**Assignment 3**

Submitted to Eng Mohamed Khaled

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# Part One

## 1.1 Gram-Schmidt Orthogonalization

In general The Gram–Schmidt orthonormalization process is a procedure for orthonormalizing a set of vectors in an inner product space So we used it here in the vector space representation of the signal so that we can find the basis to represent different messages on a lower dimension (less no of correlators are needed the receiver)

A screenshot of a graph

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**Figure 1 Φ1 VS time after using the GM\_Bases function** **Figure 2 Φ2 VS time after using the GM\_Bases function**

## 1.2 Signal Space Representation

Here we represent the signals using the base functions.

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**Figure 3 Signal Space representation of signals s1,s2**

## 1.3 Signal Space Representation with adding AWGN

-the expected real points will be solid and the received will be hollow

**Case 1**:

A screen shot of a graph

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**Figure 4 Signal Space representation of signals s1,s2 with E/σ¬2 =10dB**

**Case 2**:

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**Figure 5 Signal Space representation of signals s1,s2 with E/σ¬2 =0dB**

**Case 3**:

A screenshot of a graph

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**Figure 6 Signal Space representation of signals s1,s2 with E/σ¬2 =-5dB**

## 1.4 Noise Effect on Signal Space

A screenshot of a computer program

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# Appendix A: Codes for Part One:

## A.1 Code for Gram-Schmidt Orthogonalization

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## A.2 Code for Signal Space representation

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## A.3 Code for plotting the bases functions

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## A.4 Code for plotting the Signal space Representations

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## A.5 Code for effect of noise on the Signal space Representations

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A screen shot of a computer program

Description automatically generated with medium confidenceA screen shot of a computer program

Description automatically generated with low confidence