

## Dining Philosophers

In this project, we need to write a deadlock-free solution for dining philosophers and to be able to avoid from deadlock, we can use monitor based solutions or semaphores that are deadlock free. Therefore, I continue with monitors and I use monitors which have mutex (e.g. pthread\_mutex\_t). To be able to solve dining philosophers with deadlock handling, we have following solutions (from slides):

- Allow at most 4 philosophers to be sitting simultaneously at the table. *(We cannot use this because we need to give odd number philosophers.)*
- Allow a philosopher to pick up the forks only if both are available (picking must be done in a critical section).
- Use an asymmetric solution -- an odd-numbered philosopher picks up first the left chopstick and then the right chopstick. Even-numbered philosopher picks up first the right chopstick and then the left chopstick.

I use like following:

1. At the first step, all philosophers are created and started to thinking randomly.
2. Then each philosophers will check right and left philosophers, in other words neighbours of that philosopher.
3. After the checking condition, that philosopher will start to eat.

For generating random values, I created a function, which is creating random values for dining and thinking, and name is “generate\_random\_time\_for\_dining\_and\_thinking”. The function has 2 different distribution functions (e.g. “uniform” or “exponential”).

$Uniform(max, min) = max * random\_number$

$Exponential(max, min) = -(min + max) / 2 * \log(1 - random\_number)$

I tested on 5 philosophers:

1. phsp 5 50 100 5 10 exponential 15
  - Philosopher 4 duration of hungry state = 0
  - Philosopher 5 duration of hungry state = 3
  - Philosopher 2 duration of hungry state = 0
  - Philosopher 3 duration of hungry state = 0
  - Philosopher 1 duration of hungry state = 2
  - **Average:** 1
  - **Standart Deviation:** 1.2649110640674

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2. phsp 5 50 100 5 10 exponential 30
    - Philosopher 5 duration of hungry state = 8
    - Philosopher 2 duration of hungry state = 9
    - Philosopher 1 duration of hungry state = 0
    - Philosopher 3 duration of hungry state = 0
    - Philosopher 4 duration of hungry state = 0
    - **Average:** 3,4
    - **Standart Deviation:** 4.1761226035642
  
  3. phsp 5 50 100 5 10 exponential 45
    - Philosopher 2 duration of hungry state = 0
    - Philosopher 4 duration of hungry state = 2
    - Philosopher 1 duration of hungry state = 0
    - Philosopher 5 duration of hungry state = 9
    - Philosopher 3 duration of hungry state = 0
    - **Average:** 2,2
    - **Standart Deviation:** 3.4871191548325
  
  4. phsp 5 50 100 5 10 exponential 60
    - Philosopher 1 duration of hungry state = 0
    - Philosopher 3 duration of hungry state = 10
    - Philosopher 4 duration of hungry state = 0
    - Philosopher 2 duration of hungry state = 5
    - Philosopher 5 duration of hungry state = 8
    - **Average:** 4,6
    - **Standart Deviation:** 4.0792156108742