HO CHI MINH UNIVERSITY OF TECHNOLOGY
FACULTY OF COMPUTER SCIENCE AND ENGINEERING

OPERATING SYSTEM LAB (CO2018)

LAB 6 : SYNCHRONIZATION

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1 PROBLEM 1 :

We assume that :

- balance = 20.000.000 VND
- The husband calls function : `withdraw(5.000.000)`
- The wife calls function : `deposit(10.000.000)`

All possible outcomes we could get :

- `withdraw()` is executed **before** `deposit()` :
  - `withdraw(5.000.000)` ⇒ balance = 20.000.000 - 5.000.000 = 15.000.000 (VND)
  - `deposit(10.000.000)` ⇒ balance = 15.000.000 + 10.000.000 = 25.000.000 (VND)
- `withdraw()` is executed **after** `deposit()` :
  - `deposit(10.000.000)` ⇒ balance = 20.000.000 + 10.000.000 = 30.000.000 (VND)
  - `withdraw(5.000.000)` ⇒ balance = 30.000.000 - 5.000.000 = 25.000.000 (VND)
- `withdraw()` and `deposit()` are executed **concurrently** :
  - `withdraw(5.000.000)` ⇒ balance = 20.000.000 - 5.000.000 = 15.000.000 (VND)
  - Concurrently, `deposit(10.000.000)` ⇒ balance = 20.000.000 + 10.000.000 = 30.000.000 (VND)

As we can see, the third case show the unexpected result, since `withdraw()` function and `deposit()` function change the balance value at the same time.

Solution : Use mutex or semaphore.

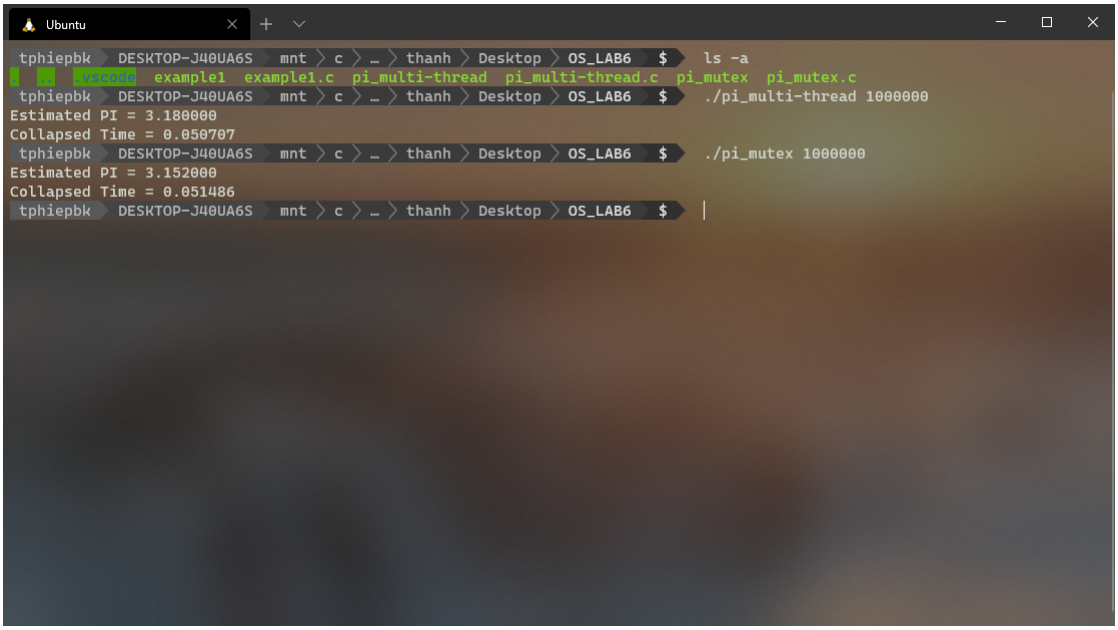
2 PROBLEM 2 :

Comparison Condition :

- Number of threads = 1000
- Number of points = 1000000

Here is the result :

- `pi_mutex` : 0.051486 s
- `pi_multi-thread` : 0.050707 s



So the mutex lock approach is slower than the multi-thread approach.