MATLAB for SMS

Problem Set 2

1. Download problem_set_2.mat from http://jnt1.web.rice.edu/matlab. (You'll have to right click and use 'save link as' or equivalent.)

2. Verify that the file contains an indexed data structure whose fields each contain a substructure. Verify that the substructures contain fieldnames 'acc', 'don', 'x', 'ba', 'bd', and 'acq_time'. Note that the fields 'acc' and 'don' contain only the FRET region of a particular trace, that x is the crosstalk parameter, that ba and bd are acceptor and donor background intensities, and that acq_time is the length of the acquisition bin.

3. Write a function that takes appropriate input arguments and returns each of the following (set of) return arguments:
    a. acceptor and donor signals in 10 ms bins
    b. background and crosstalk corrected acceptor and donor signals at 10 ms time resolution. (The function can return acc & don with both corrections applied.)
    c. efficiency vs. time at 10 ms resolution

4. Write a script that processes each trajectory with the functions you've just written. Do this by either: 1. modifying each function so that each trajectory is processed in one function call, or 2. repeatedly call the function each time a new trajectory is to be processed.

5. Store the original data along with the binned acceptor & donor intensities, corrected acceptor and donor intensities, and the efficiency vs. time vector. (You'll notice that the original data structure can simply be updated with the new information and saved.)

6. Write a script that create a full page figure for each trajectory, containing:
    a. acceptor and donor intensities at the acquired time resolution. Display the values of x, ba, and bd on this plot.
    b. acceptor and donor intensities (uncorrected) at 10 ms time resolution. Display the mean acceptor and donor intensities at 10 ms resolution on this plot.
    c. efficiency vs. time at 10 ms resolution.
    d. the efficiency distribution (normalized efficiency histogram). Display the mean efficiency and its standard deviation on this plot.

7. Compile all the efficiencies in each trajectory into a single histogram. Create a full page pdf plot that displays the ensemble distribution, its mean, and its standard deviation.

8. Collect your functions (not the data, the plots, or anything else, just the m-files) in a folder and zip it (or rar it…). Email it to jntaylor@rice.edu by Friday, July 8 at 5:00 pm.