Utray, F., Ruiz, B., Moreiro, J. A. Maximum font size for subtitles in Standard Definition Digital Television: Tests for a font magnifying application in : Matamala, A., & Orero, P. (Eds.). (2010). Listening to Subtitles. Peter Lang CH.

Francisco Utray, Belén Ruiz, José Antonio Moreiro

Maximum font size for subtitles in Standard Definition Digital Television: Tests for a font magnifying application

This article discusses the results of the tests conducted by the Centro Español de Subtitulado y Audiodescripción *(CESyA) to establish the maximum acceptable font size for subtitles in standard definition digital television (SDTV).*[1] *The screen space taken up by texts was measured in pixels when establishing the specifications for a subtitle magnifying application. This application will allow users to optionally increase character size.*

1. Introduction

Subtitles provide access to audiovisual contents and are used by a wide group of viewers who require this service either because of hearing disabilities or to gain access to contents in a foreign language that they do not know or master (Díaz Cintas, 2003). But the size of subtitle fonts can be an obstacle to people who are unable to distinguish text on screen clearly. In digital television this problem can be addressed by developing a character magnifying application with the option of increasing character size in order to improve text legibility. This is a requirement that representatives of visually impaired people have been calling for worldwide (CERMI, 2006; RNIB-BBC, 2004) but the requirement also caters to the needs of a wider group of people who would benefit from it. The application is al-

---

[1] The CESyA (Spanish Centre for Subtitling and Audio Description) is a Public Reference Institution dependent on the Royal Board on Disability – Ministry of Labour and Social Affairs. It was created to promote wider accessibility in the audiovisual media environment through the services of subtitling and audio description.

ready available in PC environments but has not yet been incorporated into European digital TV broadcasting systems.

Orero (2007) highlights the multidisciplinary nature of current studies covering content accessibility as well as the technology involved. Our article focuses on an extremely specific technological aspect, namely, the maximum size applicable in Europe to subtitle characters on 4:3 standard definition television screens. It describes the methodology followed and the results of the tests carried out by the CESyA.

In Europe, subtitles are currently broadcast on digital television via teletext services or in digital DVB sub format (ETSI, 2002, 2003; Martín Edo, Jiménez, Cisneros & Menéndez, 2007). In the case of teletext, the broadcaster transmits subtitles in text format, displaying the ASCII codes of the characters,[2] and the graphics are created in the receiver. However, in the case of the DVB sub format, subtitles are broadcast as a bitmap image, thereby ensuring a homogeneous graphical presentation on all receiver sets. In this case, typographical decisions are made by broadcasters and their subtitle production centres. Therefore, we are faced with two different scenarios for the specification of a font magnifying application, depending on whether subtitles are broadcast in text format or image format.

The first scenario deals with possible subtitles in text format: the font magnifying application needs to be developed by equipment manufacturers and it must be transparent for the broadcaster. In order to increase font size, receiver systems must be equipped with the necessary typeface options. Each receiver model will thus offer the user its own characteristics for subtitle display. The advantages of this method are that broadcast bandwidth is optimised and each manufacturer can differentiate itself from its competitors through the graphic features of subtitling.

The second scenario deals with possible subtitles in bitmap image format. In this case, typographical decisions are to be taken by broadcasters. In order to provide a font magnifying option, the broadcasters will need to broadcast two subtitle channels, one with the standard font size and another with magnified characters.[3] The advantage of this format is that it allows broadcasters to monitor the ways in which subtitles are displayed in

2   The ASCII code (American Standard Code for Information Interchange) is a code of characters used by computer systems to display texts.

3   Broadcasting of a subtitle channel in DVB Sub involves the use of a 50–120 kbit/s bandwidth, which is not always available for this purpose.

any receiver on the market. Subtitles in bitmap image format are also used for DVDs.

The following section analyses the conditioning factors that limit the possibility of increasing font size for PAL standard definition television in both scenarios referred to above.

2. Limits on increasing font size

The font magnifying application is subordinate to the main subtitle channel and must abide by the editorial decisions of the subtitler and observe the limits of the safe caption areas while ensuring interoperability with all receivers on the market. Each of these aspects is analysed below.

2.1. Safe Caption Areas

Digital television pictures for SDTV broadcasting are 720 pixels wide and 576 pixels high. According to the professional standards adopted by the industry (BBC, 2007; Ofcom, 2006), the text labelled on the image must be confined to a safe caption area, which decreases the available space by twenty per cent. Therefore, only 576 pixels are left horizontally for subtitles, as shown in Figure 1.
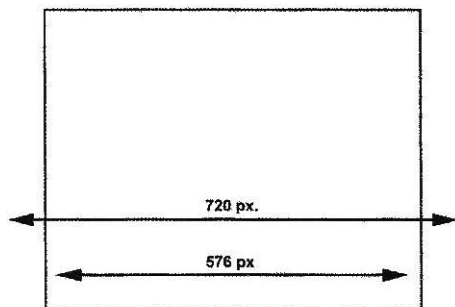

Figure 1. Safe caption area for a PAL SDTV image.

2.2. Structure of subtitle screens

During the subtitle production and editing processes, professionals comply with a number of criteria concerning reading speed (d'Ydewalle & Van Rensbergen, 1987) and grammatical arrangement of the sentences, depending on the space available (Díaz Cintas, 2003; Neves & Lorenzo, 2007). These criteria have resulted in the establishment of professional codes and standards of good practice that take into account the limitations of the Teletext system for analogue television (AENOR, 2003; ITC, 1999; Ofcom, 2006). In the digital environment, these codes and standards, which have already proved efficient in teletext, should be maintained to ensure compatibility with the catalogue of existing subtitles and with the receivers already installed in European homes. These standards establish a limit of 32 to 37 characters per line for teletext subtitling and recommend using only two lines of text on each subtitle screen (AENOR, 2003; ITC, 1999; Karamitroglou, 1998; Ofcom, 2006). This criterion is considered to set the limit for enlarging characters. Otherwise, when increasing font size, a point would be reached when three or four lines would be required to display the text, breaking the structure of the subtitle as designed during the production process.

2.3. Interoperability

Digital television reception is possible both on modern television sets with integrated digital receivers and on older television sets that require external set top boxes. The font magnifying application for subtitles should be available for all television sets in European homes. Therefore, it is important to comply with the safe caption areas, whether the subtitles are in an image format or a text format.

This requirement does not apply when the application is produced by a manufacturer for a specific screen, for example, in the case of a television set with a 16:9 flat widescreen and an integrated DTT receiver incorporating an application for magnifying subtitles in text format. The manufacturer is aware of the restrictions of these particular screens and can freely incorporate any changes to accommodate these restrictions, as the application will run only on that equipment and according to particular technical specifications. However, in the case of an external receiver, the manufacturer is unfamiliar with the characteristics of the screen to which the re-

ceiver will be connected and will therefore need to develop the application in accordance with the aforementioned specifications to ensure that the receiver will function properly on older 3:4 tube (CRT) television sets.

3. Technical tests to establish maximum font size

Technical tests were conducted to establish the maximum permitted font size, taking into consideration the different typographical styles available for subtitles. A reference text was selected for the tests, and measurements for each font were made in pixels.

3.1. Font selection

Regarding the choice of fonts, visually impaired user organisations recommend the use of fonts which are called sans serif fonts (Kitchel, 2006; ONCE, 2006; RNIB-BBC, 2004). Sans serif fonts eliminate all flourishes or serifs, which are the small decorative ornaments generally attached to the ends of the main character strokes. As pointed out by Ivarsson and Carroll (1998: 42), "embellishments like serifs might make the type more attractive and legible on paper, but tend to impair legibility on the screen". Figure 2 shows the difference between *sans serif* and *serif* fonts.

sans serif   serif

Figure 2. Example of *sans serif* and *serif* font types.

Of the sans serif fonts specifically designed to maximise legibility on electronic screens, the Tiresias font was created in 1998 by a team led by John Gill to meet the requirements of visually impaired people (Tiresias, 2007). It is the font recommended for digital television in the UK by the Royal National Institute of Blind People (RNIB) and by the regulator Ofcom 2006). A critical analysis of the Tiresias font performed by Clark (2005)

points out a few flaws in its design and in the research conducted with users with a view to its validation.

In Spain, the national organisation for blind people (*Organización Nacional de Ciegos Españoles* (ONCE)) published a report in 2006 on captioning characteristics for visually impaired people, recommending the use of the Arial font (ONCE, 2006). Although the organisation fails to indicate how this conclusion was reached, it is along the same lines as the research on font legibility conducted by Bernard, Liao, Chaparro and Chaparro (2001), who consider Arial and Verdana to be the sans serif fonts best suited for computer screens. A major advantage of these typefaces is that they are available in most computer operating systems and on electronic equipment. However, the use of specific fonts for subtitles requires that the fonts be installed in production equipments and also in the receivers when broadcasting is performed in text format.

Four sans serif fonts were chosen for measurement: Arial Regular, Arial Narrow, Verdana and Tiresias. With the Arial Narrow font, letter spacing is substantially reduced and the shape of the characters is condensed so that the font also takes up less space on screen. In contrast, Verdana has wide interspacing. Tiresias was chosen because of its widespread use in the UK. The maximum permitted size was tested for each of these fonts in accordance with the aforementioned limitations.

3.2. Selection of a reference text for measurement purposes

The alphabet includes wide characters (such as M or W) that take up many pixels and narrow characters (such as I or L) that take up less room. Therefore, it is not possible to determine the exact length in pixels of a line of 32–37 characters as it depends on the arrangement of the characters that make up the subtitle line and on the language used for subtitling (Ivarsson & Carroll, 1998).

In the following examples, two lines of 37 characters were taken from the Latin text *Lorem ipsum*, which has been used for typographical tests since the invention of the printing press: *Lorem ipsum dolor sit amet, consectet* and *Quisque molestie cursus sem. Maecenas*. This text has been considered a useful reference for measuring the pixels required, since it contains the maximum number of characters permitted by the standards consulted (see 2.2) and an average combination of short and long letters.

3.3. Measurements in pixels of the reference text for each typeface

As mentioned above, in an SDTV image only 576 pixels are available horizontally (see 2.1) for subtitle texts. Measurements were carried out on the four selected fonts to establish the size beyond which the chosen text exceeds the 576 pixels available on the screen. The resulting figure for each of these fonts is the maximum font size recommended for a subtitle magnifying application in SDTV screens.

Figure 3 provides an example of subtitles in Arial Regular font. Above 31 points, texts may exceed the safe caption area. Therefore, 31 is the maximum size recommended.
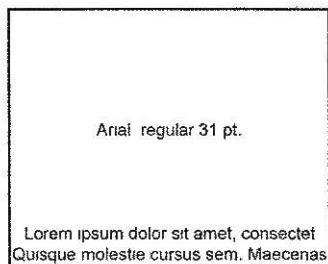
Figure 3. Example of subtitles in Arial Regular 31.

As shown in Figure 4, Arial Narrow characters are narrower and the maximum size in this case is 39 points. It should be noted that the characters of this typeface are taller and thus take up a larger area of the picture.
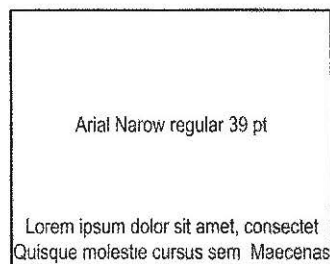
Figure 4. Example of subtitles in Arial Narrow 39.

Figure 5 shows the same example using Verdana typeface. In this case, the maximum recommended size for character magnification is 28 points.
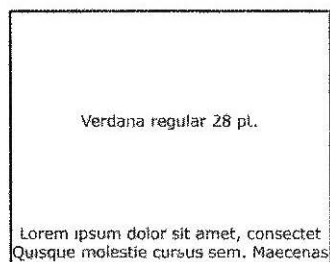
Figure 5. Example of subtitles in Verdana 28

And lastly, the tests conducted using Tiresias typeface in Figure 5 point to a maximum recommended size of 30 points.
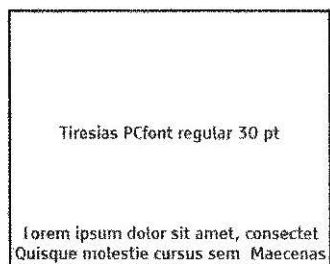
Figure 6. Example of subtitles in Tiresias 30.

4. Conclusions

Character magnifying applications for subtitles in digital television need to be compatible with all receivers installed in homes, including older television sets which cut off the edges of the picture. It is therefore necessary to comply with caption safety areas as defined by industry standards and quality standards of subtitling for people who are deaf and hard o

hearing. In this respect, subtitles should take up fewer than 576 pixels horizontally.

Sans serif fonts, which have no ornamental details at the ends of the strokes, are the most legible fonts on screen. Arial, Tiresias and Verdana are examples of the fonts recommended by users for television screens.

According to the measurements carried out, the maximum recommended sizes for SDTV screens are as follows: Arial Regular 31, Arial Narrow 39, Verdana 28 and Tiresias 30. Above these sizes, there is a risk that the texts may not always fit on the screen.

The measurements were made on PAL Standard definition 4:3 screens. Therefore, they do not apply to future high definition television channels or to modern 16:9 screens. This is an important issue for the immediate future of television in Europe, which needs to be debated and researched, also paying attention to retrocompatibility for users who still have old television sets from the analogue era.

References

Asociación Española de Normalización y Certificación (AENOR). (2003). *Norma UNE 153010: Subtitulado para personas sordas y personas con discapacidad auditiva. Subtitulado a través del teletexto.* Madrid: Asociación Española de Normalización y Certificación.

Bernard, M. L., Liao, C. H., Chaparro, B. S., & Chaparro, A. (2001). Examining perceptions of online text size and typeface legibility for older males and females. *Proceedings of the 6th Annual International Conference on Industrial Engineering: Theory, Applications, and Practice.* San Francisco. Retrieved 6 April 2009, from <http://psychology.wichita.edu/mbernard/articles/IJIE%20Legibility%20for%20Older%20Adults.pdf>.

British Broadcasting Corporation (BBC). (2007). *BBC Technical Standards for Network Television Programme Delivery.* Retrieved 6 March 2008, from <http://www.bbc.co.uk/guidelines/dq/pdf/tv/tv_standards_london.pdf>.

CERMI. (2006). *Accesibilidad de la televisión digital para personas con discapacidad.* Retrieved 29 February 2008, from <http://www.infodisclm.com/documentos/accesibilidad/acces_tv_digital.html>.

Clark, J. (2005). What's wrong with Tiresias? Retrieved 6 April 2008 from <http://screenfont.ca/fonts/today/Tiresias/>.

Díaz Cintas, J. (2003). *Teoría y práctica de la subtitulación inglés – español.* Barcelona: Ariel.

Díaz Cintas, J. (2007). Por una preparación de calidad en accesibilidad audiovisual. *Trans. Revista de Traductología, 11,* 45–60.

d'Ydewalle, G., & Van Rensbergen, J. (1987). Reading a message when the same message is available auditorily in another language: The case of subtitling. In J. K. O'Regan & A. Lévy-Schoen (Eds.), *Eye movements: From physiology to cognition* (pp. 313–321). Amsterdam: Elsevier Science.

European Telecommunications Standards Institute (ETSI). (2002). *ETSI EN 300 743 V1.2.1. Digital Video Broadcasting (DVB): Subtitling systems.* Retrieved 6 March 2008, from <http://broadcasting.ru/pdf-standard-specifications/subtitling/dvb-sub/en300743.v1.2.1.pdf>.

— European Telecommunications Standards Institute (ETSI). (2003). *ETSI EN 300 472 V1.3.1 Digital Video Broadcasting (DVB): Specification for conveying ITU-R System B Teletext in DVB bitstreams.* Retrieved 6 March 2008, from <http:/broadcasting.ru/pdf-standard-specifications/multiplexing/dvb-txt/en300472.v1.3.1.pdf>.

Independent Television Commission (ITC) (1999). *ITC guidance on standards for subtitling.* London: Independent Television Commission.

Ivarsson, J., & Carroll, M. (1998). *Subtitling.* Simrishamn: TransEdit.

Karamitroglou, F. (1998). A proposed set of subtitling standards in Europe. *Translation Journal, 2,* 1–15.

Kitcherl, E. J. (2006). *Large print: Guidelines for optimal readability and APHont^{TM} a font for low vision.* American Printing House for the Blind. Retrieved 7 March 2008, from <http://ubceac.org/files/Large%20Print%20Guidelines%20for%20Optimal%20Readability.pdf>.

Martín Edo, C.A., Jiménez, D., Cisneros, G., & Menéndez, J.M. (2007). Implantación de la accesibilidad en la televisión digital: Situación actual y futuros desarrollos. In B. Ruiz & F. Utray (Eds.), *Accesibilidad a los medios audiovisuales para personas con discapacidad AMADIS 06* (pp. 115–129). Madrid: Real Patronato sobre Discapacidad.

Neves, J., & Lorenzo, L. (2007). La subtitulación para Sordos: panorama global y prenormativo en el marco ibérico. *Trans. Revista de Traductología, 11,* 95–113.

Ofcom. (2006). *Code on Television Access Services.* London: Office of Communication. Retrieved 14 April 2008, from <http://www.ofcom.org.uk/tv/ifi/codes/ctas/ctas.pdf>.

Orero, P. (2007) La accesibilidad en los medios: una aproximación multidisciplinar. *Trans. Revista de Traductología., 11,* 11–14.

Organización Nacional de Ciegos Españoles (ONCE) (2006). *Características de la rotulación para personas con discapacidad visual.* Retrieved 6 March 2008, from <http://wssa.once.es/crpdv/Senaletica.htm>.

RNIB-BBC. (2004). *Text on screen guidelines for television audience with sight problem.* Retrieved 5 April 2008, from <http://www.rnib.org.uk/xpedio/groups/public/documents/publicwebsite/public_TVprofessionals.hcsp#P8_658>.

Tiresias. (2007). *Guidelines: Television.* Retrieved 6 February 2008, from <http://www.tiresias.org/guidelines/television/>.