

## **Project#2 Turbo Code**

**Project Report:** (Submit to the Blackboard no hardcopies)

The project report must include:

- 1) a brief description of the turbo code.
- 2) Presenting your data in tables as in the paper.
- 3) What are the decoded bits.
- 4) Source code of your decoder program(3 pages maximum).

### **Project Description:**

- a) Refer to the two turbo code papers provided for this project, and develop a program to decode the product code example given on page 97 in paper 'A Primer on Turbo Code Concepts'. You can use MATLAB or any other programming language, but you must provide clear running result that shows the input and output of the decoder, which should be the same to the data given in that example.
- b) Given input data:

$L_c(x_1) = 2.81$	$L_c(x_2) = -1.23$	$L_c(x_{12}) = 0.61$
$L_c(x_3) = 0.08$	$L_c(x_4) = -0.23$	$L_c(x_{34}) = 1.53$
$L_c(x_{13}) = 2.43$	$L_c(x_{24}) = 5.37$	

use your program to decode the input and find out the soft output as what is done in part **a)**. Please note that: **1)** Use equation (23) in the paper to calculate the sum of two log likelihood ratios (LLRs). **2)** equation (23), there is a typo; the correct one is as follows.

$$L(d_1 \oplus d_2) \approx (-1) \times \text{sign}[L(d_1)] \times \text{sign}[L(d_2)] \times \min(|L(d_1)|, |L(d_2)|)$$

- Note:** 1) The report for project#2 should be not more than 13 pages (including source code).  
2) The source codes should be commented in details.  
3) Only softcopy is accepted, the requirement for project submission is the same as homework's.

Reference:

- [1] chapter 16, Error Control Coding, by Shu Lin and Daniel J. Costello, Jr., Prentice Hall, Second Edition, 2004.
- [2] Bernard Sklar, "A Primer on the Turbo Code Concepts", 1997.

**Due Date:04-20-2017**