The Dining Philosophers Problem

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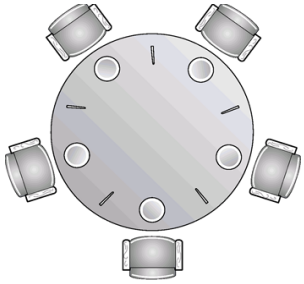

- Each philosopher repeats the following
  - sequence of states : {HUNGRY, EATING, THINKING}
- Init state : THINKING
  - 10~500 msec and then switches HUNGRY
- If he can eat, then immediately switches to EATING state
- He is in EATING state for 10~500 msec and then release both of the chopsticks
- After releasing both of the chopsticks, he switches to THINKING state

Result

```
Philosopher 0 eating count : 843
Philosopher 0 wait time in HUNGRY state (157.951 sec)

Philosopher 1 eating count : 842
Philosopher 1 wait time in HUNGRY state (171.384 sec)

Philosopher 2 eating count : 875
Philosopher 2 wait time in HUNGRY state (160.234 sec)

Philosopher 3 eating count : 849
Philosopher 3 wait time in HUNGRY state (167.027 sec)

Philosopher 4 eating count : 837
Philosopher 4 wait time in HUNGRY state (171.974 sec)

Min count 837
Max count 875
```

AVG count 849.200
Count Variance = 180.960

Min wait time (157.951 sec) in HUNGRY state
Max wait time (171.974 sec) in HUNGRY state
AVG wait time (165.714 sec) in HUNGRY state
Variance wait time (33.187007 sec) in HUNGRY state

Total Run time (600.042 sec)

Submissions

- Report
    - Annotated Source code
    - Development process
    - Screenshot
    - Comment about this homework

Contact Info.

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Template Code

```
#include <stdio.h>
#include <stdlib.h>
#include <limits.h>
#include <time.h>
#include <pthread.h>
#include <semaphore.h>
#define HUNGRY 0
#define EATING 1
#define THINKING 2
#define NUM_PHIL 5
#define EXEC_TIME 600

typedef struct philosopher
{
    unsigned short numEat;
    int state;
    long wait;
}philosopher;

philosopher phil[NUM_PHIL];
sem_t chopstick[NUM_PHIL];
// 10~500 msec wait
int idlewait()
{
    int sleepTimeMS = (rand() % 491 + 10);
    usleep(sleepTimeMS * 1000);
    return sleepTimeMS;
}

unsigned int tick() //get current time(msec)
{
    struct timeval tv;
    gettimeofday(&tv, (void*)0);
    return tv.tv_sec * (unsigned int)1000 + tv.tv_usec / 1000;
}
void initPhil(void)
{
      /* ..................................................................................... */
}
void* dining(void* arg)
{
    unsigned short i;
    unsigned short left, right;
```

```
    unsigned int start_time;
    unsigned int start_hungry, end_hungry;
    /* ..... */

}

void main(void)
{
    pthread_t t[NUM_PHIL];
    unsigned short i, args[NUM_PHIL], minCount = USHRT_MAX, maxCount =0;
    long start, end, minWait = LONG_MAX, maxWait = 0, waitAVG = 0, waitVar = 0;

    double countAVG = 0, countVar = 0;

    srand(time((void*)0));
    start = tick();
    initPhil();

    for(i=0;i<NUM_PHIL;i++)
        args[i]=i;

    /* ..... */

    end = tick();

    for(i=0;i<NUM_PHIL;i++)
    {
        printf("Philosopher %d eating count : %d\nPhilosopher %d waiting time in HUNGR
state : %ld.%ld sec\n\n", i, phil[i].numEat, i, phil[i].wait / 1000, phil[i].wait % 1000);
        countAVG += phil[i].numEat;
        if(minCount > phil[i].numEat)
            minCount = phil[i].numEat;
        if(maxCount < phil[i].numEat)
            maxCount = phil[i].numEat;
        waitAVG += phil[i].wait;
        if(minWait > phil[i].wait)
            minWait = phil[i].wait;
        if(maxWait < phil[i].wait)
            maxWait = phil[i].wait;
    }
    countAVG /= NUM_PHIL;
    waitAVG /= NUM_PHIL;
    for(i=0;i<NUM_PHIL;i++)
    {
```

```
        countVar += (countAVG - phil[i].numEat) * (countAVG - phil[i].numEat);
        waitVar += (waitAVG - phil[i].wait) * (waitAVG - phil[i].wait);
    }
    countVar /= NUM_PHIL;
    waitVar /= NUM_PHIL;
    printf("Min count : %d\nMax count : %d\nAVG count : %.3f\nCount variance : %.3f\n\r
minCount, maxCount, countAVG, countVar);
    printf("Min wait time in HUNGRY state : %ld.%ld sec\nMax wait time in HUNGRY sta
: %ld.%ld sec\nAVG wait time in HUNGRY state : %ld.%ld sec\nVariance wait time in
HUNGRY state : %ld.%ld sec\n\n",
          minWait / 1000, minWait % 1000, maxWait / 1000, maxWait % 1000, waitAVG /
1000,waitAVG % 1000, waitVar / 1000000, (waitVar % 1000000) / 1000);
    printf("Total run time : %ld.%ld sec\n\n", (end - start)/ 1000, (end - start)% 1000);
}
```