

Analysis the FIR filter using a Adaptive Techniques method

Ravinder Kumar¹ Vikas Sharma² & Dr. Kamal Kumar Sharma³

¹M.Tech ECE Department, E.S.E.A.R, Ambala (H.R.)

² Astit.Prof, E.C.E Department, E.S.E.A.R, Ambala (H.R.)

³Director, E Max Group of Institutions, Ambala (H.R.)

Abstract- Genetic Algorithm (GA) is a calculus free optimization technique based on principles of natural selection for reproduction and various evolutionary operations such as crossover, and mutation. Various steps involved in carrying out optimization through GA are described. Three applications, viz. finding maximum of a mathematical function, obtaining estimates for a multiple linear regression model, and fitting a nonlinear statistical model through GA procedure, are discussed. Finally, results are compared to those obtained from standard solution techniques. Classical search and optimization methods demonstrate a number of difficulties when faced with complex problems. The major difficulty arises when one algorithm is applied to solve a number of different problems.

Key words: - FIR Filter, Genetic Algorithms, Signal Processing, decimation, matlab

1. Introduction

In the past years, they have been successfully applied to a wide range of problems such as Natural Systems Modeling e.g. Artificial Life environments, immune system modeling, Machine Learning systems, and optimization. GAs handles a population of individual often modeled by vector of binary genes. Each one encodes a potential solution to the problem and so-called fitness value, which is directly correlated to how good it is to solve the problem. In general, the basic approaches are to test software consists of using formal specifications to design an application. This approach is very strict but unfortunately not often used because the breadth of formal specification methods does not encompass all the functionality needed in today's complex applications. The second approach consists of doing test as part of the traditional engineering models that have a specific phase for testing generally occurring after the application has been implemented. The modifications to these traditional models have being incorporating testing in every phase of the software development with methodologies such as extreme programming used in the implementation of Windows XP.

2. Literature Review

Subhadip Samanta, 2014, in this paper we have gone through a very brief idea on Genetic Algorithm, which is a very new approach for problems related to Optimization. There are many techniques used to optimize a function but in case of optimizing Multimodal Functions most of these techniques face a common problem of robustness. This can be overcome by using Genetic algorithm. Through this paper we will learn how the Genetic Algorithm actually works with proper explanation and with some real time examples based on MATLAB.

C. Huemmer, R. Maas, and W. Kellermann, 2015, the impulse response of an acoustical space or transducer is one of their most important characterizations. In order to perform the measurement of their impulse responses, four of the most suited methods are compared: Maximum Length Sequence, IRS, Time-Stretched Pulses and Sine Sweep. These different methods have already been described in the literature. Nevertheless, the choice of one of these methods depending on the measurement conditions is critical.

Christian Huemmer, Christian Hofmann, Roland Maas, and Walter Kellermann, 2016, present the elitist particle filter based on evolutionary strategies as an efficient approach for nonlinear system identification. The EPFES is derived from the frequently-employed state-space model, where the relevant information of the nonlinear system is captured by an unknown state vector. Similar to classical particle filtering, the EPFES consists of a set of particles and respective weights which represent different realizations of the latent state vector and their likelihood of being the solution of the optimization problem.

3. Objectives

Digital filter is an important part of digital signal processing (DSP) system and it usually comes in two categories: Finite Impulse response and Infinite Impulse response. FIR filter is an attractive choice because of the ease of design and stability. By designing the filter taps to be symmetrical about the centre tap position, a FIR filter can be guaranteed to have linear phase. Linear phase FIR filters are also required when time domain features are specified.

A Finite Impulse response filter .A Finite Impulse response digital filter is one whose impulse response is of finite duration. The impulse response is "finite" because there is no feedback in

the filter. If we put in an impulse, zeroes will eventually come out after the "1" sample has made its way in the delay line past all the coefficients. FIR filters are implemented using a finite number "n" delay taps on a delay line. The above structure is non-recursive, a repetitive delay -and-add format, and is most often used to produce FIR filters. This structure depends upon each sample of new and present value data.

The number of taps and values of the computation coefficients are selected to "weight" the data being shifted down the delay line to create the desired amplitude response of the filter. In this configuration, there are no feedback paths to cause instability. The calculation of coefficients is not constrained to particular values and can be used to implement filter functions that do not have a linear system equivalent. More taps increase the steepness of the filter roll-off while increasing calculation time and for high order filters, limiting bandwidth.

4. Methodology

GA is a search technique used to find exact or approximate solutions to optimization and search problems. GA represents a class of adaptive search techniques & procedures based on the processes of natural genetics & Darwin's principal of the survival of the fittest. There is a randomized exchange of structured information among a population of artificial chromosomes. When gas are used to solve optimizations problems, good results are obtained surprisingly quickly. A problem is defined as maximization of a function of the kind $f(x_1, x_2 \dots x_m)$ where $(x_1, x_2 \dots x_m)$ are variables which have to be adjusted towards a global optimum. Three basic operators responsible for GA are (a) selection, (b) crossover & (c) mutation. Crossover performs recombination of different solutions to ensure that the genetic information of a child life is made up of the genes from each parent.

Artificial genetic algorithm aims to improve the solution to a problem by keeping the best combination of input variables. It starts with the definition of the problem to optimize; generating an objective function to evaluate the possible candidate solutions. An initial random population of n individuals is generated. The population size, which is usually a user-specified parameter, is one of the important factors affecting the scalability and performance of genetic algorithms. For example, small population sizes might lead to premature convergence and yield substandard solutions.

On the other hand, large population sizes lead to unnecessary expenditure of valuable computational time. The size of this population varies from one problem to another although. These n individuals are called chromosomes that are symbolized by binary strings, where each binary position of the chromosome is called a gene and denotes a specific characteristic.

5. Findings

As a digital filter design method, the frequency sampling technique has attracted a great deal of attention. The FS technique has the advantages that more effective narrow band filters can be found easily, and those filters can be designed with an arbitrary response. However, how to find the values of the transition band frequency sample values that produce a filter with the maximum stop band attenuation is the key task in the FS.

Using Tables method to design filter will result in a suboptimal solution. Recently, many evolutionary computation techniques, such as genetic algorithm and immune algorithm. In this case, a new method is appeal to find the transition band frequency sample, which to make the filter optimal. Swarm intelligence is an evolutionary computation technique. Heuristic Algorithm is attractive because there are very few parameters to adjust, and it has been used for a wide range of applications.

6. Simulation Results

The proposed system is tested for BER at different SNR values using MATLAB software version 7.0. BER comparison is shown for the transmitted signal over the noisy channel with and without channel coding. Since a secret key is used to generate the p-n sequence which is further used to select, it is impossible for intruder to decrypt the data and crack the channel code.

n = 2000 ; % NUMBER OF SAMPLES

plant = ch;

snr = 30;

mu = 0.06 ;

N = 8 ; % ORDER OF THE EQUALIZER

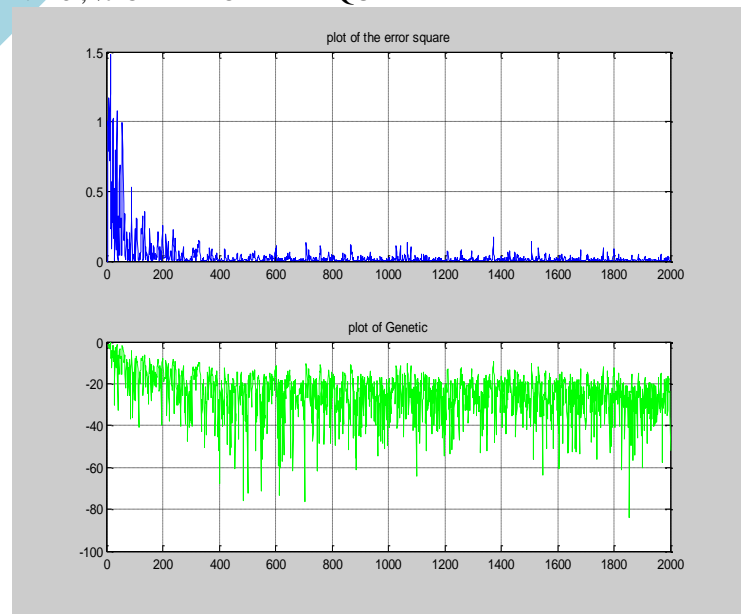


Fig 1

7. Conclusion

GA is of particular importance when one or more of underlying assumptions in a statistical model are not satisfied. Although a lot of theoretical work, particularly in engineering literature, has already been done, its application to solving agricultural research problems involving real data, is still a challenging task. Accordingly, it is highly desirable to make serious efforts in applying this optimization technique for solving various agricultural research problems. Having completed simulations and studies of different Evolutionary Strategies appropriated in analog filter design, this thesis is concluded by revealing some useful findings about the strengths and limitations of these optimization algorithm adopted in the design of multivariable system. In the same vein, we review the performance of two of the best behaved ES when tested on additional constraint in an attempt to adjust the algorithms to discrete search space.

8. Future Scope

Future work on the optimization of frequency response of FIR filter could be carried out by developing another objective function. Heuristic algorithm can be used for optimization of frequency response of FIR filter. Although a number of testing techniques and adequacy criteria have been suggested in the literature but it has been observed that

no technique/criteria is sufficient enough to ensure the delivery of fault free software consequential to the need of automatic test case generation to minimize the cost of testing. The simulation shows that the proposed GAs with the specification can find solutions with better quality in shorter time.

9. References

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