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INTERNATIONAL STANDARD

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Multimedia systems and equipment – Multimedia e-publishing and e-book technologies – Texture map for auditory presentation of printed texts

Systèmes et appareils multimédia – Technologies de l'édition électronique multimédia et des livres électroniques – Carte de texture pour la présentation auditive de textes imprimés

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

MULTIMEDIA SYSTEMS AND EQUIPMENT – MULTIMEDIA E-PUBLISHING AND E-BOOK TECHNOLOGIES – TEXTURE MAP FOR AUDITORY PRESENTATION OF PRINTED TEXTS

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The text of this standard is based on the following documents:

CDV	Report on voting
100/1882/CDV	100/1923/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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INTRODUCTION

Information interchange via printed documents between blind or visually impaired people has been carried out by using Braille. However, in order to be able to read Braille, particular training is required. Learning Braille is very difficult for aged as well as visually non-impaired people.

Printed documents with texts and text-encoded texture maps can be interchanged by ordinary circulation or publication mechanisms. They are readable as ordinary printed materials and comprehensible by blind or visually impaired people with the support of decoding and auditory presentation equipment.

Today, interchanging of printed documents has become wide-spread and international. The text-encoding scheme to generate a texture map should therefore be standardized at an international level.

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MULTIMEDIA SYSTEMS AND EQUIPMENT – MULTIMEDIA E-PUBLISHING AND E-BOOK TECHNOLOGIES – TEXTURE MAP FOR AUDITORY PRESENTATION OF PRINTED TEXTS

1 Scope

This International Standard specifies

– a text encoding scheme to generate a texture map;
– a physical shape and dimension of the texture map for printing;
– additional features for texture map printing;
– texture map decoding and an auditory presentation of decoded texts.

These specifications enable the interchange of documents and publications between visually impaired and non-impaired people.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
texture map
two dimensional cell pattern which includes alignment lines and a data matrix which is generated from text data compression and error correction encoding

2.2
auditory presentation equipment
software engine to convert text to speech

3 Shape of texture map

3.1 Names of parts

The shape of a texture map and the name of each part are indicated in Figure 1.

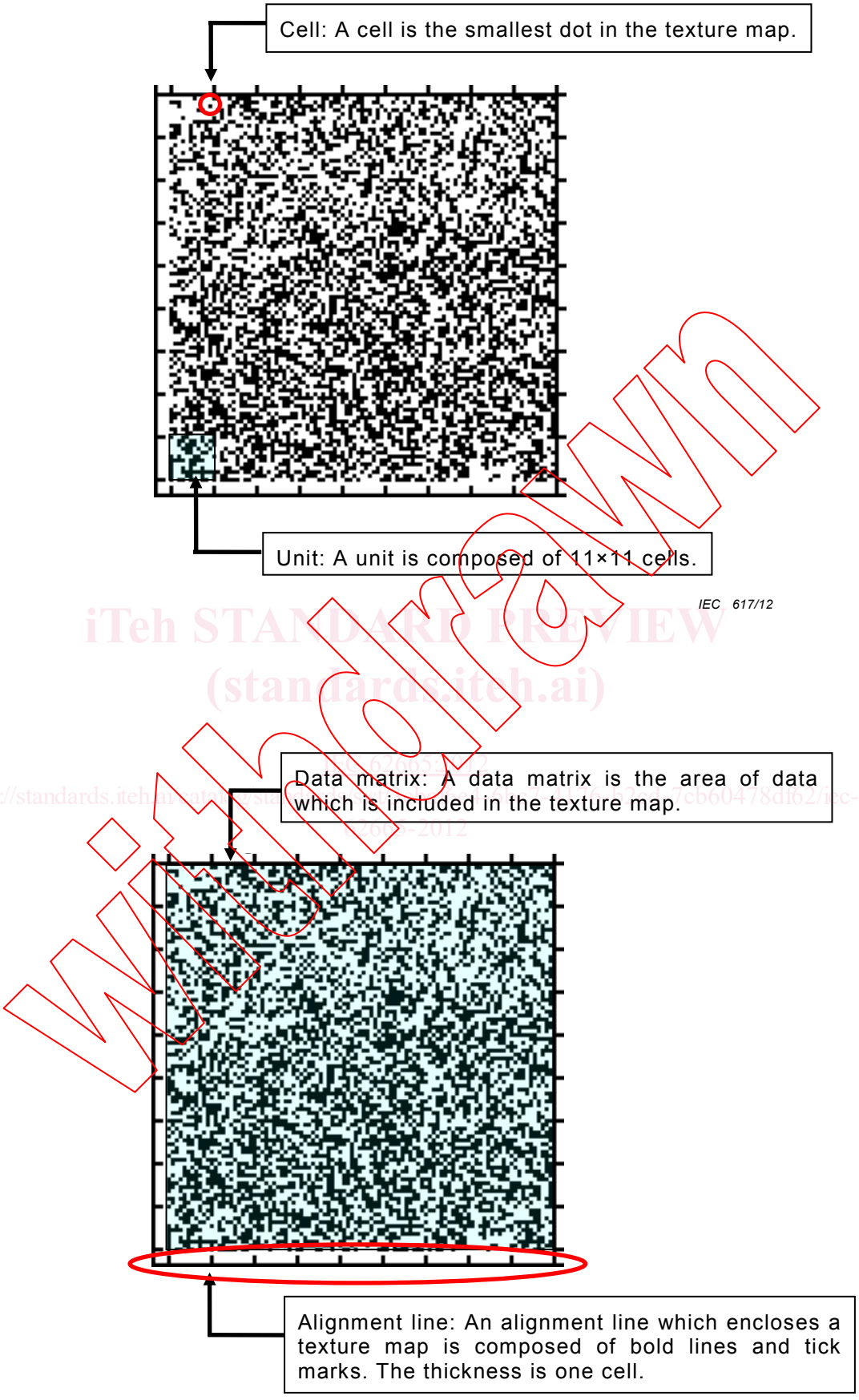

Figure 1 – Names of parts of the texture map

The figures above show an M size texture map. For size and data volume, see 4.2. Figure 1 is magnified for explanation.

3.2 Size and data volume

The texture map includes four step sizes, XS, S, M and L. The sizes and data volumes are as indicated in Table 1.

Table 1 – Sizes and data volume of texture maps

Size	Number of cells	Number of units	Dimensions at printing mm	Error correction	Data volume (double byte characters)
XS	40 × 40	3 × 3	6,8 × 6,8	strong	41
				medium	48
				weak	51
S	73 × 73	6 × 6	12,4 × 12,4	strong	250
				medium	298
				weak	329
M	106 × 106	9 × 9	17,9 × 17,9	strong	651
				medium	768
				weak	840
L	117 × 117	10 × 10	19,8 × 19,8	strong	793
				medium	921
				weak	1 027

NOTE 1 Number of cells: Cells including alignment line.

NOTE 2 Dimensions at printing: Dimensions of BMP (Bitmap) image at printing with 600 dpi resolution made by SpeechioSymbol function.

NOTE 3 Error correction: There are 3 levels of error corrections, strong, medium and weak, which are specified by encoding texts to a texture map by the SpeechioEncode function.

NOTE 4 Data volume: The values in Table 1 are approximate, not fixed values, because the compression rate is different for different types of content of text data.

3.3 Encoding method of texture map from texts

The algorithm or flow of generating the texture map from texts is shown in Figure 2.

Text data are compressed using the LZSS (Lempel-Ziv-Storer-Szymanski) method after the process of packing the input text stream. The texture map data is made by adding error correction data to the compressed bit stream using the Reed-Solomon method.

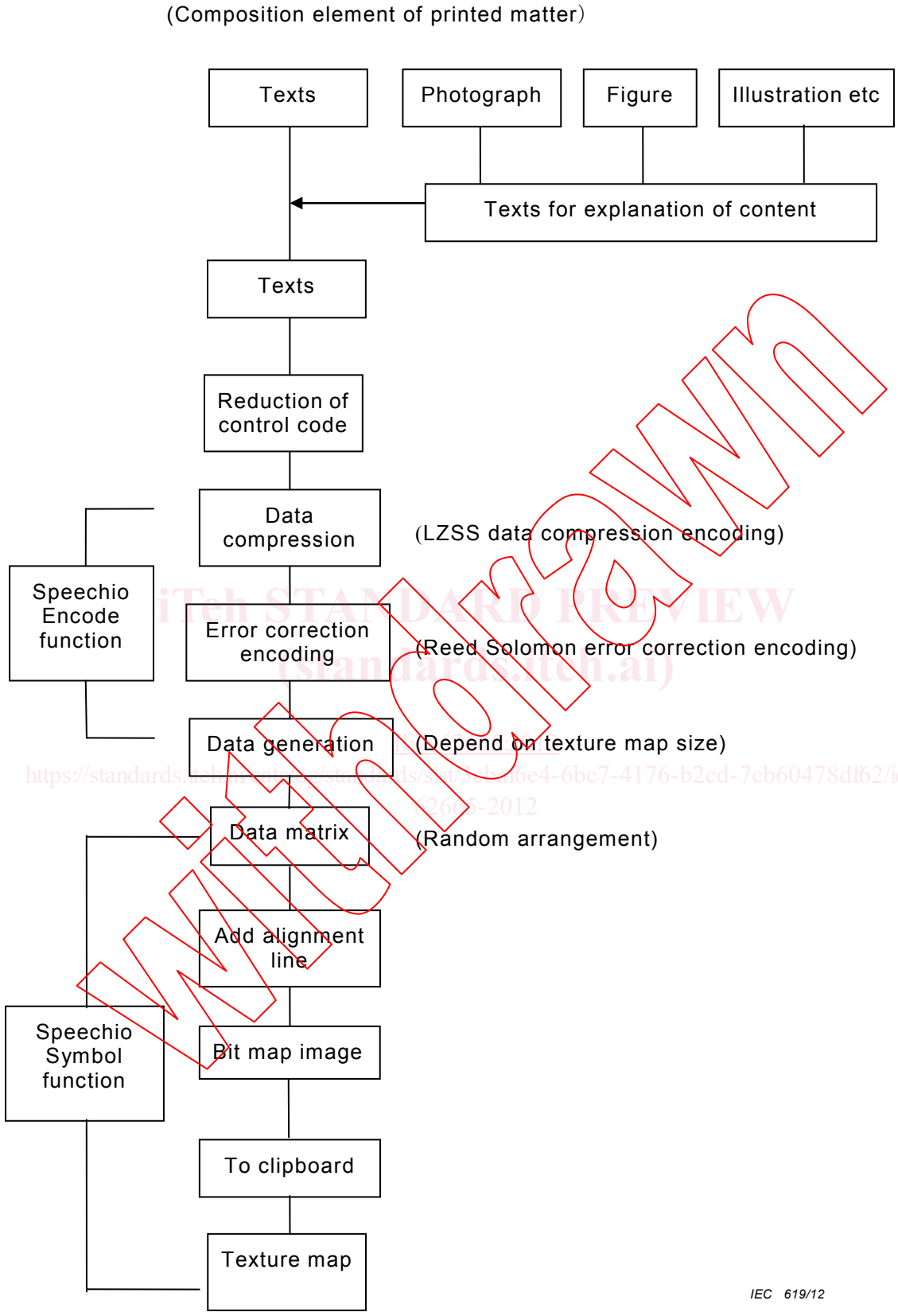

Figure 2 – Flow chart of generating texture map from texts

A texture map is easily made by using the special library Speechio.dll.

A texture map is made by first encoding the text data and then symbolizing the encoded data using the SpeechioSymbol function. Texts are encoded with SpeechioEncode function;

encoded data are stored as a bit_string. A bit_string is a character array with only “0” and “1”. These data are presented from top left to bottom right of the texture map. The SpeechioSymbol function makes the texture map image from the bit_string. The texture map image is transferred to the clip board.

3.4 Input specification

The input character code does not include the control code.

3.5 Encode function: SpeechioEncode

SpeechioEncode

```
short __stdcall SpeechioEncode(
char data_type[],
char cell_type[],
char recover_level[],
char copyright[],
short data_size,
unsigned char data_code[],
char path_name[],
unsigned char bit_string[]
);
```

Function

Encoding from input texts

Argument value

```
data_type:Type of text data=”T” (Japanese text, shift-JIS), ”E” (English
text, ascii)

cell_type Size of texture map

              ="s"(XS)/="S"(S)/="m"(M)/="M"(L)

recover_level   Strength of error correction
="S"(strong)/="N"(medium)/="P"(weak)

data_size   Byte number of input data

data_code   Input data

bit_string   Buffer for encoded data
```

Returned value

```
>0           Normal end : encode data put away to bit_string

=0        Error : failure of encoding

<0          Data volume over : =(byte number of over flow) ×-1)
```

Bit-string data to put away encoded data needs to have a memory area for the calling side. A bit-string generates an array area of "0"(0x30) and "1"(0x31) which are the middle data from left top to right bottom of the texture map.

3.6 Generated symbol function: SpeechioSymbol

SpeechioSymbol

```
short __stdcall SpeechioSymbol(
short col,
short row,
unsigned char symbol_data[]
   );
```

Function

Generating (symbolizing) a texture map from encoded data.

Argument value

```
col             Number of cells for horizontal symbol
                =40(XS)/=73(S)/=106(M)/=117(L)
row             Number of cells for vertical symbol
                =40(XS)/=73(S)/=106(M)/=117(L)
symbol_data Designated bit_string generated by SpeechioEncode function
```

Returned value

```
=0          Normal end
<0          Error
```

NOTE If the process is completed in the normal way, a texture map image is transferred to clipboard with BMP format type. Generated images are composed of cells which are composed of 4×4 dots.

3.7 Error correction

For error correction, the Reed Solomon method is used. It is recommended to use the medium error correction level if there is no reading problem.

If the printing material is not in good condition, it is necessary to use a stronger error correction level. Then the amount of data included is reduced, as shown in Table 1.

3.8 Decoding method from texture map to texts

The flow of text generation by decoding from a texture map is shown in Figure 3.

(Printed matter with texture map)

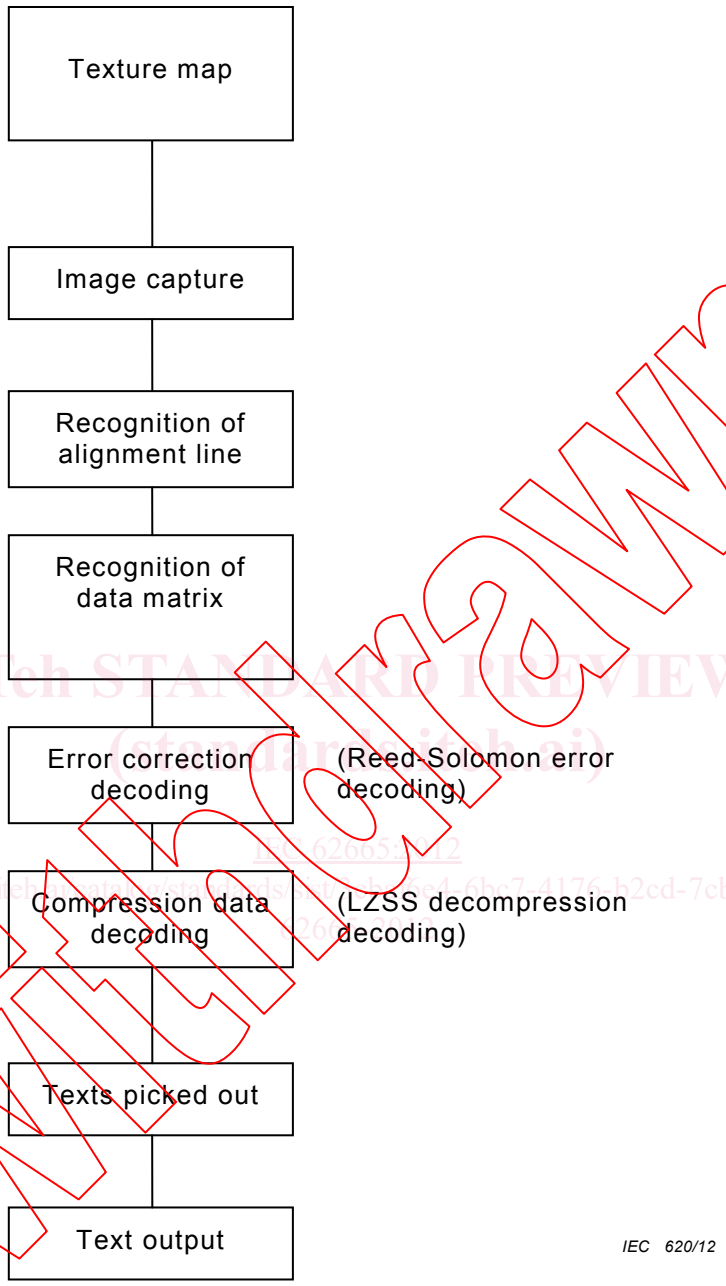

Figure 3 – Flow chart of text-decoding from texture map

3.9 Example of use of function

The following is an example of the use of an encoding and symbol generating function:

```
/*************************************************************************
*
* Example of using encoding and symbol generating function
*       Link to Speechio.lib file. “Speechio.dll” is allocated to a given/transmitted holder (system holder or program holder)
*
*************************************************************************/
#include <stdio.h>
#include <string.h>
#include "Speechio.h"/* declaration of function prototype, header of definitional
SP_MAX_BIT_SIZE */
int main(void){
unsigned char text[] = " example of generated texture map";
/* input text data */
unsigned char bit_str[SP_MAX_BIT_SIZE];/* bit_string buffer */
short rc;/*variables of returned value of function*/

/* encoding process/*
rc = SpeechioEncode( "T", "m", "N", "", (short)strlen(text), text, "", bit_str);
if(rc <= 0){
if(rc == 0)
printf( "failure of encoding process\n");
else if(rc < 0)
printf( "%hd byte over\n”, -rc)
return 1;
}

/* process of generating texture map image /*
rc = SpeechioSymbol(106, 106, bit_str);
if(rc < 0){
printf("failure of image generating process\n");
return 1;
}

 printf("texture map image is transferred to clipboard\n");

return 0;
}
```

4 Printing of texture map image

4.1 General

It is necessary to print the texture map generated by a personal computer at the appropriate position and using the correct size of the image on paper, because the auditory presentation equipment has a CCD (Charge Couple Devices) camera at a fixed position.