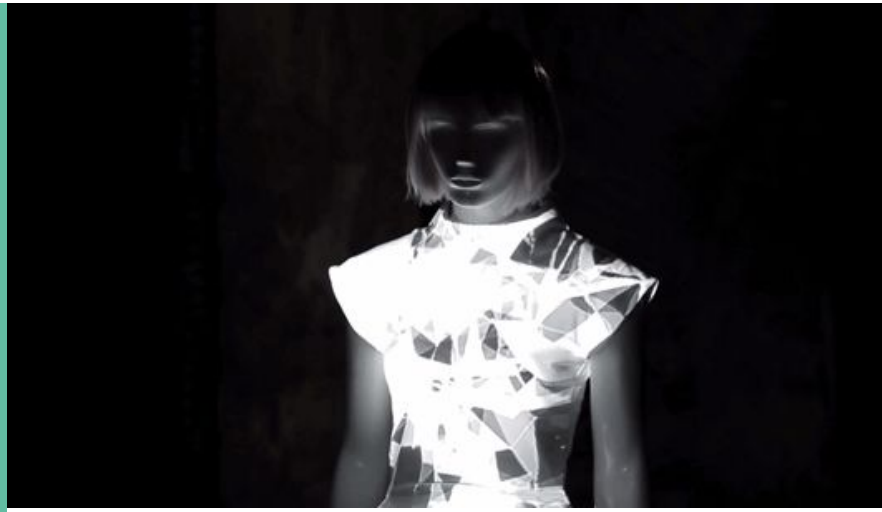
What are some examples you can think of?



https://blog.adafruit.com/2013/11/20/raspberry-pi-wearable-computer-glasses-wearablewednesday/

What are some concerns you may have here?

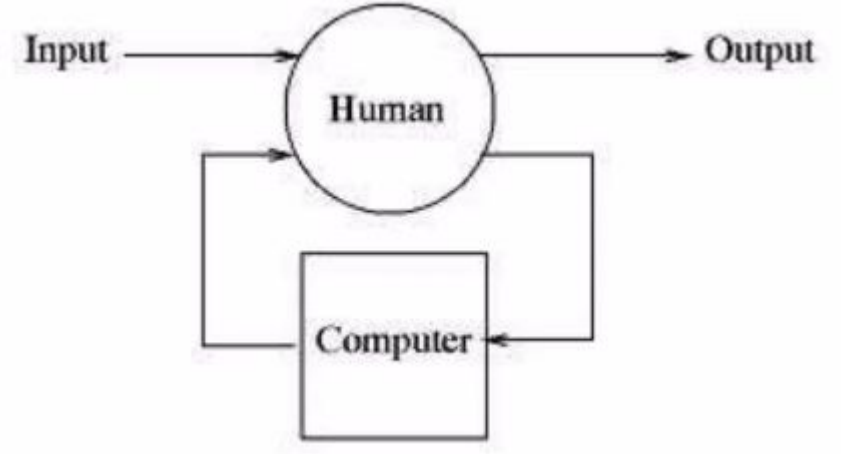




Typical components

Some form of computing device worn by a human *somewhere*

- Powered by battery or some form of regenerative power supply

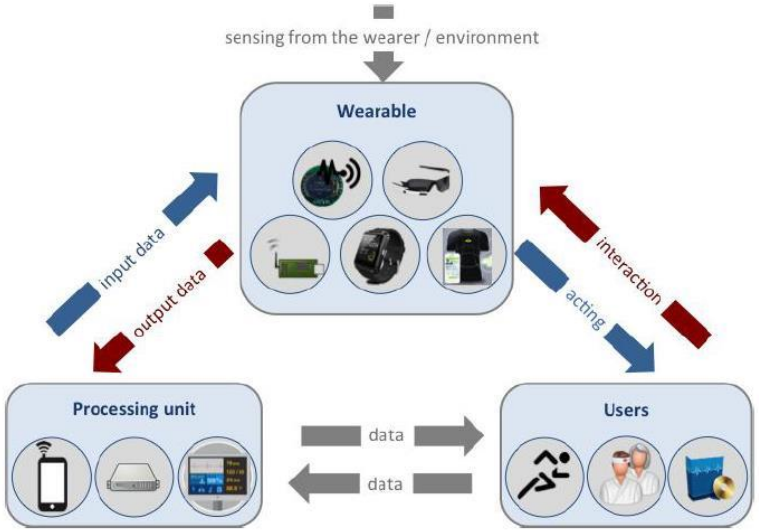


Inputs / Outputs

Any form of I/O is feasible!

Input: Touch sensor, IR, buttons, speech recognition, etc.
- Think of your Bluefruits!

Outputs: Sound, light, haptics, etc.
- Same!



Recent!

CES**2024**: Insane Wearable Tech!
https://www.youtube.com/watch?v=BcZZOIdpISw

The Future of Wearable Technology - CES **2015**
https://www.youtube.com/watch?v=8WBEEWEhKAc

Communication

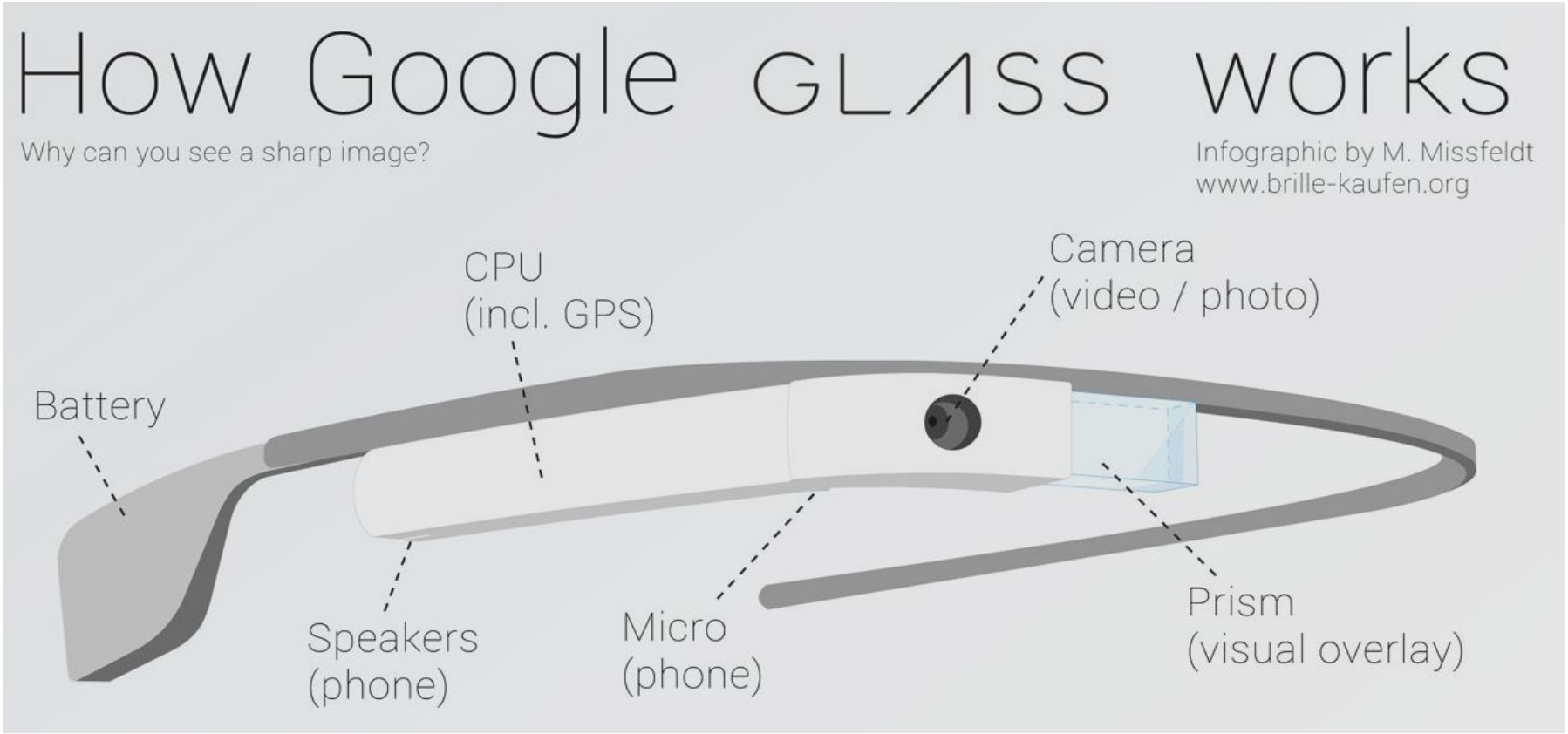
Take advantage of common protocols

- WiFi, Bluetooth, cell...

To us, as long as a path of communication is feasible, no reason not to use it!

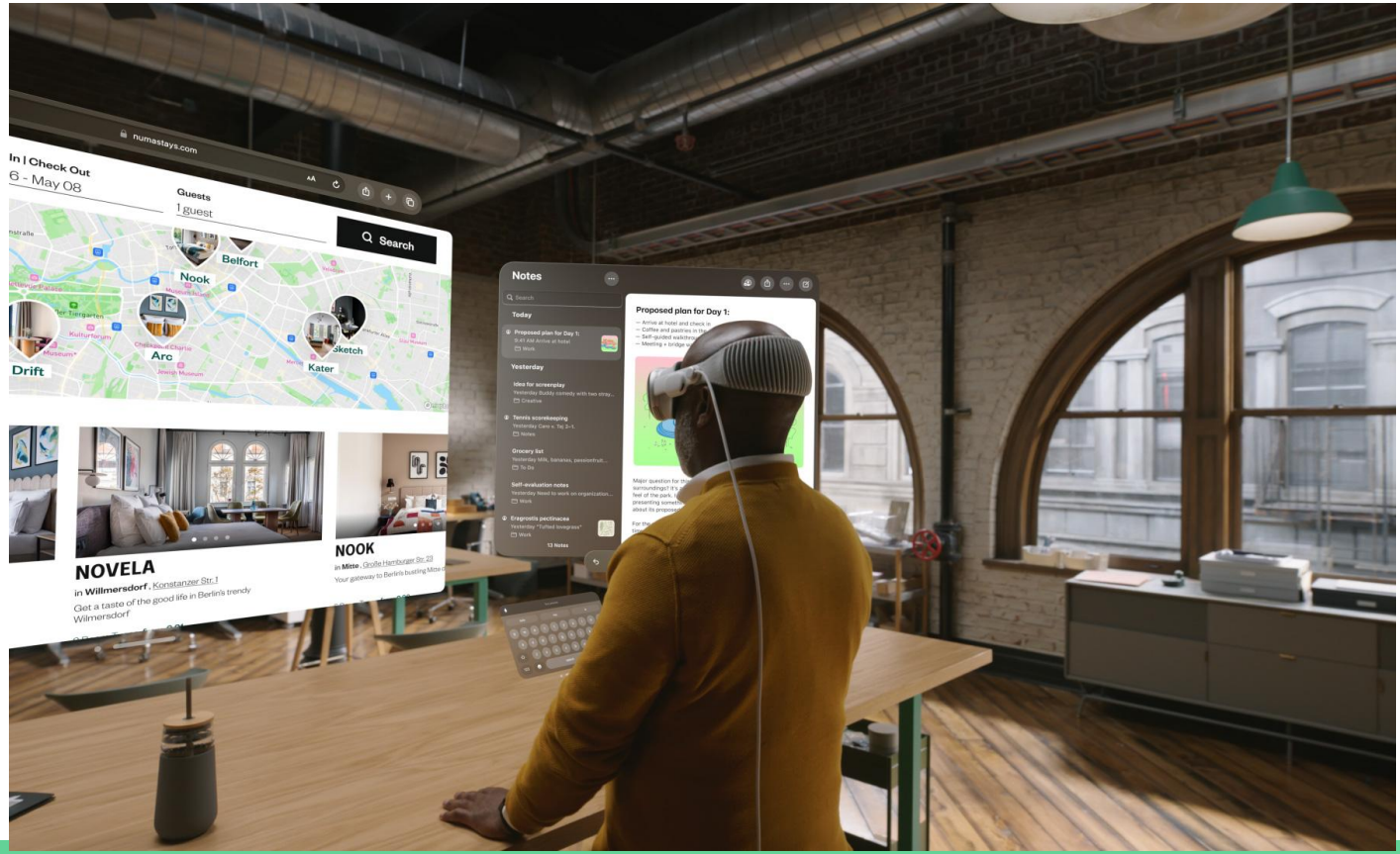
- Though, some are more energy-efficient than others
  - Bluetooth Low Energy, for example

Google Glass (Smart Glasses)

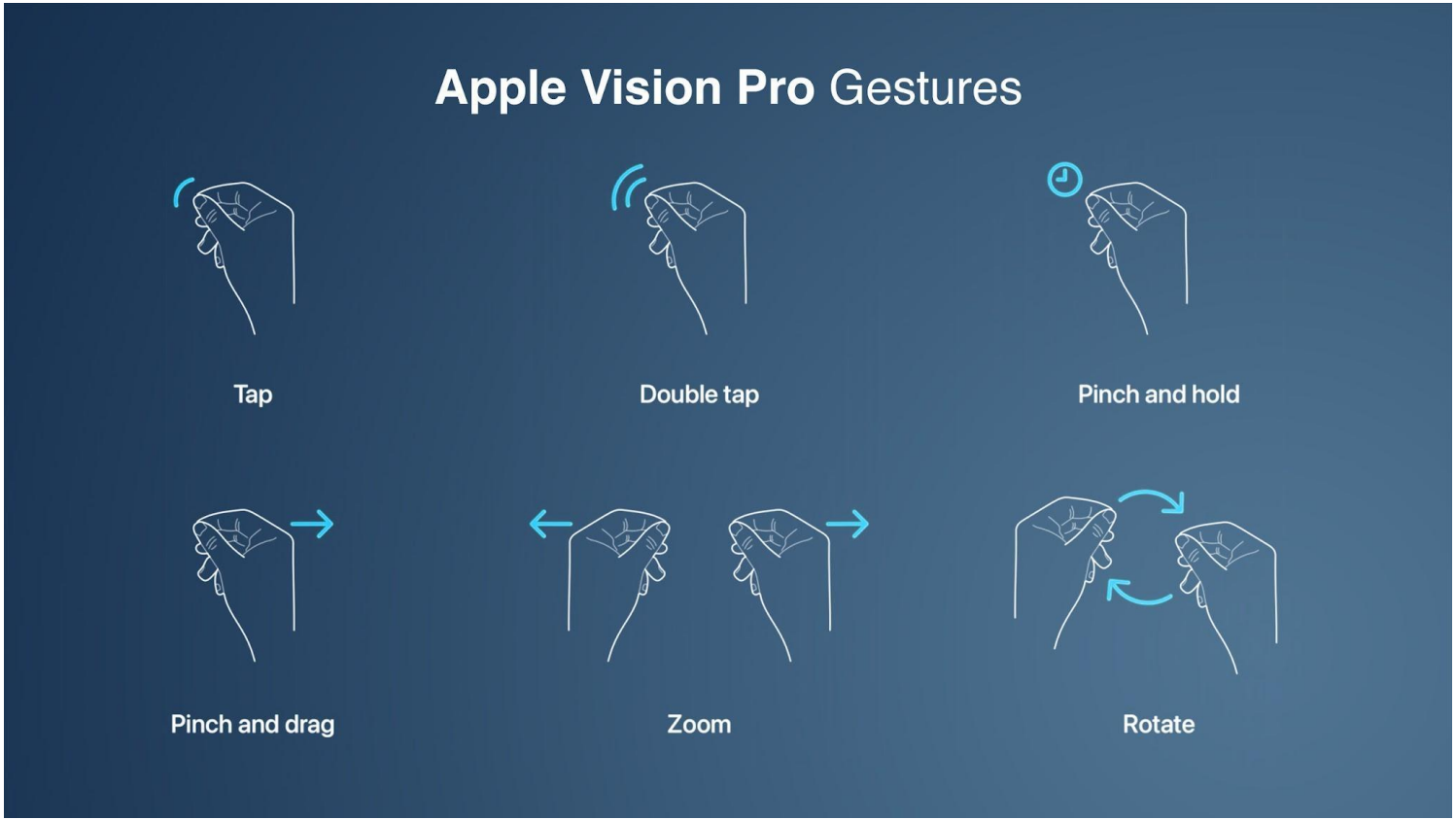


Apple watch

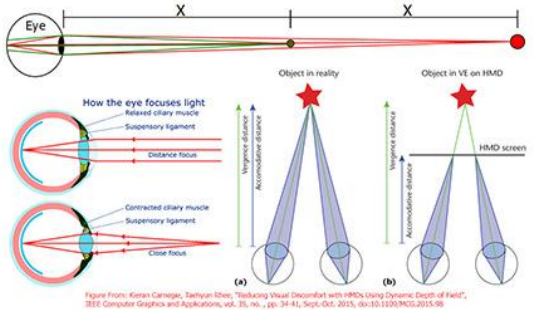
Apple Vision Pro (AVP)

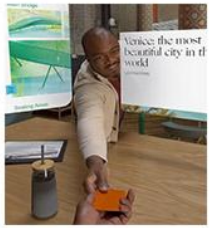


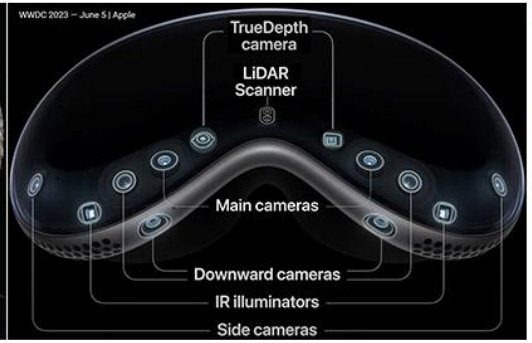
Apple Vision Pro

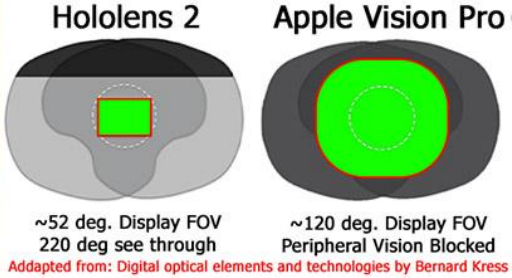


Apple Vision Pro (Part 2) - Hardware Issues









https://kguttag.com/2023/06/16/apple-vision-pro-part-2-hardware-issues/

Hololens

Microsoft's mixed-reality headset

How to use the Hololens 2:

https://www.youtube.com/watch?v=4sZY_Daxg1U

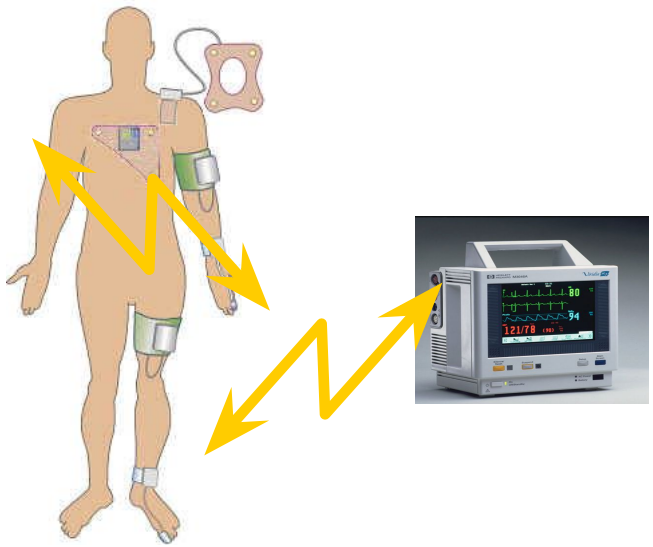
HoloLens 2 Synchronized Interaction Side-by-Side Demo

https://www.youtube.com/watch?v=eiuOeGblh0M

Body Sensor Network

Medical application

- Vital patient data
- Wireless sensors
- Link with bedside monitor
- Count on 10 – 20 sensors



Wireless Body Sensor Network for Remote Monitoring, Gold 2017

https://www.youtube.com/watch?v=3OZ1iK80ctA

Would a BSN be Single-hop or Multi-hop?

Challenges of Wearable Computing

What are some challenges we have?

Challenges

Size vs. processing/storage limit

Security & privacy

Interference (multiple sensors)

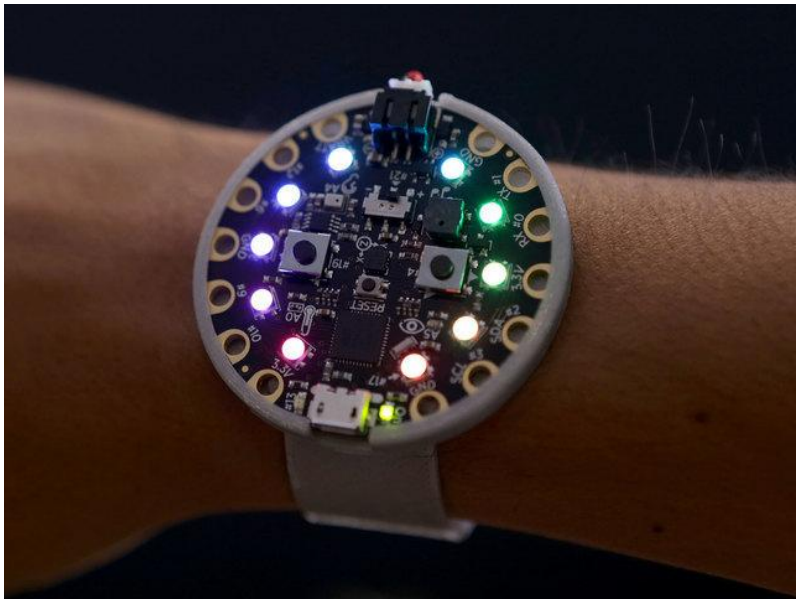
Energy consumption

Wireless communication (unstable)

Cost!!!

What could we do with this?

https://learn.adafruit.com/circuit-playground-wearable/overview



(requires specialized flexible 3D filament)