ENEL420 - Genetic Algorithms in Digital Signal Processing

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October 15, 2020

Abstract

I would like to say some bullshit here that summaries my report in an interesting way.

Contents

1 Introduction

Genetic Algorithms are inspired by the mechanism of natural selection where the strongest and fittest individuals would likely be the winners in a competing environment. Genetic Algorithm is used as a direct analogy of such natural evolution where it presumes that a potential solution of a problem is an individual and can be represented by a set of parameters. These sets of parameters are regarded as the genes of a chromosome and can be structured by a string of values in binary form. A fitness value is used to reflect the degree of goodness of the chromosome for the problem which would be highly related with its objective value [1].

History has shown that the fitter chromosome tends to yield good quality offspring which means a better solution to the problem. Practically, a population pool of chromosomes must be randomly set initially. The size of this population varies from one problem to the other. Each cycle of genetic operation is termed as an evolving process where a subsequent generation is created from the chromosomes in the current population. This evolving process can only be succeeded if a group of those chromosomes, which are generally called "parents" or a collection term "mating pool" are selected. The genes of the parents are then mixed to produce offspring in the next generation. From this manipulation of genes process, the "better" chromosome will create a larger number of offspring, and thus has a higher chance of survival in the subsequent generation, emulating the survival-of-the-fittest mechanism in nature [1].

To make sure the desired termination criterion is reached, the cycle of evolution is repeated. The offspring of the previous generation are reinserted into the model, further yielding higher quality offsprings [1].

There are two fundamental operators that facilitate the evolution cycle: Crossover and Mutation. Both operators are required for such a process even though the selection routine. To further illustrate the crossover procedure, the one-point crossover mechanism is shown in Figure 1. Genes are exchanged between parents to form offspring. Mutations are randomly generated after crossover with a small probability of occurrence.

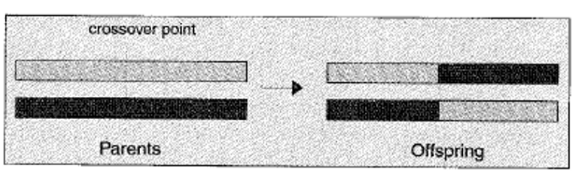

Figure 1: Interference frequencies present in the ECG signal.

2 Background

2.1 Digital Signal Processing of ECG Signals

In assignment one, a noisy ECG signal with 1024Hz sampling frequency was provided to be filtered. The assignment required the implementation of a notch filter with either an FIR or IIR filter. An FIR or IIR notch filter was suited to filter this ECG signal since there were a clear two interference frequencies present within the frequency spectrum of the ECG signal. These interference frequencies were identified to be $f_1 = 31.456Hz$ and $f_2 = 74.36Hz$ as shown in Figure 2. It should be noted that the first peak in Figure 2 is the DC component due to the use FFT to get the frequency response of the time domain ECG signal.

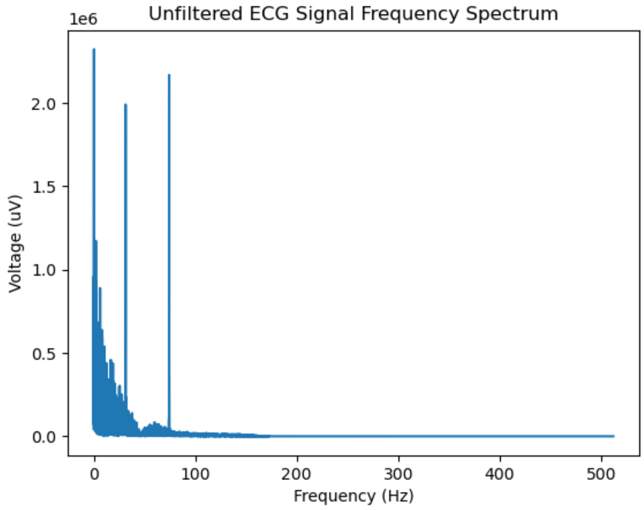

Figure 2: Interference frequencies present in the ECG signal.

One method to filter these two frequencies was to reject them with either a window or Parks-McClellan filters.

2.2 Genetic Algorithms

Plz write something here.

3 Method

Describe the method followed for this assignment.

3.1 Creating a Population from DSP Singal Data

Plz write something here.

3.2 Fitness Function

Plz write something here.

3.3 Selecting Paranets for next GA Generations

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3.4 GA Operators

Plz write something here.

3.4.1 Crossover

Plz write something here.

3.4.2 Mutation

Plz write something here.

3.4.3 Parents

Plz write something here.

3.5 Filtering of ECG Signal Using FIR Filters

3.5.1 Window Filter

Plz write something here.

3.5.2 Parks-McClellan Filter

Plz write something here.

4 Results

Describeæthe results you've got. Don't give your opinion in here that goes in the Discussion. Unless combine the Results and Discussion sections

$$V = IR \tag{1}$$

4.1 Creating a Population from DSP Singal Data

Plz write something here.

4.2 Fitness Function

Plz write something here.

4.3 Selecting Paranets for next GA Generations

Plz write something here.

4.4 GA Operators

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4.4.1 Crossover

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Plz write something here.

4.5 Filtering of ECG Signal Using FIR Filters

4.5.1 Window Filter

Plz write something here.

4.5.2 Parks-McClellan Filter

Plz write something here.

Figure 3: Shows that you can relax at this beautiful beach

5 Discussion

Discussion.

6 Conclusion

Reinstate the stuff you've talked about in the report. Don't introduce new materials in here.

7 References

[1] K. F. Man and K. S. Tang, "Genetic algorithms for control and signal processing," in *Proceedings of the IECON'97 23rd International Conference on Industrial Electronics, Control, and Instrumentation (Cat. No.97CH36066)*, vol. 4, 1997, pp. 1541–1555 vol.4.

8 Appendices

8.1 Appendix A