生产者消费者上机实验

一、实验内容

采用信号量机制实现消费者与生产者的线程同步,具体内容为

- 1个生产者,1个消费者
- 1个生产者,多个消费者
- 多个生产者, 1个消费者
- 多个生产者,多个消费者

二、实验环境

使用visual studio 2019开发,采用.net framework 4.7.2框架,界面采用winform框架。

三、实验思路

首先分别编写生产者、消费者线程代码,在其中实现线程间的同步问题,之后通过所输入的生产者、消费者数目等等信息创建对应进程,最后将输出结果输出到显示器。

需要三个信号量对该模型进行线程同步,其一是需要一个互斥量mutex,其作用是控制写同步;其余两个是两个Semaphore类型的produce和consume信号量分别控制生产者和消费者的线程同步问题,初始条件下缓冲区内没有货物,produce信号量的值为缓冲区大小(意味着生产者能生产货物),consume信号量的值为0(意味着消费者并不能消费货物)。

3.1 生产者线程

首先对于produce信号量申请资源,即WaitOne()函数,若申请失败,则输出错误信息,若申请成功,则进入下一流程;之后通过mutex进行加写锁,生产货物,输出信息,完成之后释放写锁,即ReleaseMutex()函数;之后cosume信号量释放资源,即Release()函数(意味着消费者可以消费生产者所生产的这一货物);之后根据速率大小设置生产者线程的挂起时间;最后判断生产的总货物数目是否大于输入时所设置的数目,若是,则退出线程。

3.2 消费者线程

大致流程同理如上,不同之处在于消费者线程首先对consume信号量申请资源,之后对produce信号量释放资源。

3.3 创建并开启线程

使用线程数组生成生产者以及消费者线程,来控制线程名称规范。

如上是生产者线程的创建及开启。

四、实验结果

4.1 winform UI设计



4.2 1个生产者, 1个消费者

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4.3 1个生产者,多个消费者

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4.4 多个生产者,一个消费者

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4.5 多个生产者,多个消费者

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消费者数目:	2							
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