

# Role of AI in promoting digital accessibility

Concertation Event EASIER-SignON @ Brussels

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# Background



- Researcher at Multimedia and Vision Research Group at Queen Mary University of London
- LEAD-ME Working Group 3 Leader
- Member of BSI/37 on Coding of picture, audio, multimedia and hypermedia information"
- Member of ART/01 on Artificial Intelligence group
- Member of the ISO IEC standards committee
- Scientific coordinator for Horizon Europe and H2020 projects focussed on AI
- Key technical contributor to the development of ***MetamorphoSis of cultural Heritage Into augmented hypermedia assets For enhanced accessibiliTy and inclusion (SHIFT)*** project implementation

# Agenda



- Introduction
- Universal design principles
- European accessibility policy
- AI powered media accessibility
- Conclusion and future work

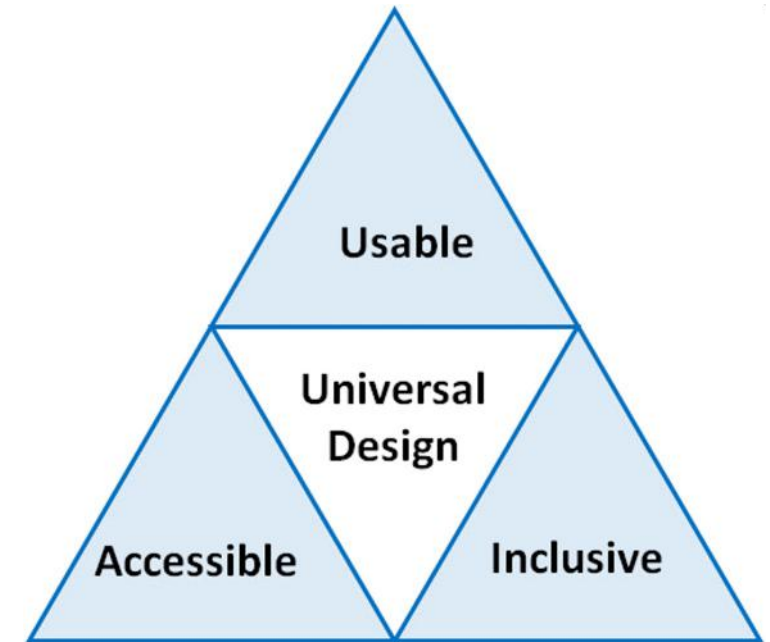
# Introduction



- Content economy has led the industrial growth for more than two decades
- Digital transformation services are playing a key role in society's evolution
- The adoption rate of digital services has created a digital divide for content accessibility
- Key to unlocking the full potential of content economy relies on bridging the digital divide and adopt the need for 'knowledge economy'
- Exponential growth of Artificial Intelligence (AI) solutions
- Recent applications include:
  - Image/Video description (audio transcription)
  - Generation of new images (raise of computer generated art)
  - Question and Answers (ChatGPT)
  - Language translation services
  - Automated audio description (AD) services
  - [etc]

# Universal design principles

- The notion of accessibility within digital transformation has been widely addressed within the context of information being shared through Internet services
- The triple synergy of Universal Design includes usability, accessibility and inclusion
- Despite the existence of standards, there is a lack of support for integrating such accessibility standards within individual organisations
- This is a key barrier for the adoption of universal design in enabling digital content access for all



Chandramouli, K. (2022). Role of AI in Promoting European Accessibility Policy. In: Stephanidis, C., Antona, M., Ntoa, S., Salvendy, G. (eds) HCI International 2022 – Late Breaking Posters. HCI 2022. Communications in Computer and Information Science, vol 1655. Springer, Cham. [https://doi.org/10.1007/978-3-031-19682-9\\_77](https://doi.org/10.1007/978-3-031-19682-9_77)

# European Accessibility Policy



- International effort on digital content accessibility
  - Establishment of Web accessibility initiative (WAI), by W3C
  - WCAG 2.0 was published in December 2008
  - WCAG 2.1 in June 2018 and the first public draft of WCAG 2.2 in February 2020.
  - WCAG 2.0 became the international standard ISO/IEC 40500:2012. WCAG 2.1 contains all the success criteria of WCAG 2.0 plus 17 additional success criteria
  - WCAG recommendations help website designers and developers to better meet the needs of users with disabilities and older users.
- EAA is a step forward in reducing barriers for people with disabilities within the EU
  - Better accessibility of products and services that citizens use every day
  - Enhanced access to digital devices (such as phones), services (transport banking),
  - Enable assistance to people with sensory impairments to be able to fully participate in society on an equal basis with others,
  - Have better access to education and to enter more easily the open labour market

# AI powered media accessibility

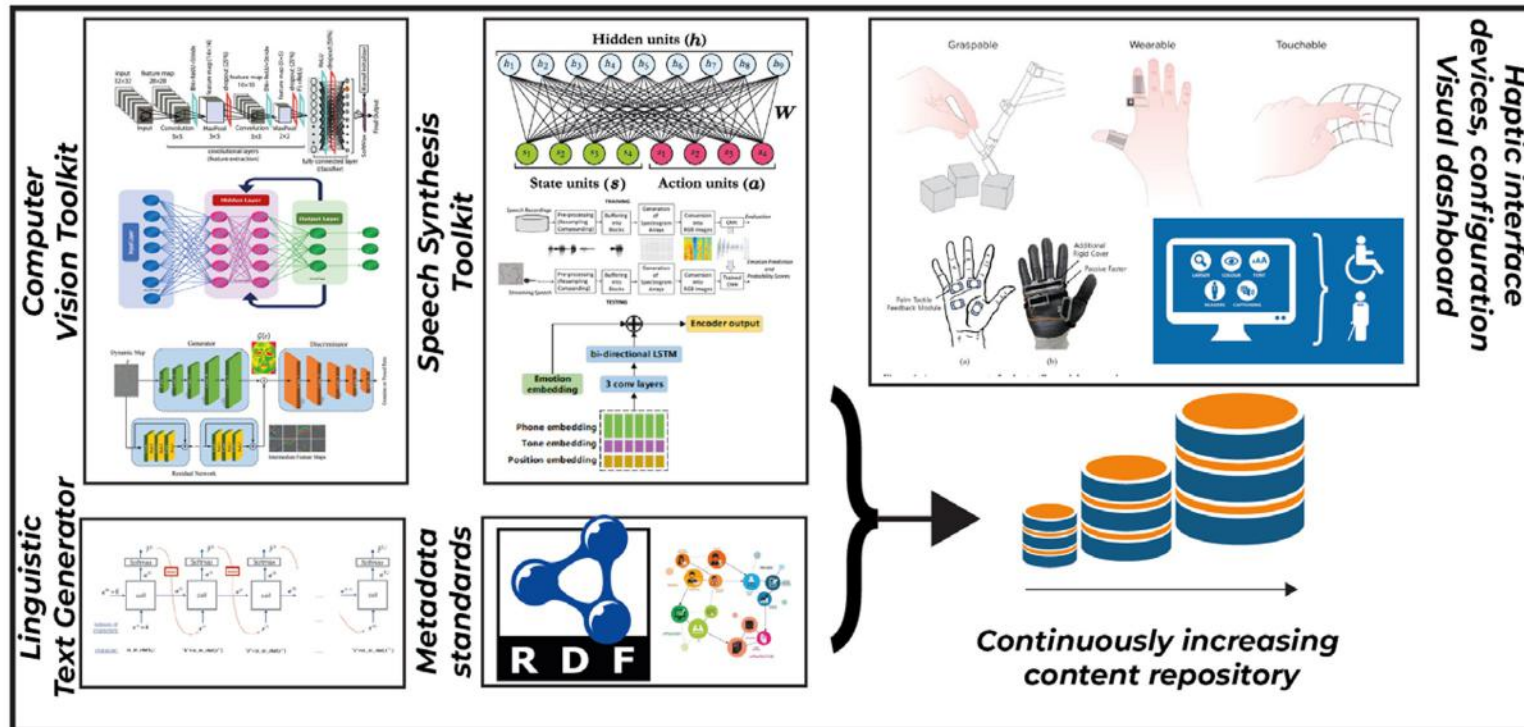


- According to ECAG recommendations, the four principles of accessibility could be defined as follows:
  - **Perceivable** - Information and user interface components must be presentable to users in ways they can perceive.
  - **Operable** - User interface components and navigation must be operable.
  - **Understandable** - Information and the operation of user interface must be under-standable.
  - **Robust** - Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.

# AI powered media accessibility



AI for content  
modality  
transformation

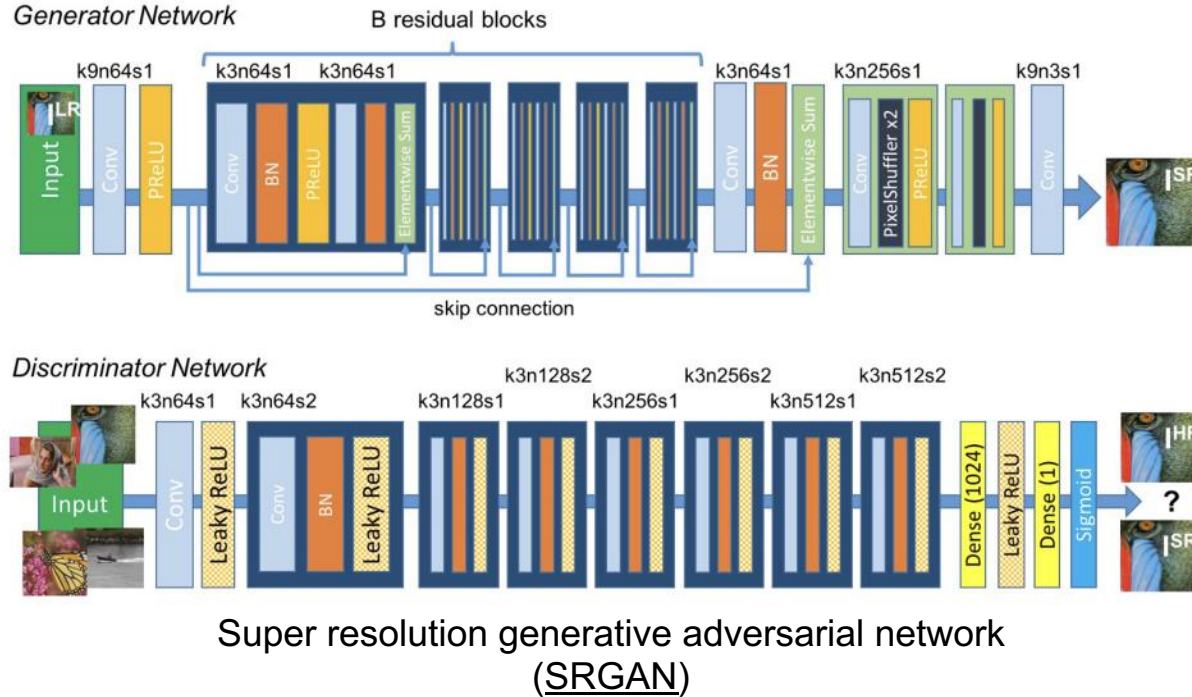


SHIFT project AI framework for accessibility and inclusion  
<https://cordis.europa.eu/project/id/101060660>

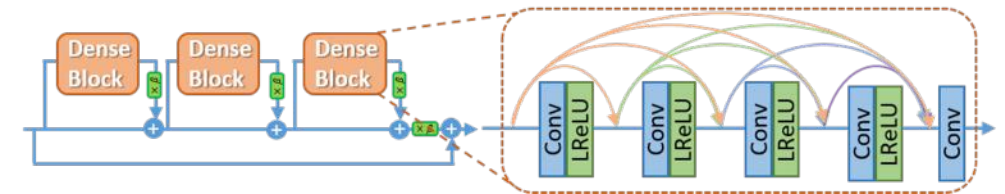


# AI powered media accessibility

- Examples of enabling content digitally accessible, through super resolution



Residual in Residual Dense Block (RRDB)



Enhanced Super resolution generative adversarial network (ESRGAN)

# AI powered media accessibility

- Examples of enabling content digitally accessible, through super resolution



Results from the Segment Anything (AI) Model



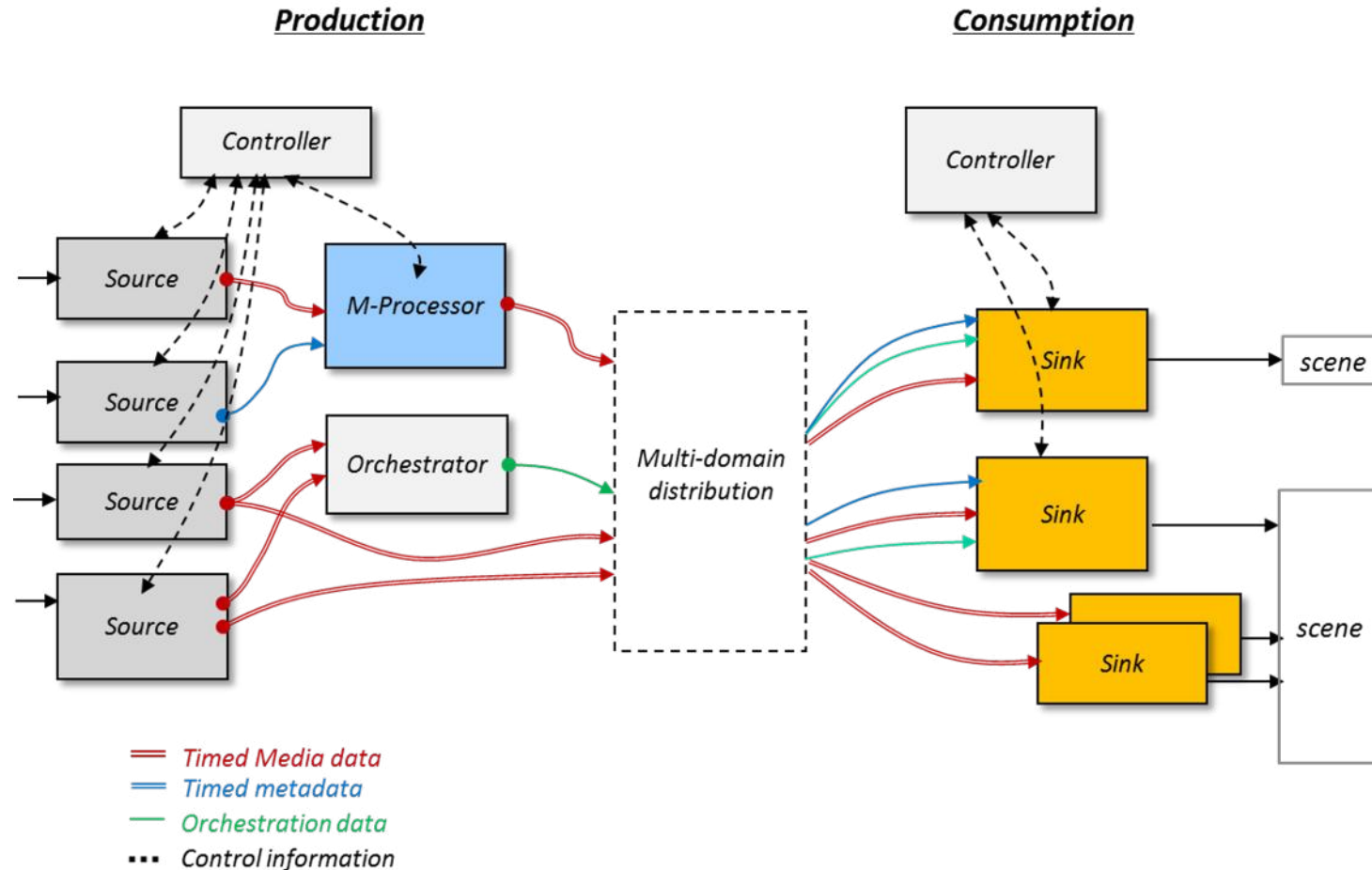
Implementation carried out by MDS, partner in SHIFT

# AI powered media accessibility



- The computer vision toolkit is included to extract knowledge embedded within the pictures and video sequences
- The extracted knowledge in terms of objects or key terms, will be converted into full-fledged sentences by the linguistic toolkit
- The textual descriptions are then subsequently transformed into speech with audio synthesis tool.
- The use of semantic technologies powered by Resource Description Framework (RDF) will ensure the semantic interpretability of information and ensure cross linking of relevant information
- The semantic repository populated by the analysis tools are then transformed into haptic language to be closely integrated within the wearable devices.
- The implementation of a multi-modal interoperability among the digital technologies, it is important to establish metadata standards to enable accessibility of media content.

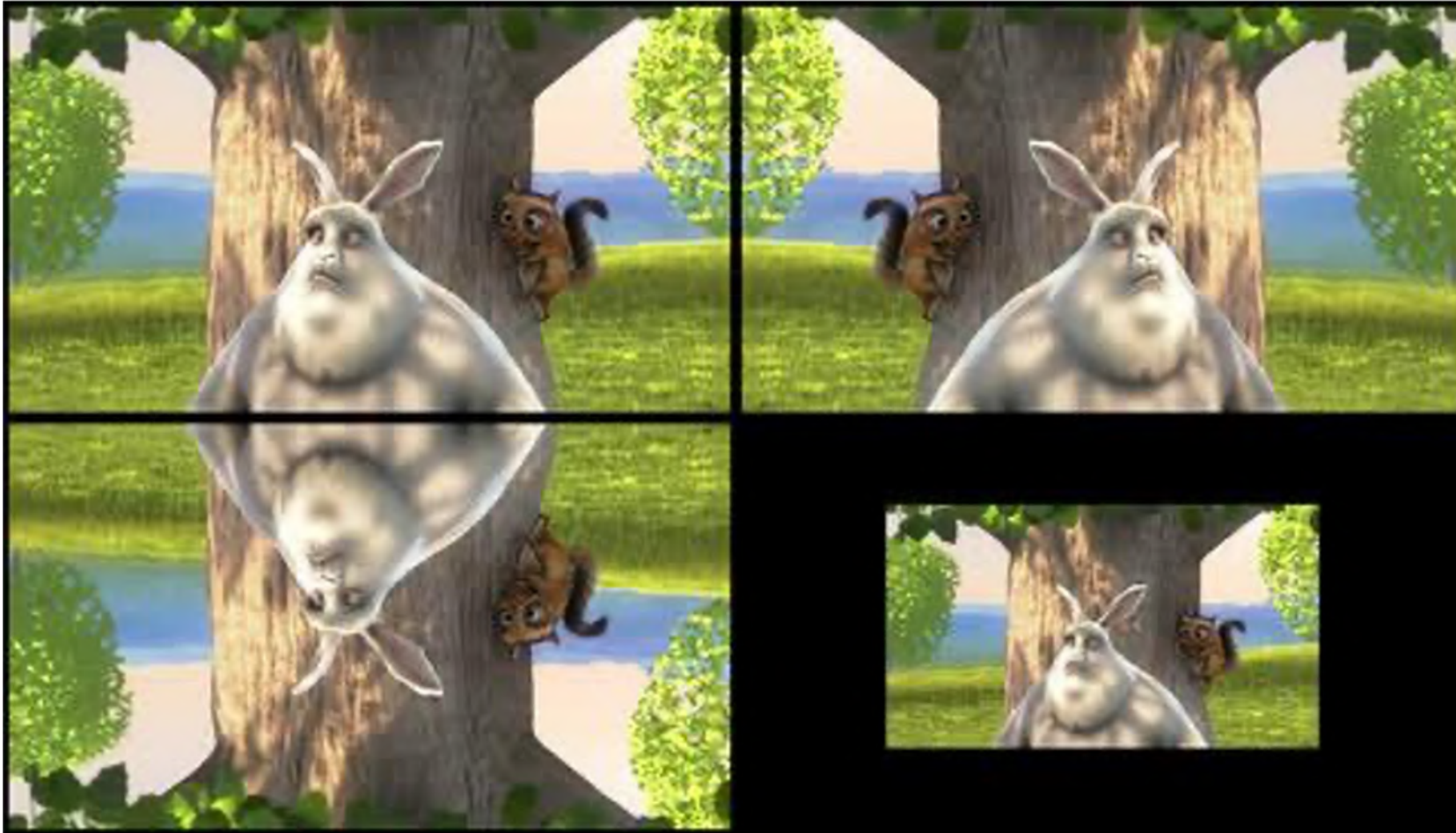
# AI powered media accessibility



Reference architecture for Media Orchestration International standard  
ISO/IEC 23001-13

<https://mpeg.chiariglione.org/standards/mpeg-b/media-orchestration/wd-isoiec-23001-13-media-orchestration-more>

# AI powered media accessibility



- Transformation of individual experience to collective social experience
- AI for content orchestration for multiple users

[https://zulko.github.io/moviepy/getting\\_started/compositing.html](https://zulko.github.io/moviepy/getting_started/compositing.html)

# Conclusion and future work



- Digital content is increasingly becoming pervasive
- A large number of organisations are adopting digital transformation strategies
- Need to bridge the gap between for citizen's right to access digital content
- AI technology offers new opportunities to be leveraged, through content transformation methodologies
- Reliability, trust, and transparency of AI algorithms should complement legal and ethical compliance
- Adoption of international standards reference architecture could pave the way forward in building advanced digital tools offering equal rights to content access