NATIONAL CHIAO-TUNG UNIVERSITY

Introduction to Communications System: Software and Hardware Term Projects

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I. FILE UPLOAD AND DOWNLOAD

1. You shall download your data files from

   http://140.113.13.117:8080/CMProject/

   with ID: CM2016 and password: cm2016.

   Hint: In MATLAB, you can read in a "*xxxx*.txt" file by using the below command:

   ```
   A = textread('hello.txt');
   ```

2. You shall upload your project outputs to your own folder under

   http://140.113.13.117:8080/upload/

3. The file name of your report should be "Student ID-TX.doc" and "Student ID-RX.doc" respectively for hardware transmitter and software receiver (if you use Microsoft Words). For example, you shall name your files as "0012345-TX.doc" and "0012345-RX.doc". If you wish to renew the file that you have already uploaded, just re-upload with a proper version number such as

"0012345-TX-v2.doc", "0012345-TX-v3.doc", ..., etc.

4. The file name of your report can also be "Student ID-TX.pdf" and "Student ID-RX.pdf" respectively for hardware transmitter and software receiver (if pdf is the format you wish to use). For example, you shall name your files as "0012345-TX.pdf" and "0012345-RX.pdf". If you wish to renew the file that you have already uploaded, just re-upload with a proper version number such as

   "0012345-TX-v2.pdf", "0012345-TX-v3.pdf", ..., etc.

5. The hardware project report is due at **midnight** on **December 8**. The software project report is due at **midnight** on **December 15**.

II. Baseband Signals and Carrier Frequency

Below we describe how the message signal $m(t)$ is generated.

1. A decimal number such as $(758)_{10}$ can be binary-represented as

   $$(0010\ 1111\ 0110)_2.$$

2. In a binary sequence that consists of 32 bits, each "0" will be sent as $-\sin(2\pi t)$ with $t \in [0,1)$, and each "1" will be sent as $\sin(2\pi t)$ with $t \in [0,1)$. This implies that the duration of a bit is 1 second. The sampling rate is $\frac{1}{1000}$ seconds. Thus there will be $32,000$ samples in a file.

3. From the above description, the frequency of the message signal $m(t)$ is basically $f_{\rm m} = 1$ Hz.

4. The carrier frequency is $f_{\rm c} = 100$ Hz.

Here are some notes for your interest.

1. MATLAB has functions for "covering DEC to BIN" and also for "converting BIN to DEC".

2. If you wish to generate a $\sin(2\pi t)$ signal wave of duration "1 second" and sample it with sampling rate being equal to $\frac{1}{1000}$ seconds, the MATLAB command is:

```
t = 0:0.001:1-0.001;    % create an array [0, 0.001, 0.002, ..., 0.999]
A = sin(2*pi*t);        % evaluate sin(2πt) for each t
```

III. REPORT FOR SOFTWARE RECEIVER

Again, your report for software receiver should contain the following items.

1. Name and Student ID.
2. A table that lists the File Name, the Modulation Type and the Decimal Numbers your demodulator obtained.

File Name	Modulation	Decimal
1.txt	DSB-SC	758
2.txt	DSB-C	128
...	...	...

3. A paragraph to describe how or in which manner you design your demodulators?
4. For each of the messages recovered, which demodulator (i.e., which modulation type) you are using and why?
5. What is the main difficulty you encountered in this project?
6. Your demodulator program/code with comments/explanations (either inside the written report or on the program body). This will also be considered a part of the report grade.