MEDIA EDUCATION
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Firenze University Press
www.fupress.com/me

OPEN ACCESS

Citation: E. Bisenzi, A. Carducci (2022) 48 Hours to make animation accessible. *Media Education* 13(1): 147-158. doi: 10.36253/me-12029

Received: September, 2021

Accepted: April, 2022

Published: June, 2022

Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

Competing Interests: The Author(s) declare(s) no conflict of interest.

Best Practices

48 Hours to make animation accessible

48 Ore per rendere un'animazione accessibile

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Abstract. The article presents an inclusive design toolkit made up of User Interface and Storytelling solutions with the aim to support animators and video creators to design accessible animations. Technical solutions are presented in order to satisfy disabled people's needs with special regard to challenges such as blindness, deafness, color blindness, epileptic, cognitive impaired and dyslexic peoples and outlining the importance of a proper implementation of open and standard languages while implementing different adaptive user interfaces and storytelling for each specific target.

Keywords: accessible animations, inclusive design, adaptive storytelling, adaptive user interfaces, media education practices.

Riassunto. L'articolo presenta un Kit in tema Inclusive Design costituito da proposte di Interfaccia Utente e Modelli Narrativi che possono essere realizzati in poco tempo con lo scopo di supportare artisti e produttori di animazioni digitali affinché siano accessibili. Vengono presentate soluzioni tecniche per soddisfare I bisogni di persone disabili con particolare riguardo ai non vedenti, sordi, daltonici, epilettici, disabili cognitivi e dislessici, sottolineando l'importanza dei linguaggi open source e standard così come la possibilità di adattare interfacce utenti e modelli narrativi ad ogni singolo target.

Parole chiave: animazioni accessibili, progettazione inclusiva,narrazione adattiva, interfacce utenti adattive, buone pratiche di media education.

SETTING	Academy of Fine Arts in Rome & Cardeis Art animation and game studio
TARGET	Animators and video creators involved in the restyling of animations into accessible ones
DURATION	Each procedure takes about 48 hours of work depending on the specific target to support (including all the different user interfaces and storytelling solutions)
EQUIPMENT	Adobe After Effect and Adobe Premiere Pro software for video editing; Open Source Audacity software for audio editing; Open Source Gimp software photo editing; Autodesk Sketchbook software for sketch, storyboard, animation and line art; Open Source Krita software for animation, shading, colors; Open Source Blender software for dialogue synchronization and animation/ video editing; Wacom Cintiq on-screen graphics tablet with typographic pen hardware, Epilepsy Analysis Tool offered for free by the US College of Information Studies of the University of Maryland.
PRODUCTS	A final inclusive toolkit with user interfaces and storytelling examples available on the Web here: https://cardeisart.com/projects/xs2animation

1. INTRODUCTION TO ACCESSIBILITY

Accessibility as a principle is a decidedly vast concept: widespread are architectural accessibility solutions such as inclined planes or elevators to assist the mobility of people who use wheelchairs. But in a broader sense, accessibility includes solutions for all types of difficulties presented by some kind of disability (For example, also consider the concept of accessible tourism that proposes to guarantee a dignified experience extended to those with sensory difficulties or personal mobility).

Accessibility has recently left room for the concept of Inclusive Design, moving on from the concept of Universal Design (Preiser & Smith , 2011) in favor of inclusive design (Gilbert, 2019), taking into consideration not only permanently disabled people as we commonly mean (deaf, blind, etc.) but any person who experiences difficulty due to a temporary disability or unfavorable environmental condition with a particular user experience (UX).

The Inclusive Designer therefore has the difficult task of adapting a User Interface (UI) (Schneider-Hufschmidt et al., 1993) in order to meet the needs of "any" person regardless of permanent or temporary conditions (Browne, 2016). We remind you that the derogatory term "handicap" derives from horse racing, where a particularly good English jockey would hold his hand in the hat (Hand in the cap) to make the bets more unpredictable, and into other sports as an athlete accepts a disadvantage to level the playing field. However, it can also include such cases as the mobility level of a parent's arms who is carrying a small child, or a person who is otherwise young and very healthy but while dancing in the disco finds it impossible do understand a videowall projection of a movie because the audio is overpowered by music and dancing.

Refugees and travelers, people 'too' young or 'too' elderly, those with little education or learning disabilities … for these and many other reasons they can benefit from inclusive design to take advantage of communication and information systems with solutions that treat these situations culturally (Ting-Toomey, 2010). (Certainly, you will agree that a video in Korean will be decidedly more understandable to us all thanks to English subtitles…). This was our design approach: to assemble a kit of existing solutions and others presented in an innovative way to ensure the availability of an animation to any person regardless of environmental or disability conditions (whether temporary or permanent) in which that animation might be found. An ambitious and difficult goal, but which gave us great satisfaction starting with a recent encounter with Patrizia Ceccarani , Scientific Technical Director of the Alloy of Golden Thread, who has long been involved in assisting people with pluri-sensorial and cognitive disabilities. She graciously gave us a valuable advice (which had not occurred to us) to better satisfy the needs of people with limited peripheral vision.

It is particularly difficult to create accessible alias inclusive digital animations, as videos and animations are characterized by a plurality of multi-sensory inputs. These inputs are often presented quickly and in succession. Perhaps for this reason there has not yet been experimental research. So especially for this reason, we invite the community of developers and creators of digital animations and also disability specialists and inclusive designers to consider our operational proposal, by critiquing or questioning it if necessary.

In this article, we first present some basic principles of accessibility, and than we present our toolkit and its features to make animations accessible to disabled people, presenting a direct experience of production.

We focused on digital animations because it can be made with less economic effort than video, which needs more technical and even professional resources for their production. Digital animation is 'determinable' in every little detail and narrative moment, being able to precisely define alternative storytelling useful to meet the needs of different kinds of disabled people (Head, 2016). With animation, everything is possible, everything is reversible. The nature of animation goes beyond the laws of physics; its expressive force and its universal communication language are timeless, and

its artistic and technical forms are always current (Nurizmawati et al., 2015). It adapts to any category and target and in this way is particularly useful for educational activities (Mittiga, 2018) and purposes. In synthesis, digital animation is a flexible language greatly appreciated not only by children (Brandell, 1988) but also by people with cognitive disabilities, both of them often in a position to learn. Therefore, digital animation can be designed in a very detailed way to produce short or very short communication products that are widely appreciated by anyone within educational contexts.

We hope with our *inclusive design toolkit* to support the on-going cultural revolution that is spreading all over the world among artists and technicians with the aim to support people with access to information and communication. Blind people, deaf people (Heller, 2013), color blind people, epileptics, autistic, and young students suffering of specific learning disorders all have the right to access and use digital information and communication media.

2. BASIC PRINCIPLES OF ACCESSIBILITY AND SPECIAL NEEDS, IN THEORY

Under a theoretical profile, the basic principles of accessibility and therefore of inclusive design (Vukcevic et al., 2020) are that disabled people (whether permanent or temporary) must be able to enjoy any user experience (UX) through special user interface adaptations (UI). People who have restricted peripheral vision or those that do not distinguish colors (achromatopia) have a right to access a quality user experience (UX), as well as epileptic people who may be harmed by certain flashes or frequencies. We also include the blind who experience the world through hearing and touch, and the deaf who must use the written language (sometimes simplified) or sign language (remembering that many communities exist, each with their own sign language, and that the language of international sign is not widely known and used.) Finally, we include people with cognitive disabilities who must be able to view the animation with adaptations and especially presentation timing that puts them at ease.

In the following paragraphs, we summarize some basic principles, that we adopted for the design of our toolkit for accessible animations.

2.1 Critical Visual Issues

Do not assign significant information exclusively to a color: For example, a character who shouts “Pay attention to the man with the green cap!” may embarrass color blind people who cannot recognize him. Of course if visual and textual communication assign significant information exclusively to a color, you must have an alternative and the time to change the previous sentence to, “Pay attention to the man with the green pointed cap!” to identify it by something other than only color. Additionally in the construction of the animation for those people suffering from epilepsy, you must pay attention not to create dangerous intermittence that means sudden changes from light to dark with a frequency equal to or greater than three beats per second. For example, in Japan on December 16, 1997 an episode of Pokemon - Pokémon, Dennō senshi Porygon (でんのうせんしポリゴン lit. “Porygon computer soldier” – broadcasted on TV Tokyo and other Japanese broadcasters caused hundreds of cases of convulsions and seizures in kids, 150 of which required hospitalization. Of course, if you recognize an intermittence as a danger for epileptics you must have the opportunity and the time to replace it with a slower one, but it is usually a rare event. You should also avoid absolute white backgrounds to avoid the disturbance of “floaters” in the field of vision: if this occurs, it will require opportunity and time to change background colors, but it really is a small job to carry out. Low vision readers also need legibility and readability solutions, as do severely visually impaired people or those with peripheral vision difficulties.

2.2 Text-only description

A text-only description of the animation is an important perceptual option for blind people who prefer to perceive through audio or braille bar everything that is “text only” thanks to their screen-reader aids. The textual description, in the perspective of adaptive storytelling, will have to replace everything that is represented at the multimedia level, particularly the visual part. We must try to transmit with textual storytelling a description of the animation, not only in physical terms but also emotionally. It is appropriate to describe the landscape, the music and sound effects, the characters (including what they say and perhaps why they say it), the atmosphere, and the emotions transmitted. In other words, reproduce the user experience through copy writing as well as it is done with visual and multimedia storytelling (Boie, 2014).

2.3 Closed Caption (CC)

Many people can’t listen to audio, music, voices and so on or in some situations they prefer not to listen, such

as the majority of Facebook users playing video. That's the reason why subtitles and particularly Closed Caption (CC) are so useful. CC Closed Captions are widely used in all those contexts of multimedia offerings that can be hosted through Web languages (and beyond, for example popular streaming platforms such as Netflix) and represent an excellent aid for many types of disabilities related to cognitive or audio perception (Servizio Sottotitoli-RAI, 2016).

2.4 Audio description

Audio descriptions are useful for those such as blind people who are unable to perceive visual information, and also for those such as dyslexics (Edizioni Centro Studi Erickson, 2020) who may prefer an audio experience because visual reading makes them tired. Offering differentiated storytelling (Lipman, 2005) in this case is useful from a communicative-emphatic point of view because the audio not only makes it possible for people in these categories to understand visual information, but the whole storytelling becomes more emphatic and engaging due to the professional use of narration which, together with the sound effects of the animation synchronized with the storytelling, makes for one of the most engaging and effective audio user experiences.

2.5 Sign Language

Sign Language is greatly preferred by many deaf people over written language even despite the fact that ISL (International Sign Language), also called Signuno or Gestuno, is not fully widespread. For example, for the languages spoken, English is now a cultural heritage common to many people in the world. However, every linguistic community (Italian, French, etc.) has their own corresponding sign language, thus making a sign language translation useful only for the linguistic community of reference.

2.6 Augmentative Alternative Communication

Cognitive and autistic disabled people need adaptive transposition of slides with more understandable depictions consisting of simplified pictographic representations as well as simplified text associated with images. Another benefit of simplified slides for people with cognitive disabilities is that they are not linked to the animation timing and therefore their interpretation takes place according to the end user's own timing and not by the animation itself.

3. INTRODUCTION TO XS2ANIMATION

XS2Animation means "access to animation" and we have chosen the icon of a triangle pointing to the right as is known to represent animation or video features in the digital communication field (Figure 1 and 2).

Some inclusive design solutions call for the use of a second screen placed on the left of the main one where the animation is represented. This design solution allows you to highlight the forms of parallel language (subtitles, sign languages, etc.). The conscious choice of sizing the second screen with disability aids more or less equivalent to the one in which the original version of the digital animation is displayed is an intentional message. It

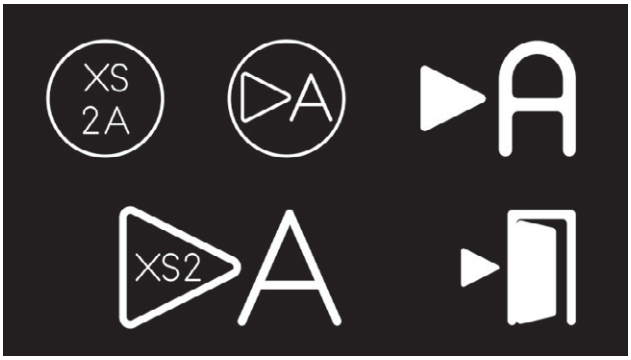

Figure 1. XS2Animation logo tests involving open door symbols, circles, video activation play symbol.

Figure 2. Logo *XS2 (access to) animation - make animation accessible* surrounding a horizontal triangle, typical of the "play" video or audio function.

Figure 3. Example of second screen interface.

serves as an invitation to consider similar any type of storytelling, whether animated, textual, or other claiming equal dignity and equivalent right to access to communication and digital information for disabled people. The second screen is the other point of view, which we didn't even imagine, the unexpected one and maybe it could enrich the original point of view.

In order to widespread our toolkit for accessible animation, we decided to develop a short animation that could be an example in terms of digital inclusion, working towards a simple and playful proposal capable of making people understand the advantages of the stylistic solution XS2Animation - Make Animation Accessible.

The reference page of this research project is https://cardeisart.com/projects/xs2animation and also represents the practical conclusion to our experimental reasoning: being created in open languages, the web page and its components are all freely available by viewing the source file (usually via the keyboard shortcut CONTROL or COMMAND + U) and the files connected to it.

In the following part of the article, we summarize the steps for animation production, while in the next paragraph we exemplify how principles of accessibility were put in practice thanks to XS2Animation.

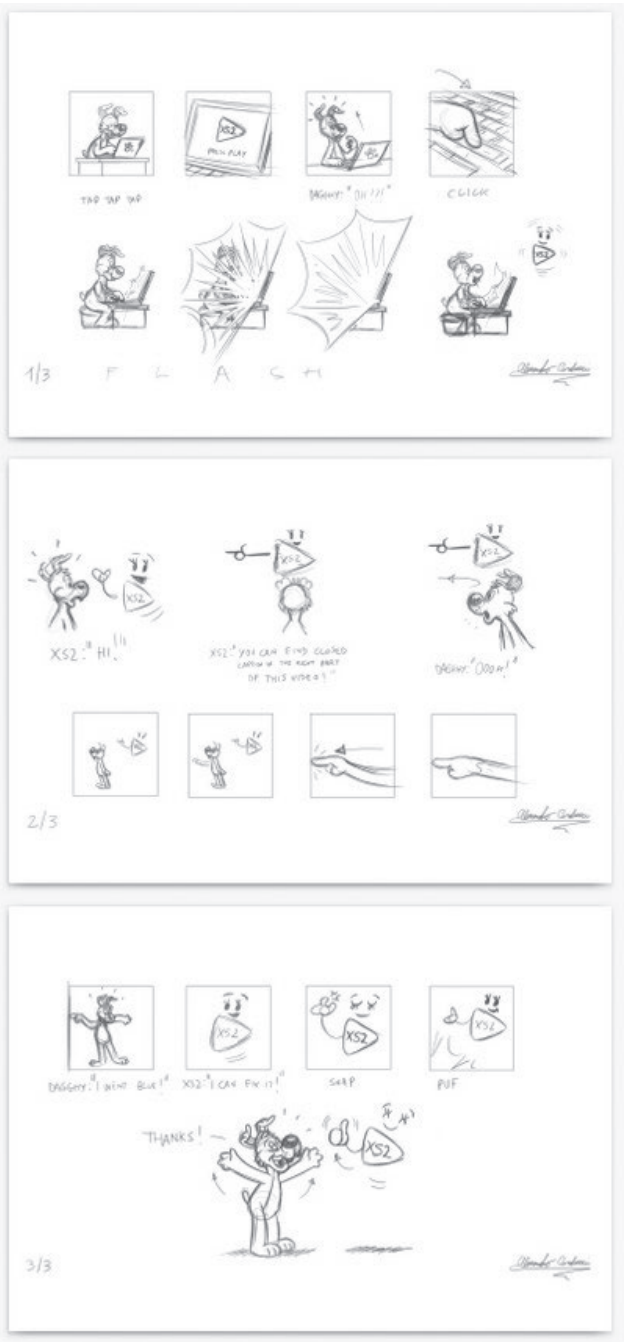

Figure 4. Storyboarding of the animation.

3.1 Designing animation step-by-step

We describe the stages of the production process:

1. Screenplay, graphic drafts and storyboard. We started with a simple script accompanied by a storyboard showing the actions, interactions, and dialogue of the characters through sketched drawings which were then refined (Fig. 4).

2. Dubbing: the voice actors were asked (see credits) to dub the text and the characters' lines in both Italian and English.

3. Audio Editing: for the audio editing of the video, sounds were created and inserted to suit the action, as well as cheerful accompanying music for the entire Animatic.

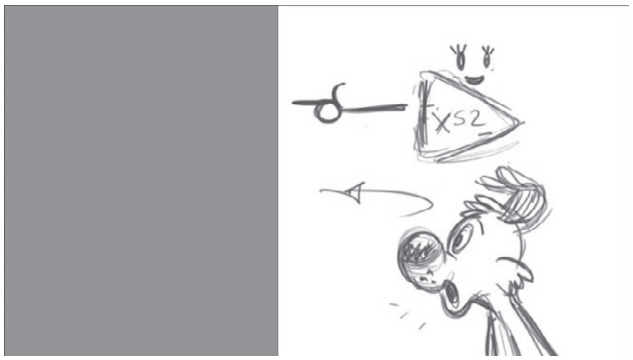

Figure 5. In the animatic XS2 shows Dagghy the help screen for textual descriptions.

4. Animatic: per the usual production process of an animation, an animatic (animated storyboard) was created which allowed us to better outline a draft of text useful for an interpretation by screen-readers, but also to arrive at a correct interpretation of the voice actors' realization of the audio description. The animated storyboard is essential to have an overall idea of the timing of the animation of the action and the various scenes, and is in effect a preview of the video with sounds and images, but without the actual animation (Fig. 5).

5. Audio-description: for the audio-description, work must be done to synchronize the dialogue and audio editing, thus using the text transcription as a basis but omitting the musical and audio parts which already exist in the final audio file with the specific purpose of "describing the audio."

6. Animation: we then moved on to animation starting by processing of the frames in the traditional 2D digital technique at 4K resolution using Wacom Cintiq (graphic tablet on screen with pen computer). The key frames were first created starting from the storyboard drawings and then proceeding with the creation of the "Pose to pose" frames. The animation process was concluded with the synchronization of the characters dialogues. The lip movement made in animation is based on the English version of the dubbing.

7. Cleaning drawings, color shading: once the animation process was completed, we moved on to cleaning, coloring and shading all the drawings.

8. Video Editing: after exporting the animated scenes, they were imported into editing software and used to replace the static images previously used for the animatic.

9. Export and optimization for the web: after completing the video editing phase, the video was exported and compressed for the web while maintaining its visual quality.

4. OUR METHOD TO TURN ANIMATIONS INTO ACCESSIBLE ONES, IN PRACTICE

Accessibility improvements: we immediately set about preparing a series of different user interfaces and also of diversified storytelling in such a way as to support the various disabilities involved and make it more inclusive. The animation is in fact made inclusive by alternative information that is represented together with the animation itself or in place of it.

We carried out several experiments to optimize the animation at a spatial level using a canonical rectangle with 16:9 dimensional ratio; subsequently we sized the actual animation in a 1:1 square and arranged the remaining space on the left as a second screen capable of accommodating the Closed Captions as well as the translation into the Sign Language (Fig. 6).

Unfortunately, the Chrome browser does not correctly interpret the position setting attribute and therefore it was necessary to implement more lines of textual description (Fig. 7).

Our stylistic proposal consists of the entire interface accessible on: https://cardeisart.com/projects/xs2animation.

The question is not only to identify accessibility solutions but how to present them all at the same time without creating disorientation and making them difficult to interpret. We therefore thought of proposing on the website https://cardeisart.com/ an implementation example of inclusive animation, presenting them on the same web page in a simple and organized way allowing the end user to perceive the entire communication offer (as far as possible with respect to their perceptive abilities) and, with the help of a vertical sticky menu, to choose the preferred type of use (Fig. 8).

First of all we identify the special needs of disabled people that could take advantage of adaptive user inter-

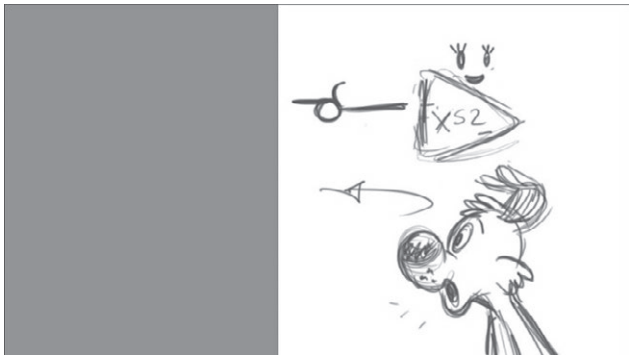

Figure 6. In the animatic XS2 shows Dagghy the help screen for textual descriptions.

Figure 7. The incorrect implementation of position made it impossible to specify significantly long text that could wrap automatically as in the Firefox browser, forcing us to do extra work to have short sentences on spaced lines, in order for it to be correctly interpreted by the Chrome browser.

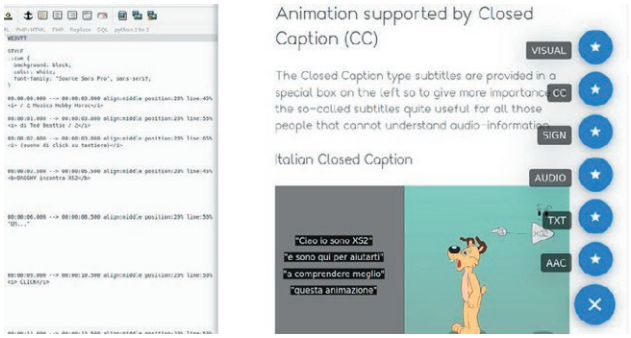

Figure 8. A vertical sticky menu is useful to choose the different accessible User Interface solutions available. In this example, the code to set up Closed Caption subtitles

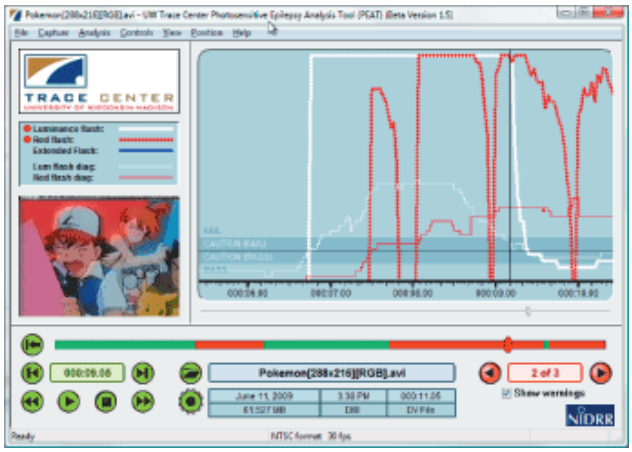

Fig. 9. PEAT tool analyzing content.

Figure 10. Achromatopsia test.

faces (Raheel, 2016) or storytelling procedures. Then we design user interfaces and storytelling in an adaptive style that takes into consideration the special needs of disabled people that may have difficulty perceiving and understanding the original storytelling, or may be damaged by some characteristics of the interface or access. We use digital information by means of software and hardware aids to enhance the perception and understanding of the original storytelling.

4.1 Practical solutions for critical visual issues

We carried out manual checks, but also thanks to tools such as the *Photosensitive Epilepsy Analysis Tool* offered for free by the *US College of Information Studies of the University of Maryland*, we were able to check for intermittent flashes which would be dangerous for people suffering from epilepsy (Fig. 9).

We also checked through simulations of color blindness and achromatopsia to ensure that color was not exclusively required to grasp informative and / or communicative meaning (Fig. 10).

We have avoided adopting absolute white backgrounds to avoid the disturbance of "floaters" in the field of vision: if this occurs, it will require time and effort to change background colors, but this really is a small job to carry out. Finally, with very little effort, we recommend using the Atkinson Hyperlegible font designed by the Braille Institute of America, as it provides greater legibility and readability for low vision readers (Fig. 11).

Another carefully implemented feature of the animation is that of having created a frame to direct the attention of the person who may have restricted peripheral vision to the area where the performed digital animation is actually displayed (Fig. 12).

4.2 Text-only description

Our text-only description of the animation take advantage of special punctuation and correct applica-

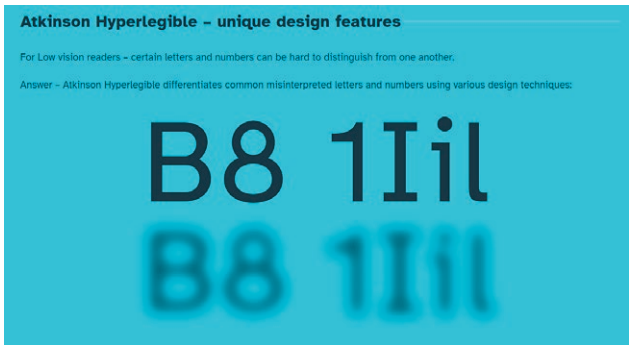

Figure 11. Atkinson font.

Figure 12. A frame with no significant information in the peripheral part of the animation helps the users who have difficulty with peripheral vision.

tion of HTML (i.e. HyperTextual Markup Language) and CSS (i.e. Cascading Style Sheets) markers to ensure an adequate reading pace and appropriate emphasis where necessary. It is difficult to establish how much it takes to draft a text to replace animated storytelling because it depends on the duration of the animation, but a maximum of 48 hours can be assumed to effectively describe any animation, even of medium and long duration.

(English text) Dagghy Meets XS2
This is the story of a cute little dog named Dagghy. He has a chance encounter with XS2, a special star whose name is pronounced as access to or access to something.
XS2 is in fact a kind of magical creature capable of helping anyone who wants to understand an animation and maybe has some difficulties listening to an audio or seeing images.
Dagghy has big ears and a pronounced nose. He is an anthropomorphic dog and is able to sit at a table and browse the Internet; On the Web he randomly meets XS2. She appears with a glow in her magic form that resembles the PLAY symbol the same that is used when you want to activate a video or a piece of audio.
Dagghy:“Oh!?!”
Leaving the computer screen, XS2 greets Dagghy with a smile and helps him to better understand animation thanks to the second side screen which contains the text descriptions.
XS2:”Hi! I’m XS2 and I’m here to help you better understand this animation!”
Dagghy the Dog is amazed and intrigued by the help screen next to him.
Dagghy:”Oooh!”
He touches it and magically he gets blue dots.
Dagghy:”I have got blue dots!”
XS2 reassures him and demonstrates her powers by restoring him to his original colors.
XS2:”I can fix it!”
Dagghy thanks XS2
Dagghy:”Thanks!”
and thus a splendid friendship is born between them.

4.3 Closed Caption (CC)

Our example of animation is supported by *Closed Caption* implemented in a second screen on the left (from the viewer’s perspective) of the animation’s screen rather than in the usual footer position of video and animation commonly supported by closed or open (integrated) captions: in this way you can effectively manage the visual formatting of captions to improve legibility and also better capture the attention of the end user (Fig. 13).

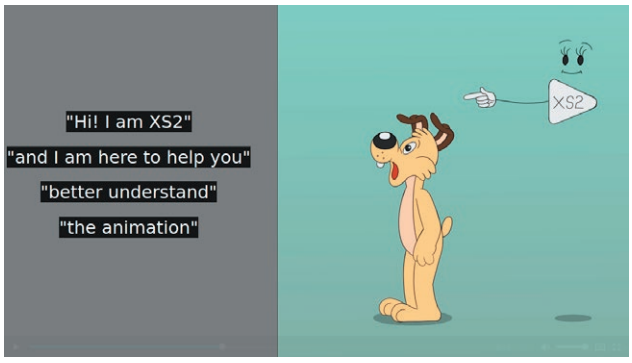

Figure 13. Closed Caption example within the second screen on the left.

We have chosen WebVTT (i.e. Web Video Text Tracks) as our Closed Caption format of choice because it is a standard of the World Wide Web Consortium (W3C) (Enamorado, 2017) and it can be implemented in almost all video sharing platforms.

We experimented with the use of the WebVTT Web Video Text Tracks Format and tested it both on smartphones and on desktop computers. We soon discovered that while the Firefox browser correctly interprets the position attribute during rendering, the Chrome browser does not correctly display these textual alternatives (MDN Mozilla Developer Network, 2021). We are convinced of the soundness of the strategy of adopting standards and open-source languages and of the need to encourage software producers to comply with the aforementioned devices and languages. If the WebVTT standard would be taken into greater consideration by browser and multimedia player manufacturers, problems of correct interpretation of closed captions could be solved. In the meanwhile, we are convinced of the need for transcriptions and audio-descriptions as better alternatives for those who use screen-readers.

4.4 Audio description

We have created an audio-only story of the animation, classically including it with the audio message icon commonly used in digital communication (Fig. 14). It is difficult to establish how much it takes to draft a text to replace an animation with an audio description because it depends on the duration of the animation, but a maximum of 48 hours of work can be assumed to effectively describe a short animation.

4.5 Sign Language

We were able to implement a specific User Interface similar to the one used for the Closed Caption, but with the second screen this time used to describe the story with the Sign Language (Fig. 15). Therefore, this opportunity has shown how any adaptive UI (i.e. User Interface) and storytelling can be employed in very useful inclusive solutions. Moreover, the animation supported by the second screen is a valuable opportunity to enrich and enhance the animation with further expressive interpretation, as demonstrated in the interpretation of the sign language of the XS2ANIMATION toolkit translating the audio contained in the animation for deaf signing people. It is difficult to establish how much it takes to carry out a sign language version of an arbitrary animation because it depends on the duration of the animation, but a maximum of 48 hours can be assumed to effectively describe a short animation with sign language.

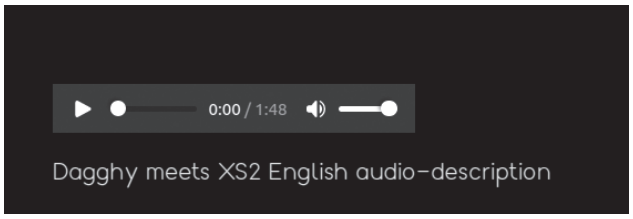

Figure 14. Audio description player.

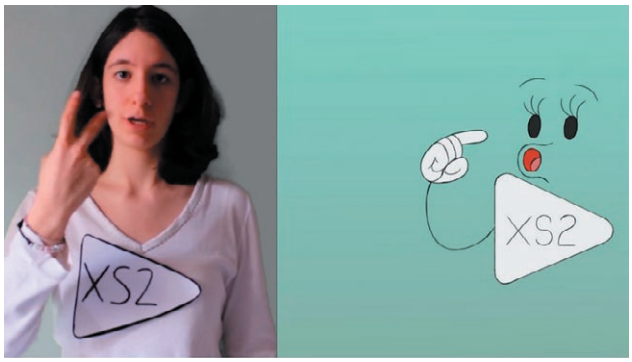

Figure 15. Within the second screen you can locate the language sign.

4.6 Augmentative Alternative Communication

We used some screenshots of the video to create a version of Augmentative Alternative Communication also known as AAC. Continuing to take advantage of our second screen UI (i.e. User Interface) we have created an adaptive transposition of slides with more understandable 'writings' for cognitive and autistic disabled people (Fig. 16). Our implementation example, therefore, could be further diversified and even simplified depending on the specific target audience and 'degree' of autism with which we are dealing (Cafiero et al., 2002). Note, in order to create adaptive storytelling, the different narrations must be present on the texts of the images and the ones assigned to the attributes ALT (i.e. Alternative Text) and LONGDESC (i.e. Long Description) for a proper implementation on a web page. It is difficult to establish how much effort it takes to carry out an AAC (i.e. Augmentative Alternative Communication) version of an arbitrary animation because it depends on the duration, but a maximum of 48 hours can be assumed to effectively describe a short animation with the Augmentative Alternative Communication based slides.

Figure 16. In this example the second screen is used to outline the text supported by Atkinson Hyperligible Font in an Augmentative Alternative Communication slide.

Example of code with the alt (alternative text) attribute to insert an image on the Web for proper interpretation by blind people. Please note the different storytelling:

<img src=”xs2-ciao.png” width=”100%” alt=”xs2 appears smiling off the screen and offers her friendship to a surprised Dagghy “>

5. FUTURE PROSPECTS

Our ‘solution’ is certainly not 100% resolutive and we obviously submit ourselves to the judgment of experts and communities of disabled people. It is certainly deficient due to some critical issues that were difficult to take into consideration, such as that of satisfying the needs of deafblind and psychosensory impaired people[1]. We undertake to keep the prototype updated on https://cardeisart.com/projects/xs2animation and this same research document available on http://www.infoaccessibile.com/xs2animation.htm with any further expedients and accessibility solutions that will emerge in the future, and also on the basis of suggestions and reports that may come from experts and communities of disabled people. This project is in continuous development and we have at least three other development ideas that we will present publicly after we have tested them. Surely in the future, the advent of Artificial Intelligence will solve many aspects of facilitated interpretation of digital information for the use and consumption by disabled people, but the fact remains that artistic and human intervention can always bring greater value to any type of artistic and communicative realization, especially if supported by devices and information aids. We are aware of the interpretative abilities of visual data by the artificial intelligence systems of social networks and search engines[2] and of some experiments of automatic translation into sign language from the written word, but currently the results obtained by these automated tools are less reliable than manual interventions. We cannot help but consider the problems of cultural interpretation that can be found in the various countries of the world linked to the type of communication used[3] (a notable example is in the different chromatic displays associated with the sense of mourning in different countries. For many countries it is black, but in Asia it is white), but this should be tackled by individual producers with the help of cultural mediators: a famous case being when Pixar expressed the sense of disgust in the cartoon Inside Out, they had to replace broccoli with green peppers for the Japanese market. This was because the latter, and not broccoli, cause real disgust in Japanese children, unlike those in the United States hate broccoli.

Fortunately, there are many research initiatives that are under development in the world as for accessibility and also in the specific area of videos and animation accessibility: among the most interesting and worthy of mention is certainly OzPlayer as well as Able Player which represent excellent professional-level technological solutions even if they are relatively complex and require maintenance over time. (Moreover, the installation and use of the aforementioned technological solutions are demanding and costly for some types of users.)

Last, it is important to mention regulatory obligations: indeed, according to a European directive (European Union, 2019), from 2025 all websites in both public and private sectors will have to comply with technical accessibility requirements.[4] Any good-willed developer spends more or less the same amount of time creating accessible or inaccessible multimedia products: it depends only on the level of consciousness and competence acquired in the field and this inclusive toolkit intends to facilitate individual technical growth in the field of digital accessibility

6. FINAL CONSIDERATIONS AND CONCLUSIONS

We think that a proper restyling of a digital animation to turn it into an accessible one can take advantage of:

[1] The Lega del Filo d’Oro is certainly a point of reference in Italy at the level of scientific research on support tools for deafblind and psychosensory people (Baroncini, 2015) with multiple impairments: https://www.legadelfilodoro.it/cosa-facciamo/la-ricerca

[2] See https://cloud.google.com/vision/

[3] See http://www.infoaccessibile.com/lab-culture.htm

[4] European Accessibility Act see https://eur-lex.europa.eu/legal-content/IT/LSU/?uri=CELEX%3A32019L0882

1. *Adaptive User Interfaces* able to support the end user and her/his software and hardware aids to perceive the animation in a proper and satisfying way;
2. *Adaptive Storytelling* because content can also be developed and vary according to the specific target you must satisfy;[5]
3. *Open Source and Standard solutions aiming at interoperability of languages and devices* should be a rule to follow not only for designers and animation creators but also for browser and multimedia producers so as to identify adaptive solutions that will be rendered in the same way by any kind of software and hardware devices.

Our XS2ANIMATION research and prototyping laboratory on accessible animations will continue to host and provide solutions to this effect. The final intent of this operational proposal remains to invite the technical and artistic community that deals with digital videos and animations to finally make a quality leap and become aware that 15% of the population are people with disabilities.[6] The industry needs ad hoc solutions to guarantee the right of these people to access and use that fantastic expressive medium that is digital animation, which has fascinated the whole world since its appearance. This is possible to achieve through simple technical adjustments, but also using alternative expressive languages that do not detract from the original work but can even compliment it: see the non-hearing version of Mahmood's "money" song to believe.[7]

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[5] See https://oaj.fupress.net/index.php/med/article/view/8816

[6] See https://www.wethe15.org/

[7] See https://www.open.online/2019/05/21/lipnotica-versione-per-non-udenti-di-soldi-di-mahmood-il-video/

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