Lab 9

RTOS and MATLAB

Due Date: Apr. 23

Objectives:

- Receive and process data in real-time in MATLAB

Files Needed:

- Lab_9.zip.
- Serialcomm.m

Assignment:

1. Download the ZIP file above, unzip it, and open it in the Keil uVision5 development environment. This sample project is mostly the same as the Lab 8 sample project, but it adds function calls to the board's accelerometer. The sample project reads the accelerometer, which always samples X, Y, and Z, and it displays the X component on the graphic LCD. Note that each reading is a signed 32-bit integer of the number of milli-g's (thousandths of earth's gravity).
   Run the sample project, but do not use PuTTY as the previous labs.
2. Connect the USB-to-serial cable to the board and your computer. Download the MATLAB script, modify it to the serial port assigned to the cable (you will need to find the number assigned to the port as you did in earlier labs), and run the script. This script shows how to respond to the serial port as an interrupt in MATLAB without having to explicitly poll the port. The comments explain some of the important points. A major point is that the port may be configured to wait for a specific number of bytes. The file is originally set to three bytes, so every time the Keil board sends a third byte, the serial port in MATLAB interrupts, and it prints the received data to the screen.
3. Modify the project and the script to meet the following requirements.
   - The Keil board transmits the current X, Y, and Z components of acceleration over the serial port 5 times per second. You may select the format of the values/message and this must be clearly documented in your comments.
   - The Keil board must display the current X, Y, and Z components of acceleration to the graphic LCD 3 times per second.
   - The Keil program must make proper use of semaphores and mutexes to access variables and hardware resources.

- MATLAB must graph the X, Y, and Z components on a graph that updates in real time and displays (up to) the last 100 samples. Hint: the serial ISR can grow an array (such as "x = [x new]" until it reaches 100 samples, then it can use the last 99 samples and the newest sample for the next one. The x axis must be labeled with the number of the samples (i.e, …,20-119, 21-120, 22-121…)
- The graph must be properly labeled.

Deliverables:

Upload an electronic copy of the deliverables to Canvas per the lab submission guidelines. Please note: **ALL** deliverables must be present in the single PDF report. (Only source code files from the project should be in the report for the first bullet's deliverable.)

- Zip file of the project. To minimize the file size, please select Project->Clean Targets before zipping up the file.
- Modified MATLAB script.
- Image of the graph with 100 points

Scoring:

- 10 points – Compliance with Submission Guidelines
- 40 points – Correct functionality
- 30 points – Proper use of RTOS concepts (i.e. semaphores, mutexes)
- 10 points – Commenting