Mulsemedia = Multisensory Media

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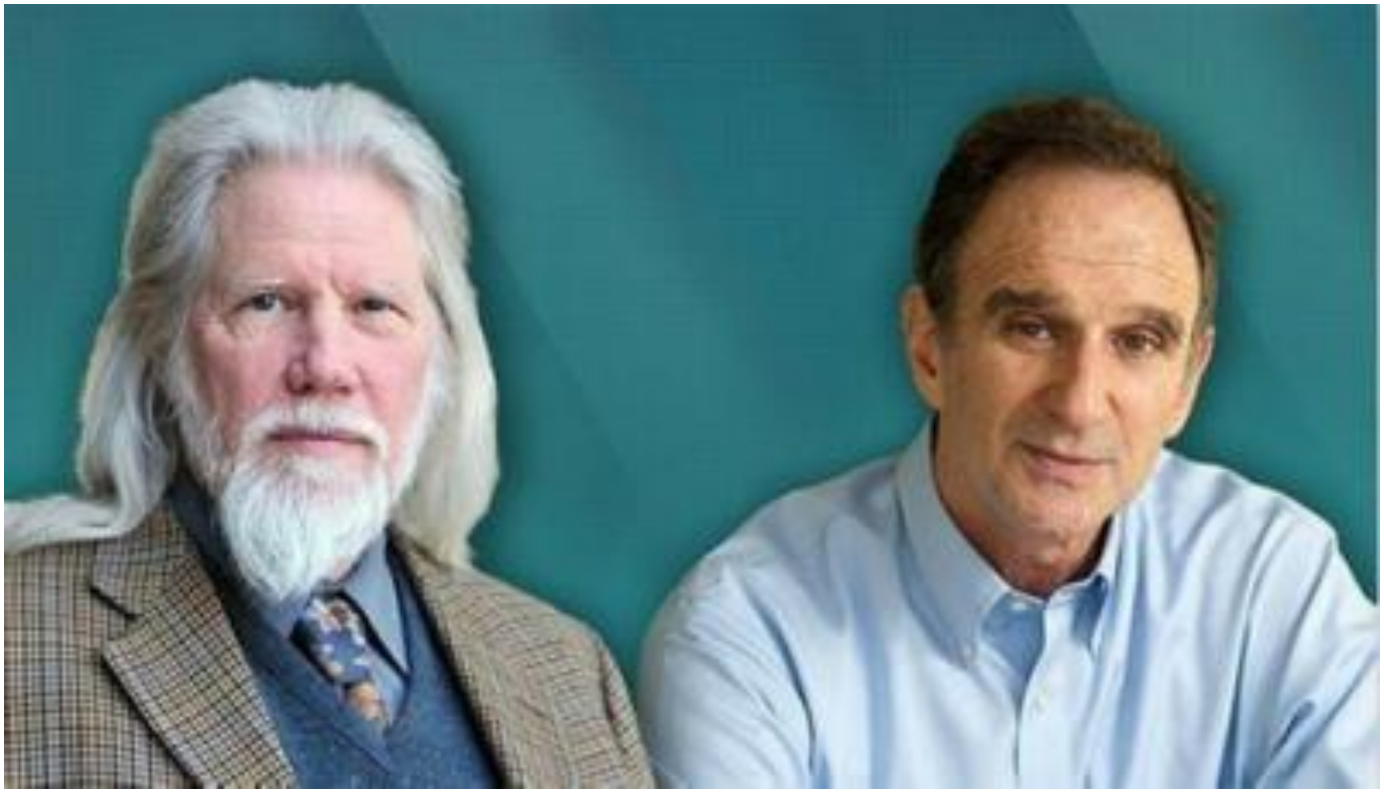
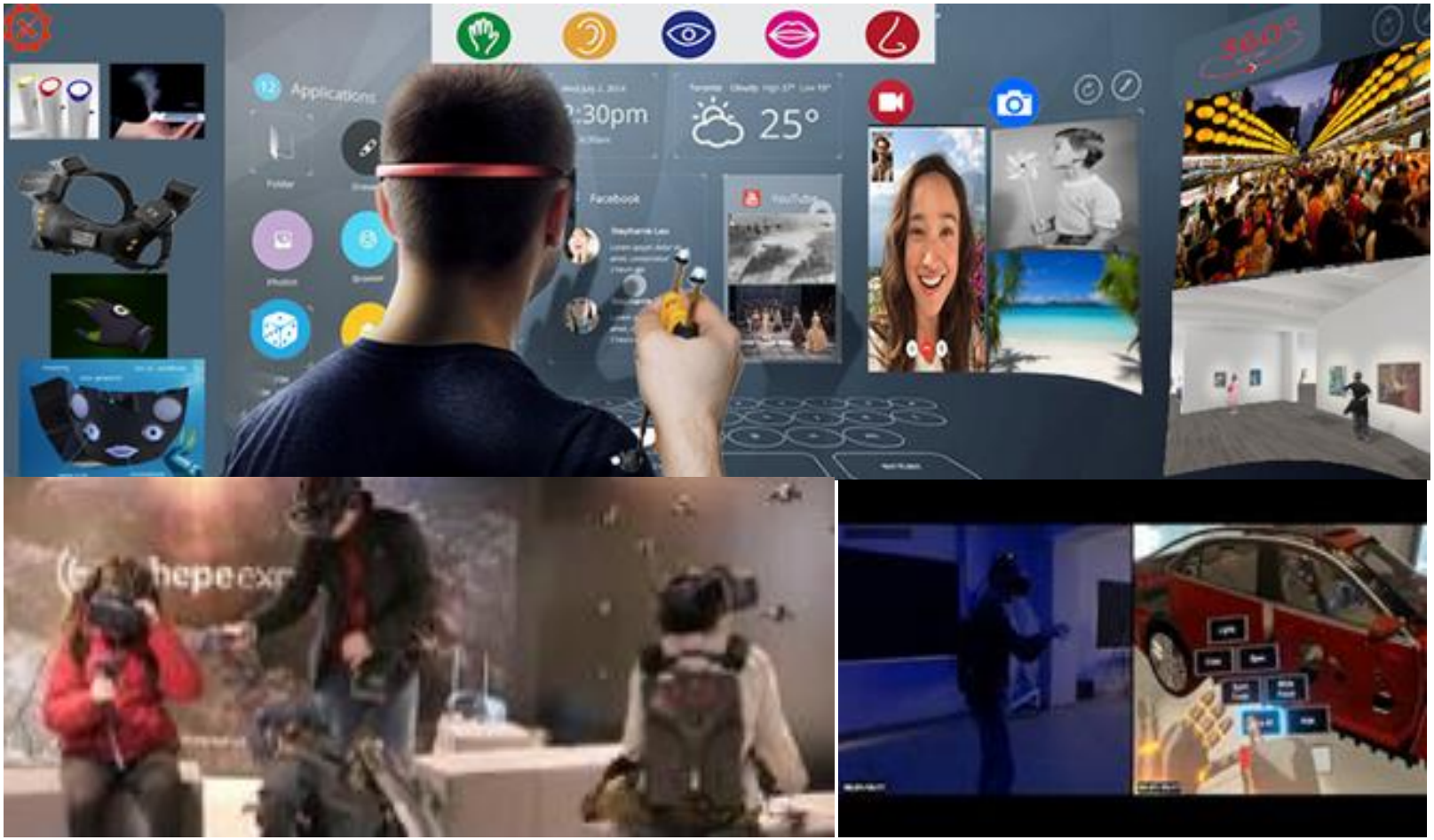
When CS is Magic



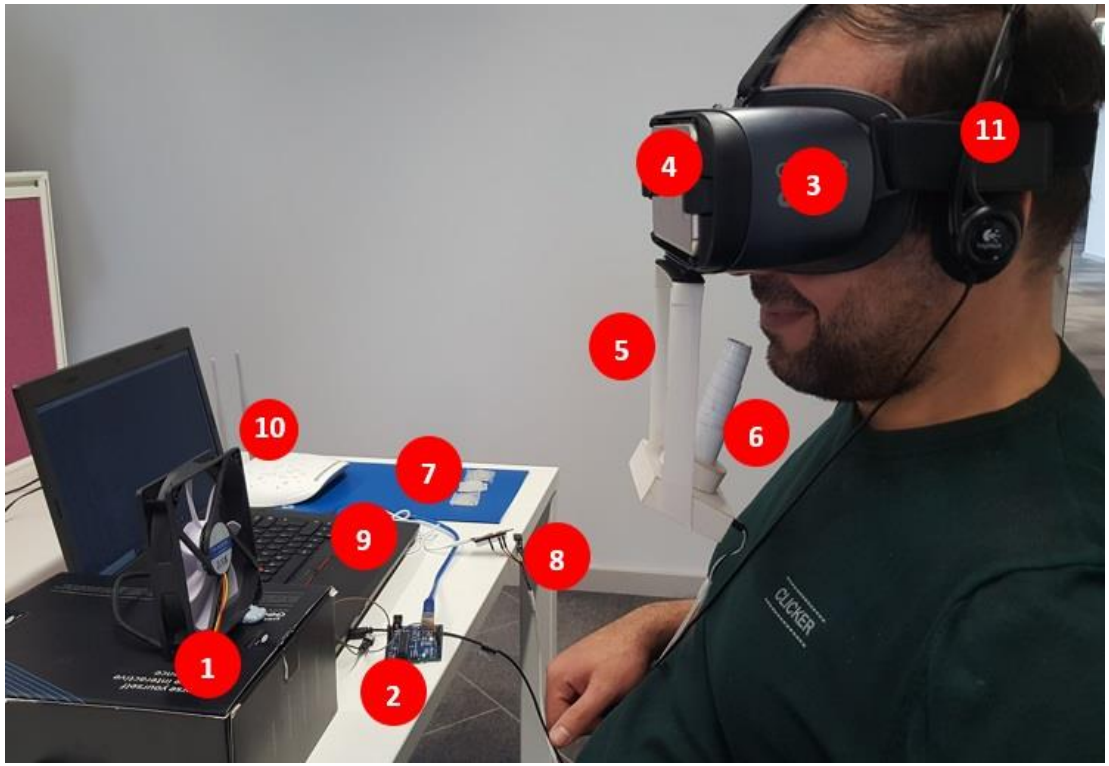
Multimedia is not Multimedia



Ghinea, G., Timmerer, C., Lin, W., & Gulliver, S. R. (2014). Mulsemedia: State of the art, perspectives, and challenges. *ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM)*, *11*(1s), 1-23.

Multisensory Displays

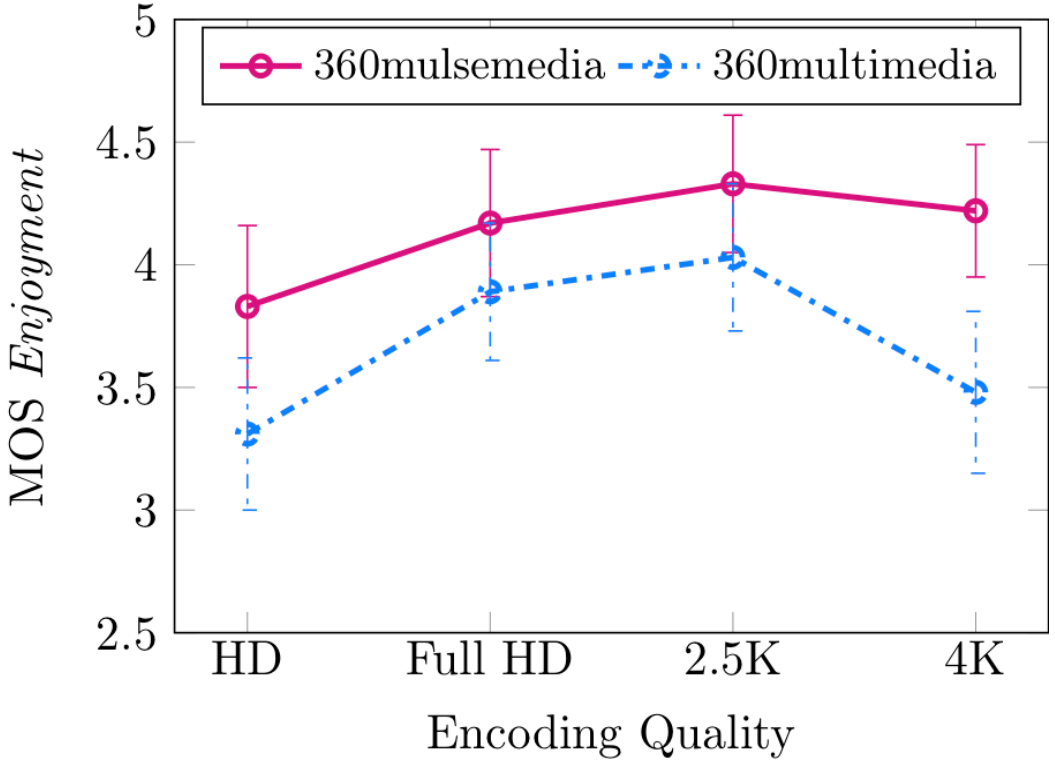
DIY 360˚ Mulsemedia Displays



(1) Wind blower fan, (2) Arduino Uno, (3) VR headset, (4) Smartphone, (5) Scent emitter, (6) Conic pipe, (7) Mesh-bags, (8) Arduino Nano, (9) Laptop, (10) Wi-Fi router, and (11) headphones.

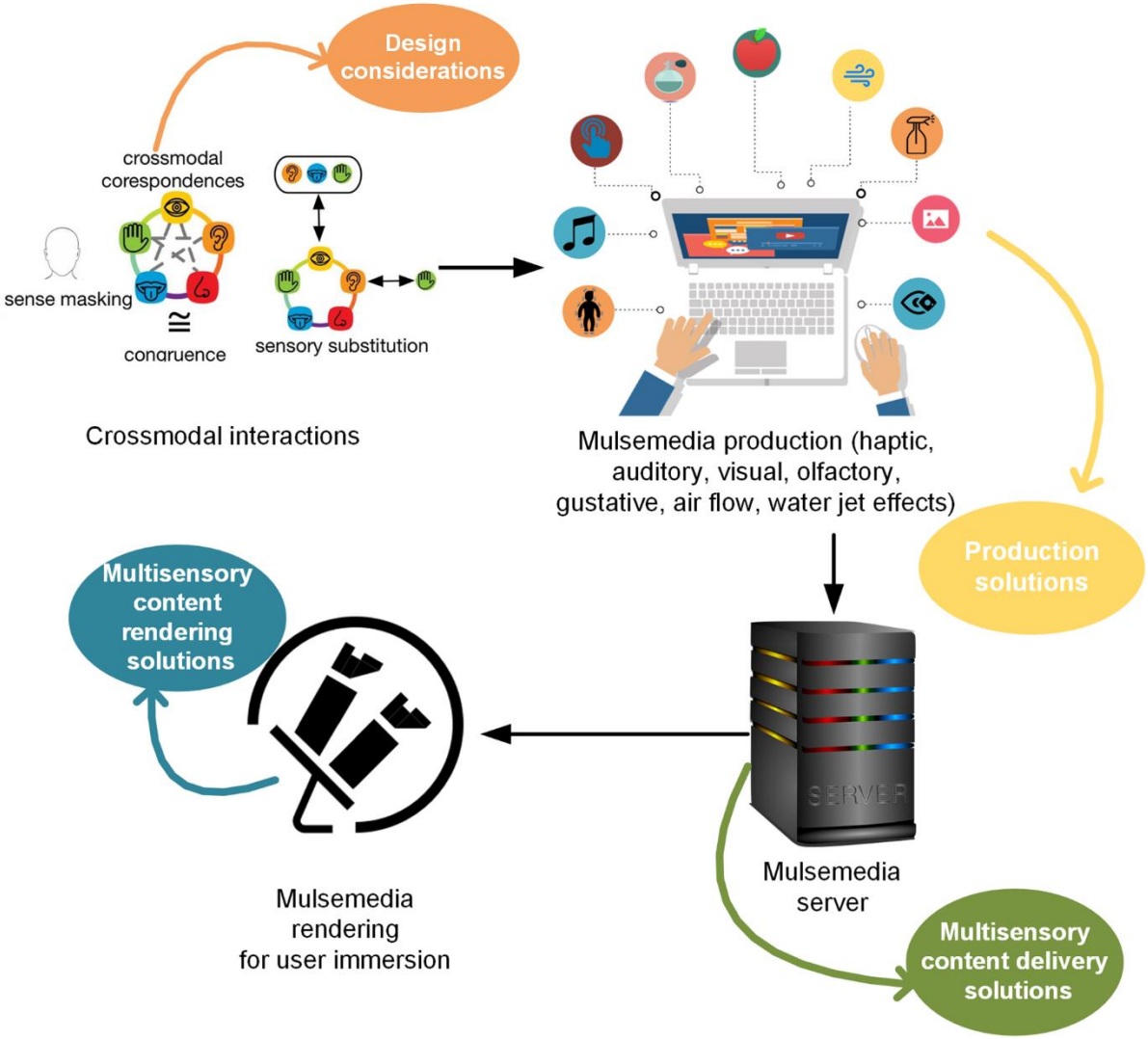
Saleme, E. B., Covaci, A., Mesfin, G., Santos, C. A., & Ghinea, G. (2019). Mulsemedia DIY: A survey of devices and a tutorial for building your own mulsemedia environment. *ACM Computing Surveys (CSUR)*, *52*(3), 1-29.

Multisensory AR/VR/XR magic



Comşa, I. S., Saleme, E. B., Covaci, A., Assres, G. M., Trestian, R., Santos, C. A., & Ghinea, G. (2019). Do I Smell Coffee? The Tale of a 360° Mulsemedia Experience. *IEEE MultiMedia*, *27*(1), 27-36.

Mulsemedia: An End-to-End Vision

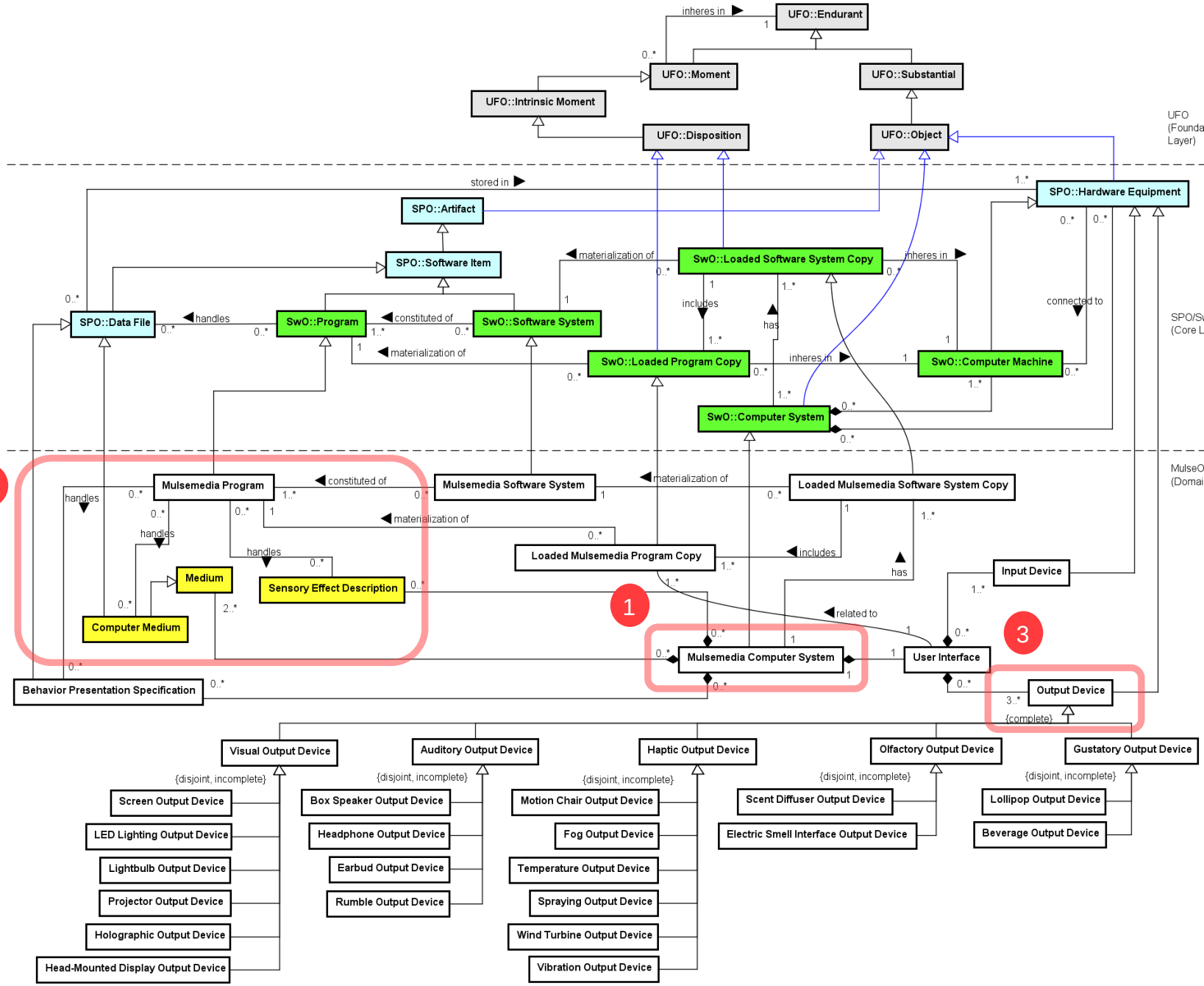


Covaci, A., Zou, L., Tal, I., Muntean, G. M., & Ghinea, G. (2018). Is multimedia multisensorial?-a review of mulsemedia systems. *ACM Computing Surveys (CSUR)*, *51*(5), 1-35.

MulseOnto

- **Capture the common conceptualization of Mulsemedia systems and what it entails to**
  - ***Reduce ambiguity and inaccuracy ->common vocabulary***
- **Describe:**
  - ***What mulsemedia systems and their components are***
  - ***Which entities they interact with***
  - ***Where sensory effects come from***
  - ***What physical realizations different kinds of media do in this context***

Saleme, E., Santos, C. A., Falbo, R., Ghinea, G., & Andres, F. (2019). MulseOnto: a Reference Ontology to Support the Design of Mulsemedia Systems. *JUCS-Journal of Universal Computer Science*, *25*, 1761.



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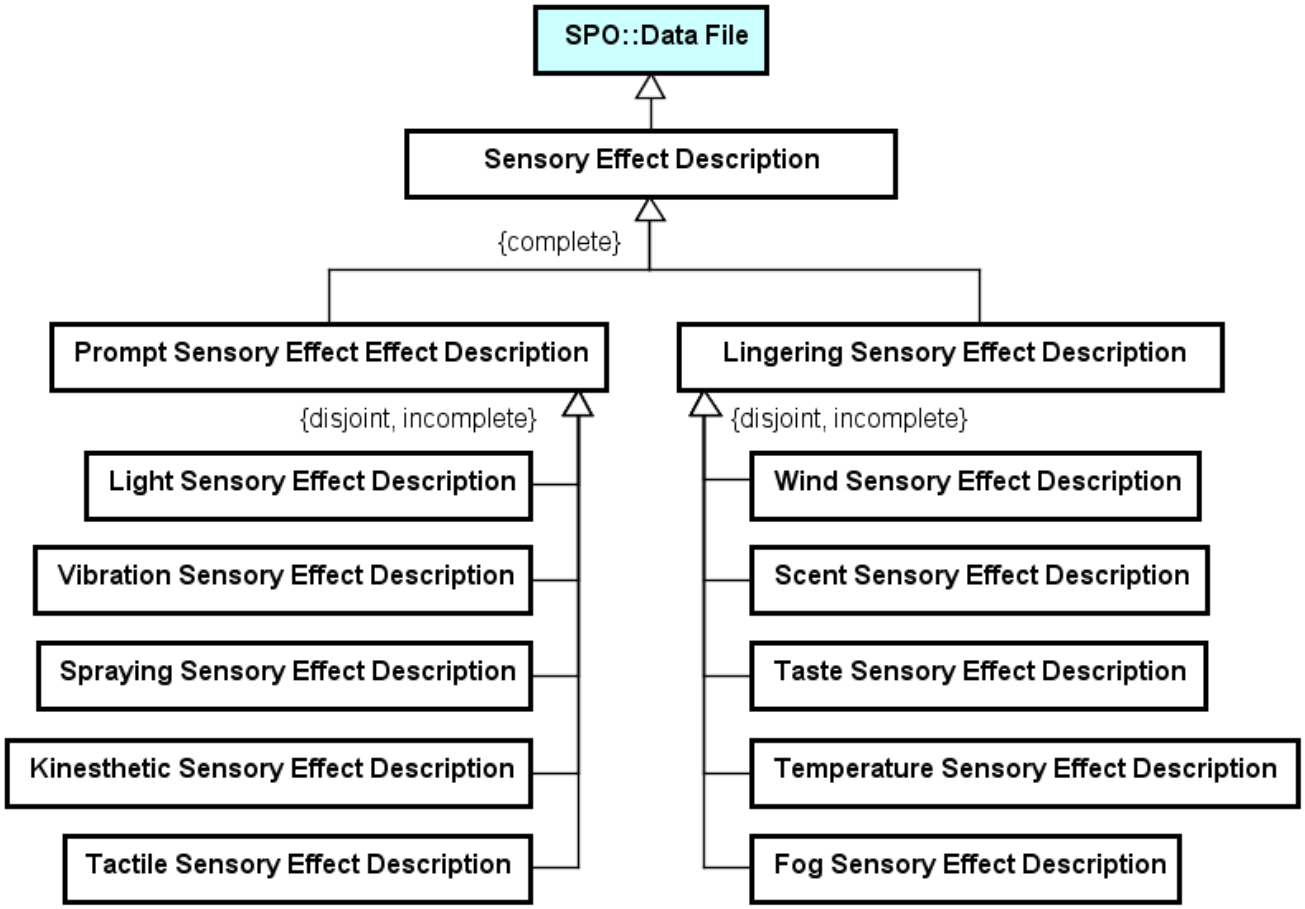
MulseOnto – Sensory Effects sub-ontology



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Issues for the Future

- **What does the future of the Internet smell (or taste) like?**
- **Lack of formal+explicit representation of mulsemedia**
- **Immersive Multisensory VR/AR/XR**
- **Wearable/Implantable mulsemedia**
- **AI/ML for Mulsemedia & Green Computing**
- **Capture/Creation – Distribution – Rendering**
  - Mulsemedia in e-commerce/e-advertising
  - Mulsemedia and performing arts

Lin, W., & Ghinea, G. (2021). Progress and Opportunities in Modelling Just-Noticeable Difference (JND) for Multimedia, accepted for publication. *IEEE Transactions on Multimedia*.

Thank You

Questions?