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RELEASE NOTE

Recommendation GSM 06.11

Substitution and muting of lost frames for full rate speech traffic channels

Previously distributed version : 3.0.0 (Release 1/90)
New Released version February 92 : 3.0.1 (Release 92, Phase 1)

1. Reason for changes

Only page numbering has been changed since the previously distributed version.

Recommendation: GSM 06.11

Title: Substitution and muting of lost frames for full-rate speech traffic channels

Date: February, 1992

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Detailed contents list
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0. SCOPE

This recommendation defines a frame substitution and muting procedure which shall be used by the RX DTX handler when one or more lost speech or SID frames are received from the radio subsystem.

The requirements of this recommendation are mandatory for implementation in all GSM Base Station Systems and Mobile Stations.

1. GENERAL

The definitions of terms used in this recommendation can be found in recommendation GSM 06.31.

The purpose of the frame substitution is to conceal the effect of lost frames.

The purpose of muting the output in the case of several lost frames is to indicate the breakdown of the channel to the user.

2. REQUIREMENTS

2.1. FIRST LOST SPEECH FRAME

Normal decoding of lost speech frames would result in very unpleasant noise effects. In order to improve the subjective quality, the first lost speech frame shall be substituted with either a repetition or an extrapolation of the previous good speech frame(s). Lost speech frames shall not be delivered to the speech decoder, nor shall the output be muted directly.

2.2. SUBSEQUENT LOST SPEECH FRAMES

For subsequent lost speech frames, a muting technique shall be used that will gradually decrease the output level, resulting in silencing of the output after a maximum of 320 ms. Section 3 gives an example solution.

2.3. FIRST LOST SID FRAME

A single lost SID frame shall be substituted by the last valid SID frame and the procedure for valid SID frames be applied as described in recommendation GSM 06.31.

2.4. SUBSEQUENT LOST SID FRAME

For the second lost SID frame, a muting technique shall be used on the comfort noise that will gradually decrease the output level, resulting in silencing of the output after a maximum of 320 ms. Section 3 gives an example solution.

For subsequent lost SID frames, the muting of the output shall be maintained.

3. EXAMPLE SOLUTION

For guidance, an example solution is given.

The first lost speech frame is replaced at the speech decoder input by the previous good speech frame. Normal decoding is then performed.

The muting procedure to be used in the case of subsequent lost speech frames or for comfort noise frames following the second lost SID frame is as follows:

The pseudo-logarithmic encoded block amplitude Xmaxcr (recommendation GSM 06.10), coded on the interval from 0 to 63, is decreased with a constant value d=4 in each frame, down to the lowest possible value. Consequently, Xmaxcr will be reduced gradually, and the output muted after a maximum of 320 ms. The grid position parameters are chosen randomly between 0 and 3 during this time.

For subsequent unusable frames, after the frame where Xmaxcr reached the lowest possible value, "silence frames" are passed from the RX DTX handler to the speech decoder to guarantee a low output level under all conditions. The silence frame is defined in table 3-1.

Log area ratio 1	= 42	
Log area ratio 2	= 39	
Log area ratio 3	= 21	
Log area ratio 4	= 10	
Log area ratio 5	= 9	
Log area ratio 6	= 4	
Log area ratio 7	= 3	
Log area ratio 8	= 2	
LTP gain	= 0	- repeated for each subsegment
LTP lag	= 40	
Grid position	= 1	
Block amplitude	= 0	
RPE pulse no. 1	= 3	
RPE pulse no. 2	= 4	
RPE pulse no. 3	= 3	
RPE pulse no. 4	= 4	
RPE pulse no. 5	= 4	
RPE pulse no. 6	= 3	
RPE pulse no. 7	= 3	
RPE pulse no. 8	= 3	
RPE pulse no. 9	= 3	
RPE pulse no. 10	= 4	
RPE pulse no. 11	= 4	
RPE pulse no. 12	= 3	
RPE pulse no. 13	= 3	

Table 3-1. Encoded parameters (recommendation GSM 06.10) of the silence frame