Homework 2

BE/EE189 Design and Construction of Biodevices

Spring 2017

Due 18 Apr 2017

1. Create a VI that calculates the hyperfactorial of any positive integer n, where the hyperfactorial is equivalent to the value obtained by the operation

$$\prod_{k=1}^{n} k^k = 1^1 \cdot 2^2 \cdot 3^3 \cdots n^n.$$  \hspace{1cm} (1)

If the user inputs a value that is not a positive value, display a message informing the user that the input is not valid and request a new input. (It is better design to only allow unsigned integers as input, but part of the purpose of this exercise is to get you familiar with error clusters.) Hint 1: two important elements of the block diagram will be the One Button Dialog function and the Power of X subVI. Hint 2: If you run into the problem of infinite loop, first exit the loop by holding Ctrl+.. Use Event Structure to allow your program to run only once when there is a change in input value.

2. Create a subVI to compute the square root of a real number that is input by the user. Using case structures and error clusters, implement an error handling capability that displays the message Square root of a negative number is not supported anytime the user inputs a negative real number. The subVI should have as inputs error in and a real number, denoted by y, and as outputs it should have $\sqrt{y}$ (assuming y is nonnegative) and the error out. If the input is a negative number, set the output to the input. So if the input is 4, the output is 2, and the error cluster shows the status is FALSE (no error). If the input is -4, the output is -4 and the error cluster shows the status is TRUE (an error occurred), the error code is -1, and the error message listed above appears. Save the VI as Square Root.vi and use it as a subVI in a new VI.

3. Construct a VI that calculates maximum heart rate using the following formulas:

\[
\begin{array}{|c|c|}
\hline
\text{Gender} & \text{Maximum Heart Rate} \\
\hline
\text{Male} & 214 - \text{Age} \cdot 0.8 \\
\hline
\text{Female} & 209 - \text{Age} \cdot 0.7 \\
\hline
\end{array}
\]

Given the gender and age, use formula nodes to calculate the maximum heart rate.