Experiment 03

Simple Spreading Technique

**Marks: 10 (If you cannot finish it by today, it will be scaled down to 6)**

In this experiment you will implement a simple spreading technique; where you will spread 2 bits into 8 bits. This kind of spreading makes it difficult for the intruders to snoop on user data.

* Assume there are **3 users**, **a spreading server** and **a de-spreading or demodulation server**.
* Each user will send a text file to the spreading server. One line at a time.
* Spreading Server will receive the line and convert it to a bit stream.
* For every two bit the server will perform spreading and make it a 8 bit code.

**Follow the illustration:**

**User 1:**

Data: 0 0

Spread code: 0 1 0 1

Apply the code to the data:

0 1 0 1 0 1 0 1

0 0 0 0 0 0 0 0

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X-OR= 0 1 0 1 0 1 0 1

**User 2:**

Data: 1 0

Spread code: 0 0 1 1

Apply the code to the data:

0 0 1 1 0 0 1 1

1 1 1 1 0 0 0 0

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X-OR= 1 1 0 0 0 0 1 1

**User 3:**

Data: 1 1

Spread code: 0 0 0 0

Apply the code to the data:

0 0 0 0 0 0 0 0

1 1 1 1 1 1 1 1

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X-OR= 1 1 1 1 1 1 1 1

* After that the server will combine all users data and make one signal ( *we cannot produce signals so we will use the value of voltage instead*)

Combining all three signals: (**we represent 0 bit by +1V and 1 bit -1V**)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| User # | Signal | Data | | | | | | | |
| 1 | Data | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| Voltage | +1 | -1 | +1 | -1 | +1 | -1 | +1 | -1 |
| 2 | Data | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 |
| Voltage | -1 | -1 | +1 | +1 | +1 | +1 | -1 | -1 |
| 3 | Data | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Voltage | -1 | -1 | -1 | -1 | -1 | -1 | -1 | -1 |
| Spreading Server Signal | Adding the voltages | **-1** | **-3** | **+1** | **-1** | **+1** | **-1** | **-1** | **-3** |

* After that server will send these voltage sequences to the de-spreading or demodulation server.
* Now you have to design a de-spreading or demodulation server which will extract the data (2 bits) from the composite signal and recreate the sent files.

*This server has the* ***spreading codes*** *for all the users.*

**Demodulated Voltage = summation of demodulated code word / length of code word**

User #1 demodulated voltage = (-1+3+1+1)/4 = +1V which stands for a 0 bit

User #1 demodulated voltage = (1+1-1+3)/4= +1V which stands for a 0 bit

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Composite signal |  | -1 | -3 | +1 | -1 | +1 | -1 | -1 | -3 |
| Spreading code for User 1 | 0=+1V  1=-1V | +1 | -1 | +1 | -1 | +1 | -1 | +1 | -1 |
| Demodulated Code word | Multiply the signals | **-1** | **3** | **1** | **1** | **1** | **1** | **-1** | **3** |

User #1 data = 0 0