

# Fault Tolerant Computer Systems

## FTCS 422

### LAB Assignment

Lab Assignment 4

Due: week 9

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Design a concurrent system that consists of a total number of 6 tasks as follows. Note that it is essential to use semaphore synchronization for exchanging data between tasks.

- Task 1: Left PSD  
Read the value of the left PSD sensor and store the result in the output queue.
- Task 2: Right PSD  
Read the value of the right PSD sensor and store the result in the output queue.
- Task 3: Camera  
Read a camera image and convert it to grayscale. Calculate the average gray value along the main diagonal and store the result to the output queue.  
Implement an autobrightness function in software by adjusting the threshold for converting the grayscale image to a binary image (0 black, 255 white).  
Display the binary image on the LCD.
- Task 4: LCD output  
Continuously read the output queue and print the text for each entry to the screen.  
The interface between tasks 1..3 (“writers”) to task 4 (“reader”) is via a global queue, to make sure output requests are executed in the order they are submitted.  
Each queue entry consists of a text position (x,y) and the actual text string (max. 16 characters, terminated by a NULL character).
- Task 5: Watchdog  
Implement a watchdog task that checks whether tasks 1..4 are still running. Print an error message if one of the tasks have terminated, indicating which task has failed.
- Task 6: Testing  
Pressing KEY1 .. KEY4 should terminate task 1 .. task 4, resp., for testing purposes.  
A task can be terminated by calling `OSKill` with the corresponding task number. These task numbers have to be kept in a global array when starting the tasks with `OSSpawn`, so the testing task has access to them.