Brief Introduction about CVSD (Continuous variable slope Delta Modulation)

Piyush Gupta
Ujjain Engineering College, Ujjain (MP)
Email: ms.guptapiyush@gmail.com

Prof. Amrita Soni
Ujjain Engineering College, Ujjain (MP)
Email: amuujn@gmail.com

Abstract— *CVSD (continuous variable slope delta) modulation is popular effective scheme for companded delta modulation for audio signal. CVSD is best coding technique for improving receiver sensitivity. Here in this paper, we discuss brief introduction about continues variable slope delta modulation codec system and its comparison.*

Keywords- *CVSD, DM, PCM, BW, SIPO, PIPO*

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I. INTRODUCTION

Continuously variable slope delta modulation (CVSD or CVSDM) is an audio coding method. It is a delta modulation with variable step size [1]. Due to variation in step size slope overload error is reduces as compare to delta modulation. The CVSD modulation is a method of digitizing a band-limited audio signal. The CVSD modulator is a 1-bit analog-to digital converter. The output of this 1-bit encoder is a serial bit stream, where each bit represents an incremental increase or decrease in signal amplitude. The continuously variable slope delta (CVSD) modulation is a nonlinear, sampled data, closed loop system which accepts a band-limited analog signal and encodes it into binary form for transmission through a digital channel. At the receiver, the binary signal is decoded into a close approximation of the original analog signal.

Continuously Variable slope Delta Modulation is a simple syllabically step adaptive DM scheme offering low hardware complexity and improved noise performance. It is an attractive alternative to more complex conventional analog to digital signal conversion techniques used in telecommunication and signal processing.

II. CVSD Modulator and DEMODULATOR:

The CVSD modulator consist an 8 bit comparator, 3 bit sipo(serial in parallel out), 8 bit pipo(parallel in parallel out), overload detect and level select algorithm as shown in figure 1. The present input compared with previous level selected output in 8 bit comparator. The comparator output is a digital modulated output which is 1 bit compressed output of 8 bit A to D input.

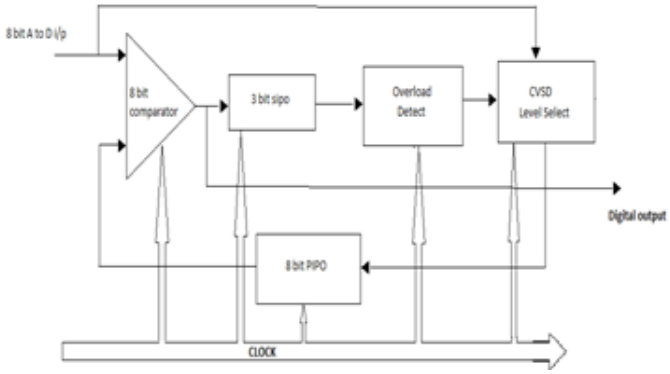

Figure 1.CVSD Modulator

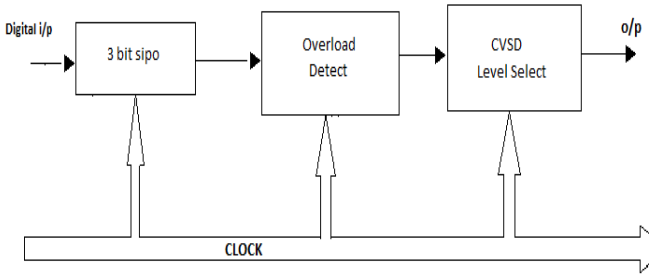

Figure 2.CVSD Demodulator

The CVSD demodulator consist an 3 bit sipo(serial in parallel out), overload detect and CVSD level select as shown in figure 2. The 3 bit sipo take 3 bit digital input and then this input is checked by overload detect block, according to the digital input the step size level is selected. The level select output is the 8 bit Demodulated output which is decompressed 8 bit output of 1 bit input. The algorithm used in both the modulating side and demodulating side are must equal.

III. COMPARISON BETWEEN PCM, DM AND CVSD:

Parameters	PCM (Pulse Code Modulation)	DM(Delta Modulation)	CVSD (Continuous Variable Slope Delta Modulation)
Step size	Fixed	Fixed	Variable
Type of error	Quantization error	Slope Overload error is high	Slope Overload error is reduced due to variable Step size[4]
Feed back	No feedback	Feedback required	Feedback required
Complexity	Highly Complex	Simplest	Simplest
Transmission B.W. required	Large Transmission BW required	Minimum Transmission BW is required	Minimum Transmission BW is required[5]

Table 1 Comparison between PCM, DM and CVSD

Here the above table 1 shows the comparison between CVSD, PCM and DM and figure 1. And figure 2. Show the comparison of slope overload error between DM and CVSD. The Table 1 shows the comparison of step size, error, complexity and bandwidth (BW) of PCM ,DM and CVSD systems . Here in figure 2 show the reduction of slope overload error in CVSD over DM.

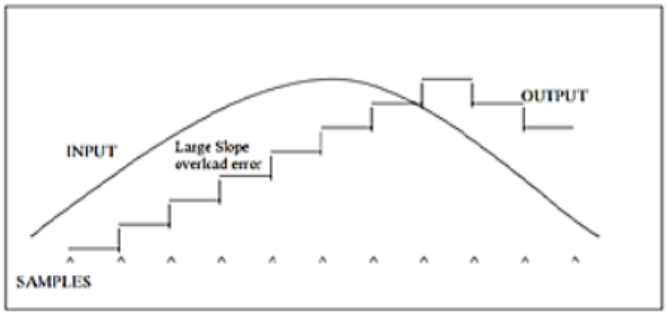

Figure 3 DM (Delta Modulation) [2]

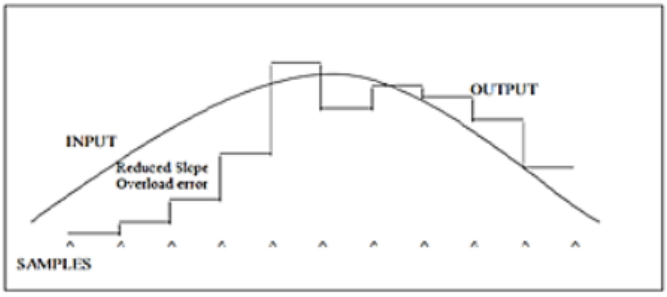

Figure 4 CVSD Modulation [2]

IV. COMPANDING ALGORITHEM

CVSD is one type of ADM (adaptive Delta Modulation). Here the step size is not constant unlike the DM [3].The encoder maintains actual sample and a step size. Each input sample is compared to the previous reference sample. If the input sample is higher, the encoder output is 1 bit and adds the step size to the given sample. If the input sample is lower, the encoder output is 0 bit and subtracts the step size from the given sample. The encoder keeps the previous n bits of output (n = 3 or n = 4 are very common) to determine variation in the step size; if the previous n bits are all 1s or all 0s, the step size is increased by an arbitrary value. Otherwise, the step size is decreased by the arbitrary value .The step size is changes for every input sample processed.

V. CONCLUSION

Here, I described a brief introduction to continuous variable slope delta modulation. The main advantage of CVSD is that it reduces the slope overload error as compare to Delta Modulation because of step size is continuously variable. It is most efficient technique for voice coding and decoding with less errors. The CVSD eliminate the need of complex framing because of one bit encoding (i.e. compression from 8 bit to 1 bit).)

REFERENCES

[1] Donald s. Taylor. “Design of continuously variable slope delta modulation”. Motorola analog marketing.

[2] Hicks, William T.; Yantorno, Robert E. “CVSD MODULATOR USING VHDL”. International Telemetering Conference Proceedings.

[3] Hari Krishna Boyapati, Rajeev Kumar Elubudi, Manoj Jain. “Efficient Implementation of Voice Processing Module with CVSD Source Coding for Tactical wireless system”.2015 IEEE International Conference on Research in Computational Intelligence and Communication Networks.

[4] G.S TOMBRAS and C. COURTIS. “Implementation and Performance of a Delayed Continously Variable Slope Delta Modulator”. Electrotechnical Conference, 1991. Proceedings., 6th Mediterranean

[5] B. Shiva Kumar Reddy, Lakshmi Boppana and Ashok Agarwal. ”BER Analysis of CVSD Vocoder for WiMAX using GNU Radio”. IEEE Region 10 Symposium, 2014 IEEE