### [进程调度](http://onvip.com.cn/index.php/archives/3" \o "Permanent Link to 操作系统课程设计-银行家算法的实现)

**一、设计目的：**  
掌握进程调度。

**二、设计内容**

实现最大优先级调度和时间片轮询调度。

**三、开发环境**

+ Windows 10 64bits

+ Intel core i5-7300hq cpu@2.5GHz

+ gcc 7.1.0 x64bits-posix threads-seh (mingw7.1.0)

**四、分析设计**

该实验模拟最大优先级调度算法和轮询调度算法。首先主线程创建10个dummy进程，填充它们的PCB，然后进行最大优先级调度，核心代码如下：

void maxPriorityScheduling(Process processes[], int processNum) {

//将所有进程都放进就绪队列（因为进程初始状态都是READY）

std::priority\_queue<Process\*, std::vector<Process\*>, Compare> readyQueue;

for (int i = 0; i < PROCESS\_NUM; i++) {

if (processes[i].status == PROCESS\_STATUS\_READY) {

readyQueue.push(&processes[i]);

}

}

//当就绪队列还有进程就一直循环

while (!readyQueue.empty()) {

//获取等待队列第一个进程

Process \* p = readyQueue.top();

readyQueue.pop();

//假装进程运行了一个时间片，这里是0.5秒

p->status = PROCESS\_STATUS\_RUNNING;

Sleep(500);

dump(processes, processNum);

if (difftime(time(NULL), p->expectTime) > 0.0) {

//如果现在时间超出进程允许运行时间那就把进程设置为EXIT

p->status = PROCESS\_STATUS\_EXIT;

}

else {

//否则它的已使用CPU时间加一，优先级减一,并放入就绪队列尾

p->status = PROCESS\_STATUS\_READY;

if(p->priority > 0){

p->priority--;

}else{

p->priority = 0;

}

p->usedCPUCount++;

readyQueue.push(p);

}

//每次调度都输出当前所有进程信息

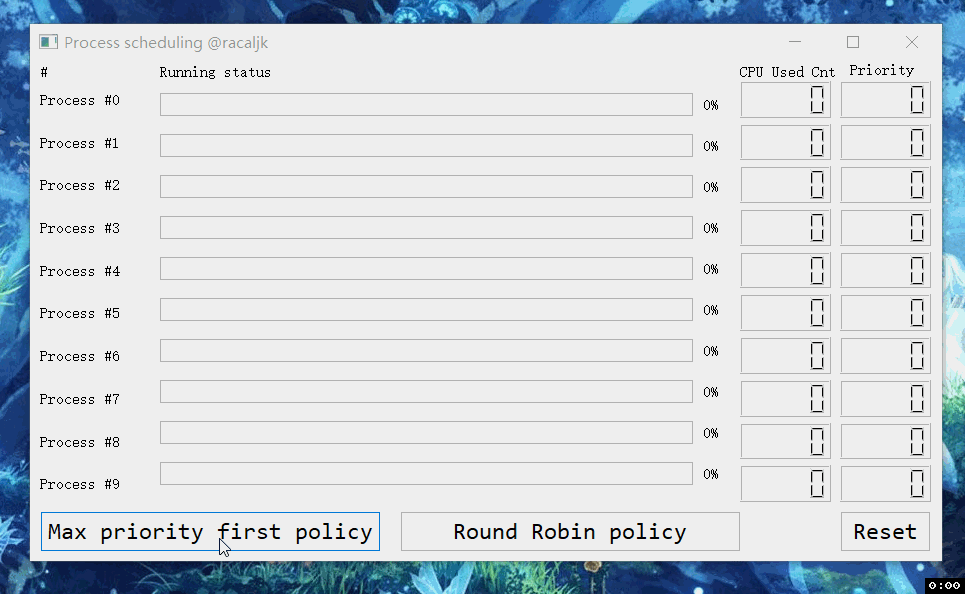
dump(processes, processNum);

}

}

代码附上了详细的comments。稍微值得注意的是创建进程的时候我们指定它的状态是READY，所以调度开始时要把所有进程加入就绪队列。然后轮转直到就绪队列为空，这里进程消耗一个时间片使用win32 API Sleep()模拟。接着进行判断，如果超时则退出进程，否则优先级减一，CPU使用计数加一，结束本进程调度。

**五**. **运行示例及结果分析**

GUI运行效果：  


最大优先级调度部分运行结果：

 Process Name State Priority CPU ticks Start Desired running duration

process-0 READY 2 0 1527557229 1527557239

process-1 READY 8 0 1527557229 1527557239

process-2 READY 5 0 1527557229 1527557239

process-3 READY 1 0 1527557229 1527557239

process-4 RUNNING 10 0 1527557229 1527557239

process-5 READY 5 0 1527557229 1527557239

process-6 READY 9 0 1527557229 1527557239

process-7 READY 9 0 1527557229 1527557239

process-8 READY 3 0 1527557229 1527557239

process-9 READY 5 0 1527557229 1527557239

Process Name State Priority CPU ticks Start Desired running duration

process-0 READY 2 0 1527557229 1527557239

process-1 READY 8 0 1527557229 1527557239

process-2 READY 5 0 1527557229 1527557239

process-3 READY 1 0 1527557229 1527557239

process-4 READY 9 1 1527557229 1527557239

process-5 READY 5 0 1527557229 1527557239

process-6 READY 9 0 1527557229 1527557239

process-7 READY 9 0 1527557229 1527557239

process-8 READY 3 0 1527557229 1527557239

process-9 READY 5 0 1527557229 1527557239

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process-3 READY 1 0 1527557229 1527557239

process-4 READY 9 1 1527557229 1527557239

process-5 READY 5 0 1527557229 1527557239

process-6 RUNNING 9 0 1527557229 1527557239

process-7 READY 9 0 1527557229 1527557239

process-8 READY 3 0 1527557229 1527557239

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process-4 READY 9 1 1527557229 1527557239

process-5 READY 5 0 1527557229 1527557239

process-6 READY 8 1 1527557229 1527557239

process-7 READY 9 0 1527557229 1527557239

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process-4 READY 9 1 1527557229 1527557239

process-5 READY 5 0 1527557229 1527557239

process-6 READY 8 1 1527557229 1527557239

process-7 RUNNING 9 0 1527557229 1527557239

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process-4 READY 9 1 1527557229 1527557239

process-5 READY 5 0 1527557229 1527557239

process-6 READY 8 1 1527557229 1527557239

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process-5 READY 5 0 1527557229 1527557239

process-6 READY 7 2 1527557229 1527557239

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process-5 READY 5 0 1527557229 1527557239

process-6 READY 7 2 1527557229 1527557239

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process-4 RUNNING 7 3 1527557229 1527557239

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process-5 READY 5 0 1527557229 1527557239

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process-5 READY 5 0 1527557229 1527557239

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process-8 READY 3 0 1527557229 1527557239

process-9 READY 5 0 1527557229 1527557239

Process Name State Priority CPU ticks Start Desired running duration

process-0 READY 2 0 1527557229 1527557239

process-1 READY 4 4 1527557229 1527557239

process-2 READY 4 1 1527557229 1527557239

process-3 READY 1 0 1527557229 1527557239

process-4 READY 4 6 1527557229 1527557239

process-5 READY 4 1 1527557229 1527557239

process-6 READY 5 4 1527557229 1527557239

process-7 READY 5 4 1527557229 1527557239

process-8 READY 3 0 1527557229 1527557239

process-9 READY 5 0 1527557229 1527557239

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process-5 READY 4 1 1527557229 1527557239

process-6 RUNNING 5 4 1527557229 1527557239

process-7 READY 5 4 1527557229 1527557239

process-8 READY 3 0 1527557229 1527557239

process-9 READY 5 0 1527557229 1527557239

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process-3 READY 1 0 1527557229 1527557239

process-4 READY 4 6 1527557229 1527557239

process-5 READY 4 1 1527557229 1527557239

process-6 EXIT 5 4 1527557229 1527557239

process-7 READY 5 4 1527557229 1527557239

process-8 READY 3 0 1527557229 1527557239

process-9 READY 5 0 1527557229 1527557239

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process-4 READY 4 6 1527557229 1527557239

process-5 READY 4 1 1527557229 1527557239

process-6 EXIT 5 4 1527557229 1527557239

process-7 RUNNING 5 4 1527557229 1527557239

process-8 READY 3 0 1527557229 1527557239

process-9 READY 5 0 1527557229 1527557239

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process-7 EXIT 5 4 1527557229 1527557239

process-8 READY 3 0 1527557229 1527557239

process-9 READY 5 0 1527557229 1527557239

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process-6 EXIT 5 4 1527557229 1527557239

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process-5 READY 4 1 1527557229 1527557239

process-6 EXIT 5 4 1527557229 1527557239

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process-5 RUNNING 4 1 1527557229 1527557239

process-6 EXIT 5 4 1527557229 1527557239

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process-8 READY 3 0 1527557229 1527557239

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process-2 EXIT 4 1 1527557229 1527557239

process-3 READY 1 0 1527557229 1527557239

process-4 RUNNING 4 6 1527557229 1527557239

process-5 EXIT 4 1 1527557229 1527557239

process-6 EXIT 5 4 1527557229 1527557239

process-7 EXIT 5 4 1527557229 1527557239

process-8 READY 3 0 1527557229 1527557239

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process-4 EXIT 4 6 1527557229 1527557239

process-5 EXIT 4 1 1527557229 1527557239

process-6 EXIT 5 4 1527557229 1527557239

process-7 EXIT 5 4 1527557229 1527557239

process-8 READY 3 0 1527557229 1527557239

process-9 EXIT 5 0 1527557229 1527557239

六、**心得与体会**

当实现了最大优先级调度之后，令我惊讶的是，轮询调度仅需要在最大优先级调度的基础上修改<3lines代码即可完成：

将

std::priority\_queue<Process\*, std::vector<Process\*>, Compare> readyQueue;

Process \* p = readyQueue.top();

修改为

std::queue<Process\*> readyQueue;

Process \* p = readyQueue.front();

即可。这再次说明两个算法的核心区别是队列的管理，而外在形式几乎没有变化。