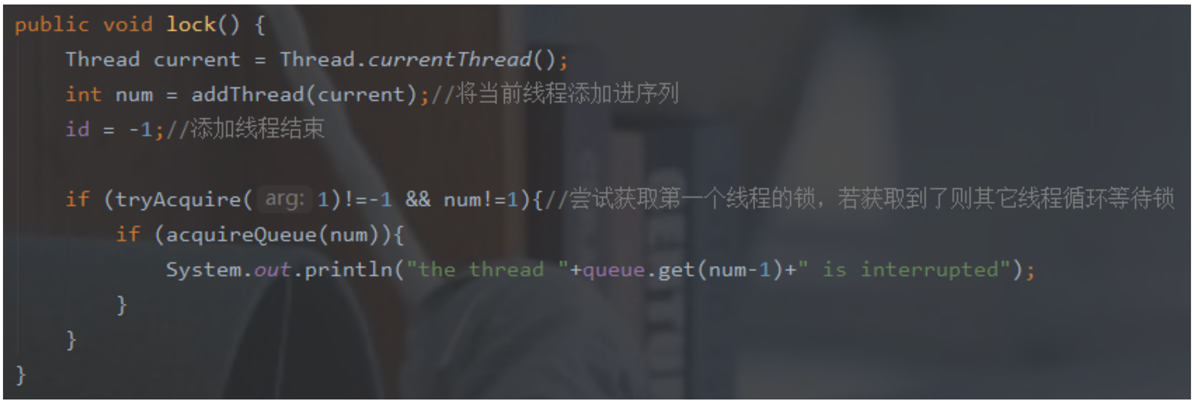
Lab2说明文档

姓名：邰荟媛

学号：19302010077

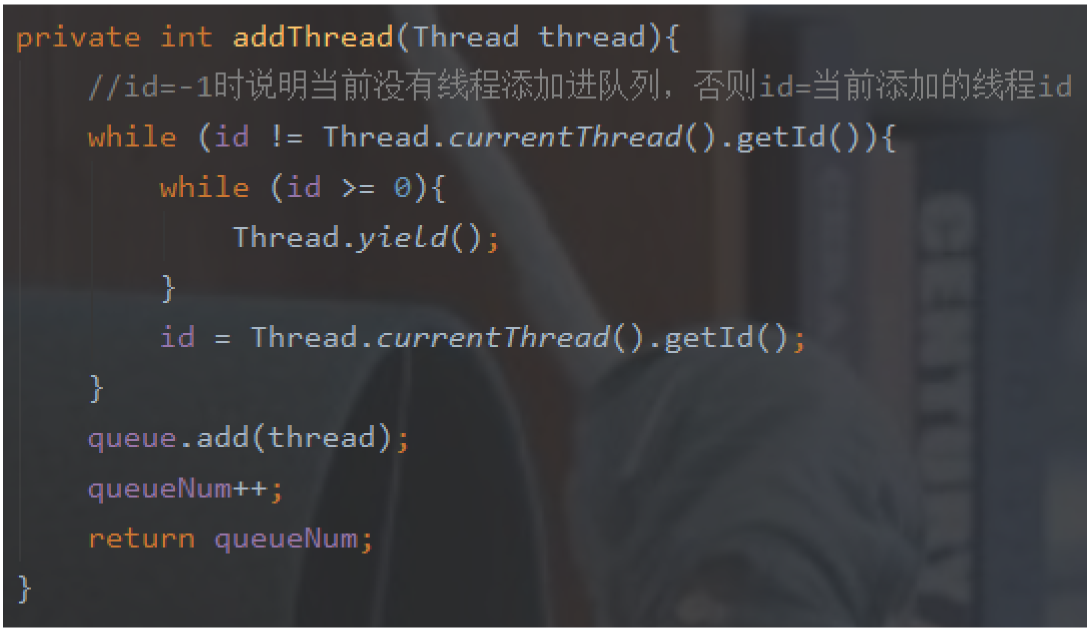
partA锁

lock



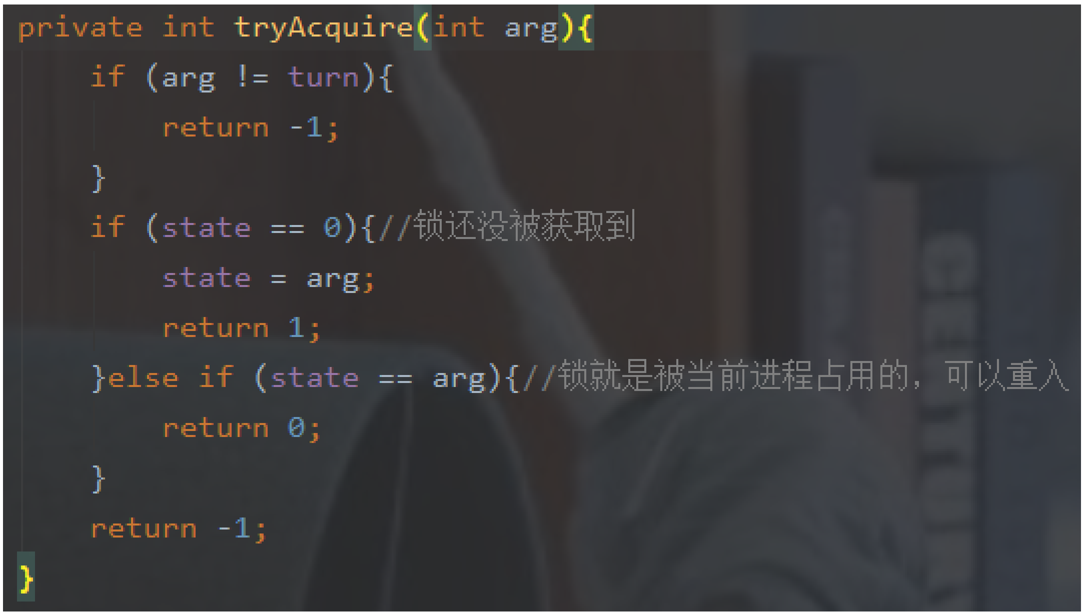
```java
public void lock() {
    Thread current = Thread.currentThread();
    int num = addThread(current);//将当前线程添加进序列
    id = -1;//添加线程结束

    if (tryAcquire( arg: 1)!=-1 && num!=1){//尝试获取第一个线程的锁，若获取到了则其它线程循环等待锁
        if (acquireQueue(num)){
            System.out.println("the thread "+queue.get(num-1)+" is interrupted");
        }
    }
}
```

将每个线程依次添加进队列



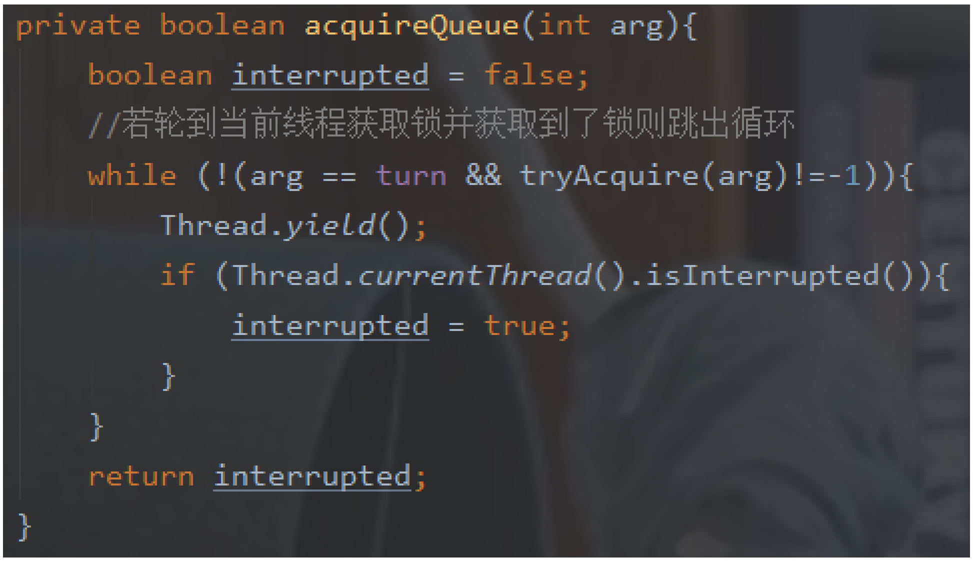
```java
private int addThread(Thread thread){
    //id=-1时说明当前没有线程添加进队列，否则id=当前添加的线程id
    while (id != Thread.currentThread().getId()){
        while (id >= 0){
            Thread.yield();
        }
        id = Thread.currentThread().getId();
    }
    queue.add(thread);
    queueNum++;
    return queueNum;
}
```

尝试获取锁，state为0表示没有线程占用，否则表示占用线程在队列中的index



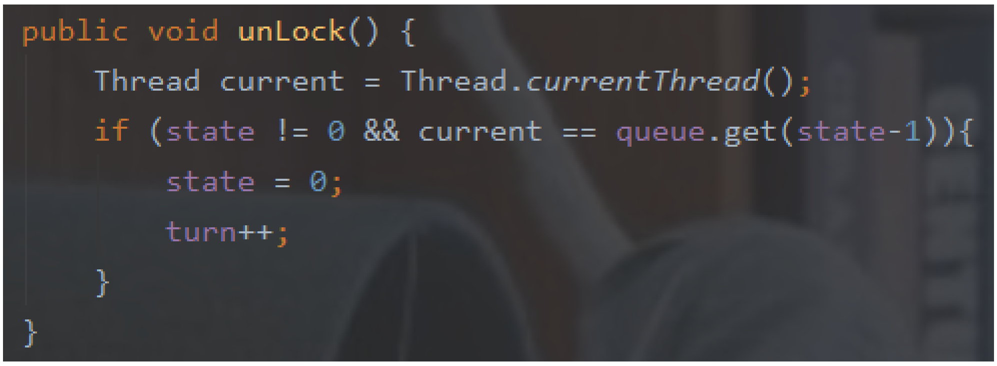
```
private int tryAcquire(int arg){
    if (arg != turn){
        return -1;
    }
    if (state == 0){//锁还没被获取到
        state = arg;
        return 1;
    }else if (state == arg){//锁就是被当前进程占用的，可以重入
        return 0;
    }
    return -1;
}
```

循环等待锁



```
private boolean acquireQueue(int arg){
    boolean interrupted = false;
    //若轮到当前线程获取锁并获取到了锁则跳出循环
    while (!(arg == turn && tryAcquire(arg)!=-1)){
        Thread.yield();
        if (Thread.currentThread().isInterrupted()){
            interrupted = true;
        }
    }
    return interrupted;
}
```

unlock

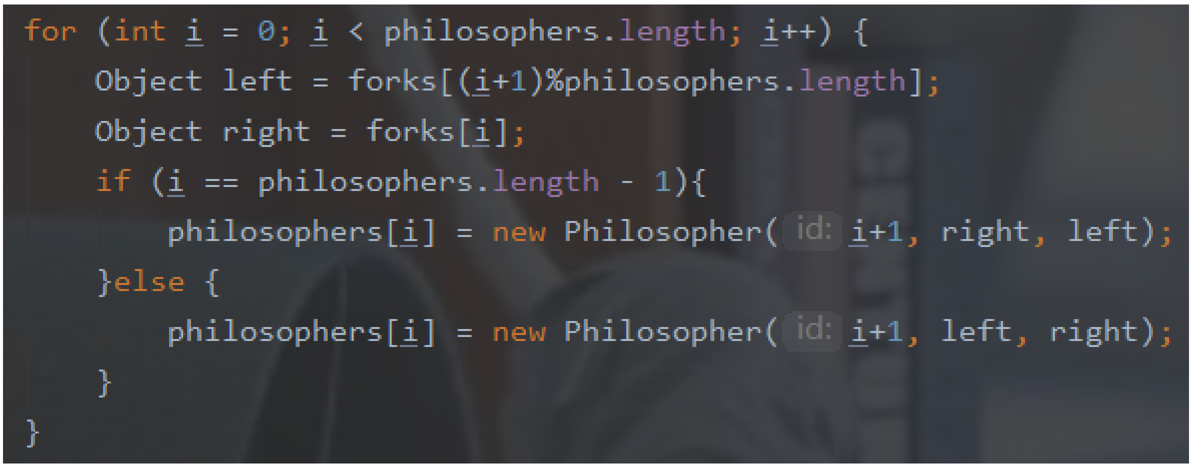


```
public void unLock() {
    Thread current = Thread.currentThread();
    if (state != 0 && current == queue.get(state-1)){
        state = 0;
        turn++;
    }
}
```

partB哲学家吃饭问题

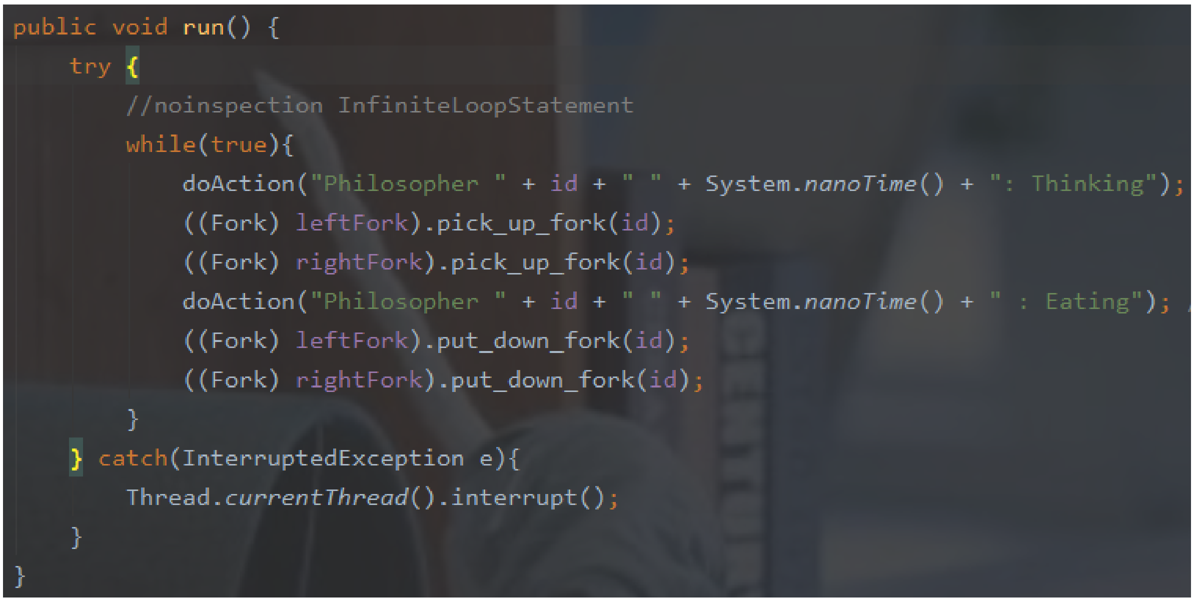
解决办法

改变其中一位哲学家的拿筷子的顺序，这样就不会形成循环等待，也就解决了发生死锁的情况



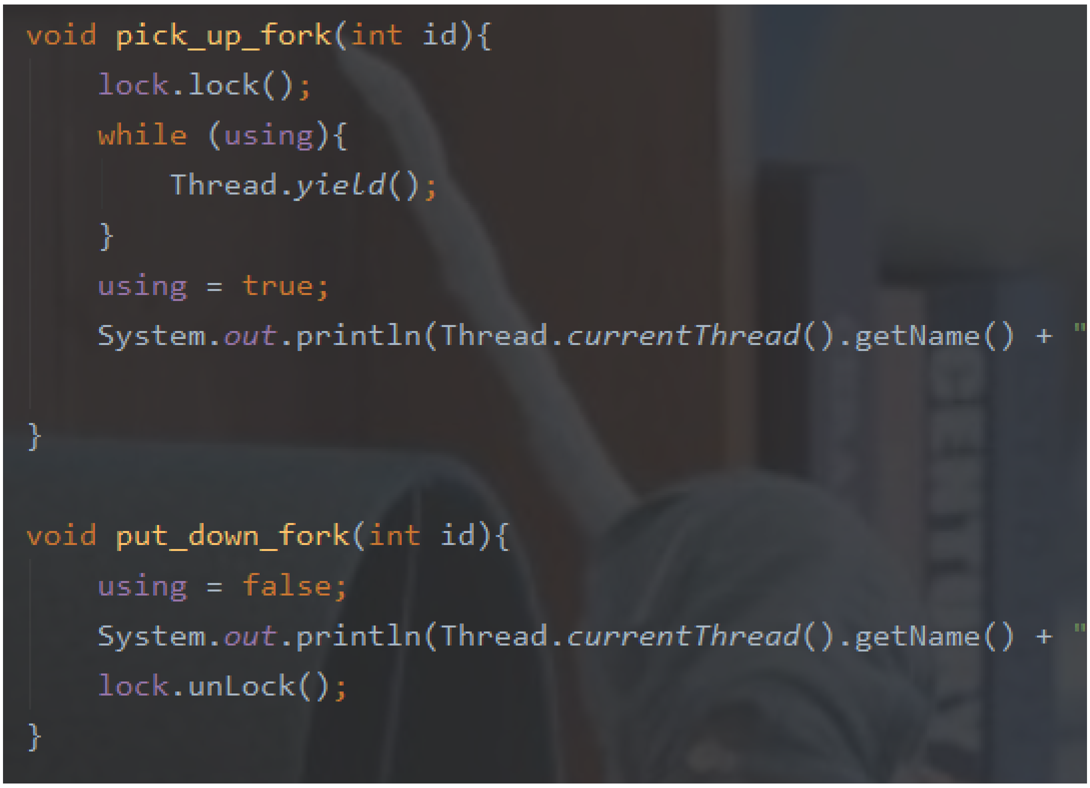
```java
for (int i = 0; i < philosophers.length; i++) {
    Object left = forks[(i+1)%philosophers.length];
    Object right = forks[i];
    if (i == philosophers.length - 1){
        philosophers[i] = new Philosopher( id: i+1, right, left);
    }else {
        philosophers[i] = new Philosopher( id: i+1, left, right);
    }
}
```

Philosopher



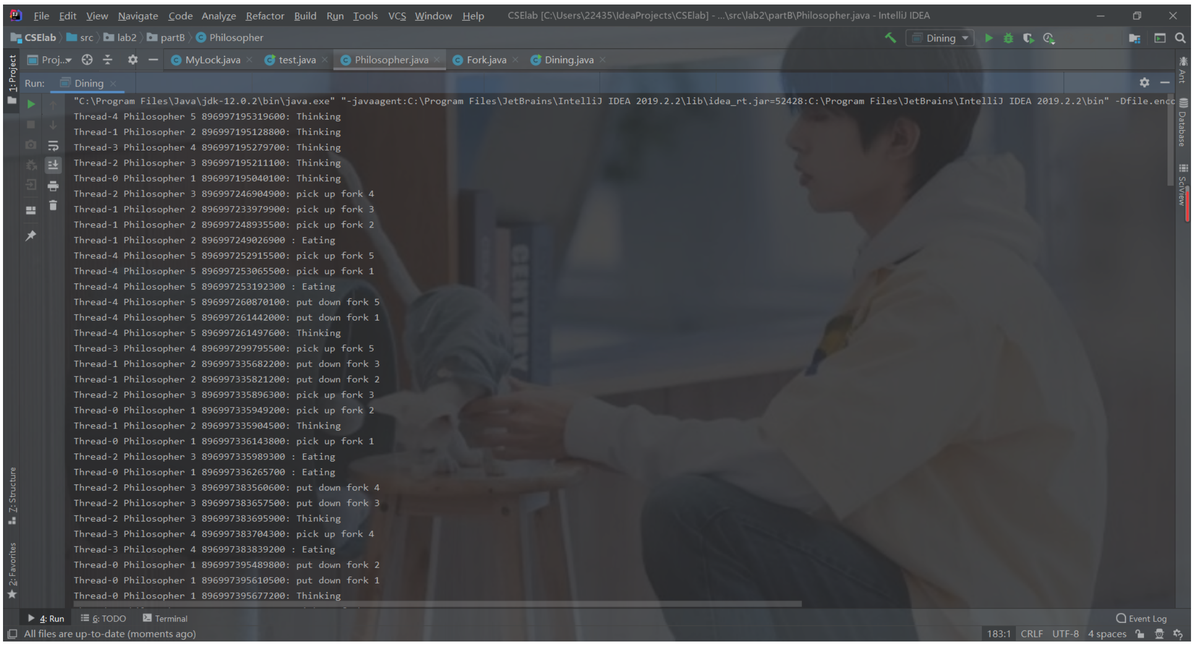
```java
public void run() {
    try {
        //noinspection InfiniteLoopStatement
        while(true){
            doAction("Philosopher " + id + " " + System.nanoTime() + ": Thinking");
            ((Fork) leftFork).pick_up_fork(id);
            ((Fork) rightFork).pick_up_fork(id);
            doAction("Philosopher " + id + " " + System.nanoTime() + " : Eating");
            ((Fork) leftFork).put_down_fork(id);
            ((Fork) rightFork).put_down_fork(id);
        }
    } catch(InterruptedException e){
        Thread.currentThread().interrupt();
    }
}
```

Fork



```java
void pick_up_fork(int id){
    lock.lock();
    while (using){
        Thread.yield();
    }
    using = true;
    System.out.println(Thread.currentThread().getName() + "

}

void put_down_fork(int id){
    using = false;
    System.out.println(Thread.currentThread().getName() + "
    lock.unLock();
}
```

输出



File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
CSElab [C:\Users\22435\IdeaProjects\CSElab] - ...\src\lab2\partB\Philosopher.java - IntelliJ IDEA
CSElab
src
lab2
partB
Philosopher
Dining
Proj...
MyLock.java
test.java
Philosopher.java
Fork.java
Dining.java
Run:
Dining
1: Project
Z: Structure
2: Favorites
Ant
Database
SciView
4: Run
6: TODO
Terminal
Event Log
All files are up-to-date (moments ago)
183:1
CRLF
UTF-8
4 spaces

```
"C:\Program Files\Java\jdk-12.0.2\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA 2019.2.2\lib\idea_rt.jar=52428:C:\Program Files\JetBrains\IntelliJ IDEA 2019.2.2\bin" -Dfile.enco
Thread-4 Philosopher 5 896997195319600: Thinking
Thread-1 Philosopher 2 896997195128800: Thinking
Thread-3 Philosopher 4 896997195279700: Thinking
Thread-2 Philosopher 3 896997195211100: Thinking
Thread-0 Philosopher 1 896997195040100: Thinking
Thread-2 Philosopher 3 896997246904900: pick up fork 4
Thread-1 Philosopher 2 896997233979900: pick up fork 3
Thread-1 Philosopher 2 896997248935500: pick up fork 2
Thread-1 Philosopher 2 896997249026900 : Eating
Thread-4 Philosopher 5 896997252915500: pick up fork 5
Thread-4 Philosopher 5 896997253065500: pick up fork 1
Thread-4 Philosopher 5 896997253192300 : Eating
Thread-4 Philosopher 5 896997260870100: put down fork 5
Thread-4 Philosopher 5 896997261442000: put down fork 1
Thread-4 Philosopher 5 896997261497600: Thinking
Thread-3 Philosopher 4 896997299795500: pick up fork 5
Thread-1 Philosopher 2 896997335682200: put down fork 3
Thread-1 Philosopher 2 896997335821200: put down fork 2
Thread-2 Philosopher 3 896997335896300: pick up fork 3
Thread-0 Philosopher 1 896997335949200: pick up fork 2
Thread-1 Philosopher 2 896997335904500: Thinking
Thread-0 Philosopher 1 896997336143800: pick up fork 1
Thread-2 Philosopher 3 896997335989300 : Eating
Thread-0 Philosopher 1 896997336265700 : Eating
Thread-2 Philosopher 3 896997383560600: put down fork 4
Thread-2 Philosopher 3 896997383657500: put down fork 3
Thread-2 Philosopher 3 896997383695900: Thinking
Thread-3 Philosopher 4 896997383704300: pick up fork 4
Thread-3 Philosopher 4 896997383839200 : Eating
Thread-0 Philosopher 1 896997395489800: put down fork 2
Thread-0 Philosopher 1 896997395610500: put down fork 1
Thread-0 Philosopher 1 896997395677200: Thinking
```