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OPTIMIZED SNR FOR INTERSYMBOL INTERFERENCE REDUCTION OVER MODIFIED DFZF EQUALIZER FOR PACKET ERASURE NETWORK

ARJUN GHULE
Research Scholar, Department of ECE, Jawaharlal Nehru Technological University, Kukatpally, Hyderabad, India

DR. PRABHU BENAKOP
Principal, Indur Institute of Engineering & Technology, Siddipet, Telangana, India

ABSTRACT:

A novel technique presented in this paper is used to find an optimal signal to noise ratio (SNR) for maximizing overall data throughput and system performance for Automatic speech Recognition (ASR) applications. In speech data transmission over communication channels inter symbol Interference (ISI) will occur. In this paper the major problem faced while implementation is loss of data due to inter symbol Interference. By changing multiplying factor at feedback filter coefficients & Optimizing the signal to noise ratio, receiver errors can be minimized. DFZFE is used to combat ISI in wireless channels. In literature, purpose of designing the feed forward equalizer in the channel is treated linear. .A drawback of this method is error propagation due to the feedback.[15]. Feedback angle is found to maximize the output signal-to-noise ratio (SNR) [17]. Algorithm that achieves the same equalization performances at a reduced complexity are used [18]. Inter symbol Interference problem is faced in many applications such as cognitive radio, robotics, and sensor networks [19]

KEYWORDS: Data communication, system performance, Intersymbol Interference (ISI), interference constraints, degradation, Signal to Noise Ratio(SNR) , Decentralized feedback zero forcing equalizer (DFZFE): Automatic speech Recognition(ASR) etc.

INTRODUCTION:

In literature it is suggested that data accuracy can be comprised because the loss due to absence of optimal feedback, as well as the gain obtained from limited feedback with local channel knowledge compared to preceding without feedback [16].In this paper optimized SNR and feedback filter coefficients are recommended at Decentralized feedback zero forcing equalizer (DFZFE)

DECENTRALIZED FEEDBACK ZERO FORCING EQUALIZER (DFZFE):

This technique is widely used in combat internal interference [1]. It is used to combat (inter symbol interference) ISI in wireless channels [2]. Codes are designed in such a way that, it will generate random symbols that which will be sent through a channel with ISI (inter symbol interference) with AWG noise [3]. Then in Next step DFZFE is applied to for decoding.

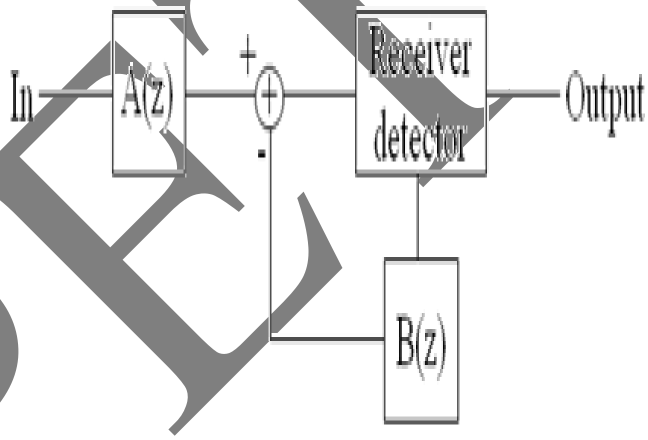

Fig. No.1. Typical DFZFE system

The main cause of inter symbol interference is time depressiveness the signal environment [4]. E.g. multipath scattering environment, delayed versions of a symbol transmission is received at receiver end this may lead to interference with other symbols transmission.

IMPLEMENTED ALGORITHM:

- Defining length of transmitting sequence.
- Convolution of channel impulse response with transmitting sequence.
- Addition of SNR.
- Modified filter with Multiplication factor of half & one fourth.
- Computing Inverse impulse Response.
- Hard decision decoding.

RESULTS & DISCUSSION:

ZF DFE solution and as such can be viewed as a generalization of an existing work. We demonstrate the effectiveness of the proposed solution through simulation [20] for zero-forcing decision feedback equalization (ZF-DFE) on fast fading channels. We present an error propagation framework in ZF-DFE [21]

Table No.1 Results of modified DZFZ equalizer

SR. No	No. of Bits	Xh for SNR (db)					Xh/2 for SNR (db)					Xh /4 for SNR (db)				
		5	20	30	40	80	5	20	30	40	80	5	20	30	40	80
1	8	2	1	0	0	0	4	0	0	0	0	1	0	0	0	0
2	10	0	0	0	0	0	3	0	0	0	0	1	0	0	0	0
3	12	10	0	0	0	0	4	1	0	0	0	3	2	0	0	0
4	14	7	0	0	0	0	4	1	0	0	0	7	0	0	0	0
5	16	5	1	0	0	0	7	0	0	0	0	11	0	0	0	0
6	18	8	0	0	0	0	7	2	0	0	0	6	1	0	0	0
7	20	10	1	0	0	0	8	2	0	0	0	0	2	0	0	0
8	22	11	1	0	0	0	7	0	0	0	0	8	0	0	0	0
9	24	11	1	0	0	0	6	0	0	0	0	9	0	0	0	0
10	26	10	1	0	0	0	7	2	0	0	0	10	0	0	0	0
11	28	12	1	0	0	0	7	3	0	0	0	10	0	0	0	0
12	30	15	0	0	0	0	8	1	0	0	0	7	0	0	0	0
13	32	12	2	0	0	0	9	1	0	0	0	10	0	0	0	0
14	34	13	0	0	0	0	7	1	0	0	0	12	0	0	0	0
15	36	14	0	0	0	0	8	0	0	0	0	11	1	0	0	0
16	38	18	0	0	0	0	12	1	0	0	0	19	1	0	0	0
17	40	17	1	0	0	0	8	0	0	0	0	11	0	0	0	0
Avg	**24**	**22.529**	**0.588**	**0**	**0**	**0**	**6.823**	**0.882**	**0**	**0**	**0**	**30.235**	**0.411**	**0**	**0**	**0**

In table no.1 modified DZFZ observations are for different number of bits are transmitted at the transmitter and same can be decoded at the equalizer output in the receiver end. Readings are obtained for different SNRs as shown .It is also observed for modified filter coefficients such as multiplying factor of 0.5 and 0.25.

As shown in the table no.2 averaging of number of bits at the transmission and corresponding average errors are obtained.

Table No:-2 averaging of different errors received through DFZF.

Sr.No.	SNR(db)	xh	xh/2	xh/4
1	5	22.5294	6.82353	30.23235
2	20	0.58824	0.88235	0.41176
3	30	0	0	0
4	40	0	0	0
5	80	0	0	0

As shown in the Table no.3 averaging of the errors when SNR is maintained for 5db.Results are further obtained for modified filter that is with multiplying facto of 0.5 & 0.25 respectively.

Table No.3 Average Errors received for 5db SNR.

Sr.No.	SNR(db)	xh	xh/2	xh/4
1	5	22.5294	6.82353	30.23235

In fig no.2 It is observed that errors are minimum if filter coefficients are multiplied by 0.5 and such errors are maximum at such filter coefficients are 0.25. for of SNR of 5db.

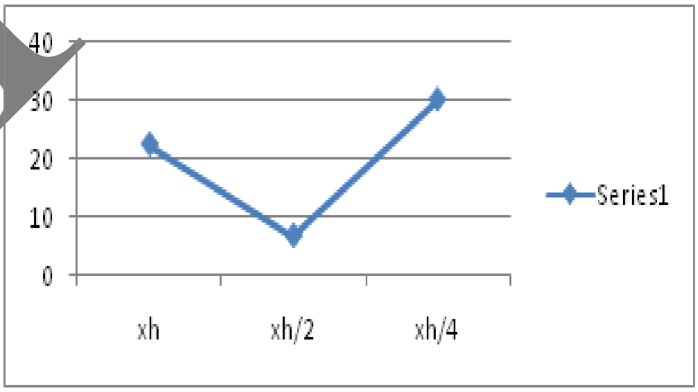

Fig. No.2. SNR = 5db , Average Number of bits for transmission = 24 bit X-axis , Xh is feedback filter coefficients at receiver Y-axis average number of bits for transmission

In table number 4 above process is repeated for SNR OF 20 db at equalizer .i.e. at receiver. Here it is observed that error are minimum at maintenance of filter coefficients are multiplied by 0.25.

Table No.4 :-Average Errors received for 20db SNR

Sr.No.	SNR(db)	xh	xh/2	xh/4
1	20	0.58824	0.88235	0.41176

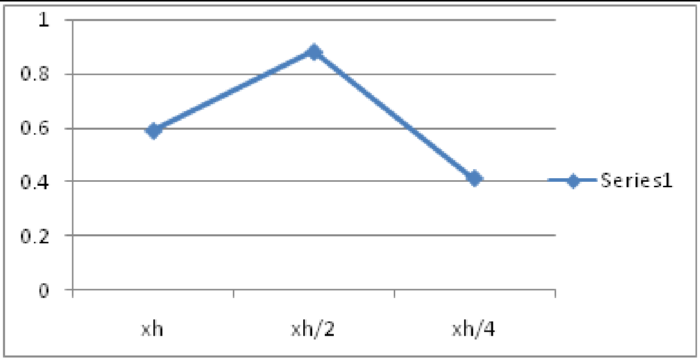

Fig no.3. SNR = 20db , Average Number of bits for transmission = 24 bits. X-axis , Xh is feed back filter coefficients at receiver Y-axis is error rate.

In table number 5. above process is repeated for SNR OF 30 db at equalizer .i.e. at receiver. Here it is observed that error are zero at maintenance of filter coefficients are multiplied by 0.5 & 0.25. But overall errors are zero for 30db SNR.

Table No.5:- Average Errors received for 30db SNR

Sr.No.	SNR(db)	xh	xh/2	xh/4
1	30	0	0	0

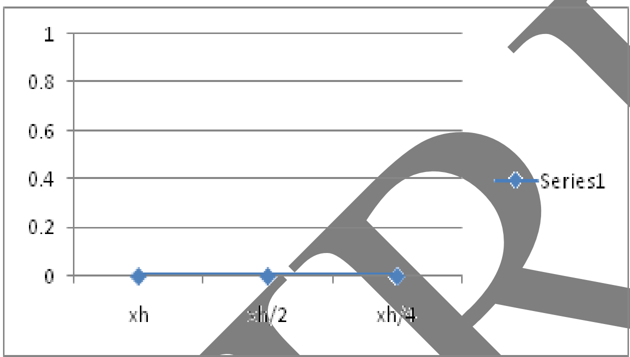

Fig no.4. SNR = 40db, Average Number of bits for transmission = 24 bits X-axis , Xh is feedback filter coefficients at receiver , Y-axis is error rate

From the simulated results we have observed that:

- Error occurred in the received signal can be minimized or made to zero by maintaining optimized Signal to Noise power Ratio (SNR).
- (Fig no.2. and Table No.3) Average Symbol errors are minimum i.e. 6.82353 for SNR 5db with average number of bits considered are 24.with modified filter coefficients are multiplied by multiplying factor of 0.5.
- (Fig no.3. and Table No.4) Average Symbol errors are minimum i.e. 0.41176for SNR 20db with average number of bits considered are 24.with modified filter coefficients are multiplied by multiplying factor of 0.25.
- (Fig 4. and Table No.5) Average Symbol errors are minimum i.e. 0.00for SNR 30db & above i.e.30 db, 40db & 80 db. With average number of bits considered are 24.with modified filter coefficients are multiplied by multiplying factor of 0.5 & 0.25 etc.

CONCLUSION:

Experimented results suggest that optimization of SNR & filter coefficients in the feedback will increase the accuracy in the speech data transmission. It can be used when ever recognizing accuracy demanded. In this paper a new algorithm for reduction in inter-symbol interference is developed by using modified DFZF equalizer packet erasure network. Few important points observed here are, average symbol errors are minimum (6.82353 multiplying factor 0.5, 0.41176 multiplying factor 0.25). Also it is observed that average symbol errors are minimized at 30db. In the implemented system, is designed to have an equipartition of energy over the entire used transmission band at the input to the channel. Moreover the actual performance degradation is negligible proposed method is designed to make errors negligible. In this paper optimized SNR and feedback filter coefficients are recommended at Decentralized feedback zero forcing equalizer (DFZFE).Optimized SNR suggested is 30 Db and above. Equalizer performance is optimized for optimized filter coefficients i.e.05 and 0.25.

REFERENCES:

1) Farhang-Boroujeny, B., *Adaptive Filters: Theory and Applications*, Chichester, England, Wiley, 1998.
2) Haykin, Simon, *Adaptive Filter Theory, Third Ed., Upper Saddle River*, N.J., Prentice-Hall, 1996.
3) Kurzweil, Jack, An Introduction to Digital Communications, New York, Wiley, 2000.
4) J. W. Lechleider, "*High Bit Rate Digital Subscriber Lines: A Review of HDSL Progress*", IEEE Journal on Selected Areas in Communications, vol. 9, no. 6, pp. 769-784, August 1991.
5) J. Salz, "*Optimum Mean-Square Decision Feedback Equalization*", The Bell System Technical Journal, vol. 52, no. 8, pp. 1341-1373, October 1973.
6) D. D. Falconer, G. J. Foschini, "*Theory of Minimum Mean-Square-Error QAM Systems Employing Decision Feedback Equalization*", The Bell System Technical Journal, vol. 52, no. 10, pp. 1821-1849, December 1973.
7) J. A.C. Bingham, *"Multicarrier Modulation for Data Transmission: An Idea Whose Time Has Come"*, IEEE Communications Magazine, vol. 28, no. 5, pp. 5-14, May 1990.

8) I. Kalet, "*The Multitone Channel*", IEEE Transactions on Communications, vol. 37, no. 2, pp. 119-124, February 1989.
9) R. G. Gallager, *Information Theory and Reliable Communication*, NY, New York: Wiley, 1968.
10) N. A. Zervos, I. Kalet, "*Optimized Decision Feedback Equalization Versus Optimized Orthogonal Frequency Division Multiplexing for High-Speed Data Transmission Over the Local Cable Network*", International Conference on Commumcations, pp. 1080-1085, 1989-June.
11) J. C. Tu, J. M. Cioffi, *"A Loading Algorithm for the Concatenation of Co-set Codes with Multichannel Modulation Methods*", Global Telecommunications Conference, pp. 1183-1187, 1990-December.
12) A. Ruiz, J. M. Cioffi, S. Kasturia, "*Discrete Multiple Tone Modulation with Co-set Coding for the Spectrally Shaped Channel"*, IEEE Transactions on Communications, vol. 40, no. 6, pp. 1012-1029, June 1992.
13) J. M. Cioffi, G. P. Dudevoir, M. V. Eyuboglu, G. D. Forney, "*MMSE Decision-Feedback Equalizers and Coding - Part I: Gerneral Results",* IEEE Transactions on Commumcations.
14) S. Kasturia, J. Aslanis, J. M. Cioffi, "*Vector Coding for Partial-Response Channels*", IEEE Transactions on Information Theory, vol. 36, no. 4, pp. 741-762, July 1990.
15) *Decision feedback equalization in channels with signal-dependent media noise* IEEE Transactions on Magnetics > Volume: 37 Issue: 4 Page(s): 1909 – 1911 Date of Publication: Jul 2001
16) P*ersonal, Indoor, and Mobile Radio Communications (PIMRC)*, 2015 IEEE 26th Annual International Symposium on. Date of Conference: 30 Aug.-2 Sept. 2015 Date Added to IEEE Xplore: 03 December 2015.
17) *Closed-Loop Space Time Block Coding for High Data Rate with Angle Feedback Published in: Communications (ICC), 2011* IEEE International Conference on ,Date of Conference: 5-9 June 2011 ,Date Added to IEEE Xplore: 29 July 2011
18) *"Complexity reduced blind multichannel equalization* "Signal Processing Conference, 2004 12th European Date Added to IEEE Xplore: 06 April 2015 ,Print ISBN: 978-320-0001-65-7.
19) *"Stability of distributed adaptive algorithms I: Consensus algorithms* "Decision and Control (CDC), 2015 IEEE 54th Annual Conference on IEEE Xplore: 11 February 2016.
20) *ZF DFE transceiver design for MIMO relay systems with direct source-destination link Signal Processing Conference,* 2011 19th European .Date of Conference: 29 Aug.-2 Sept. 2011 Date Added to IEEE Xplore: 02 April 2015.
21) "*An exact SER analysis of ZF-DFE for M-QAM on fast*" Personal Indoor and Mobile Radio Communications (PIMRC), 2010 IEEE 21st International Symposium on Date of Conference: 26-30 Sept. 2010 Date Added to IEEE Xplore: 17 December 2010