Week13-Report

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Q1

(1)

- polling:
  - pros: it is simple and working
  - cons:inefficiency on using the CPU
- Interrupt-based I/O
  - pros: can utilized the CPU more efficiently.
  - cons: need to context switch frequently which may cost more time than waiting.

(2)

- PIO: the CPU is involved in the data transfers.
- DMA: the CPU is not involved in the data transfer, but the DMA engine handles it

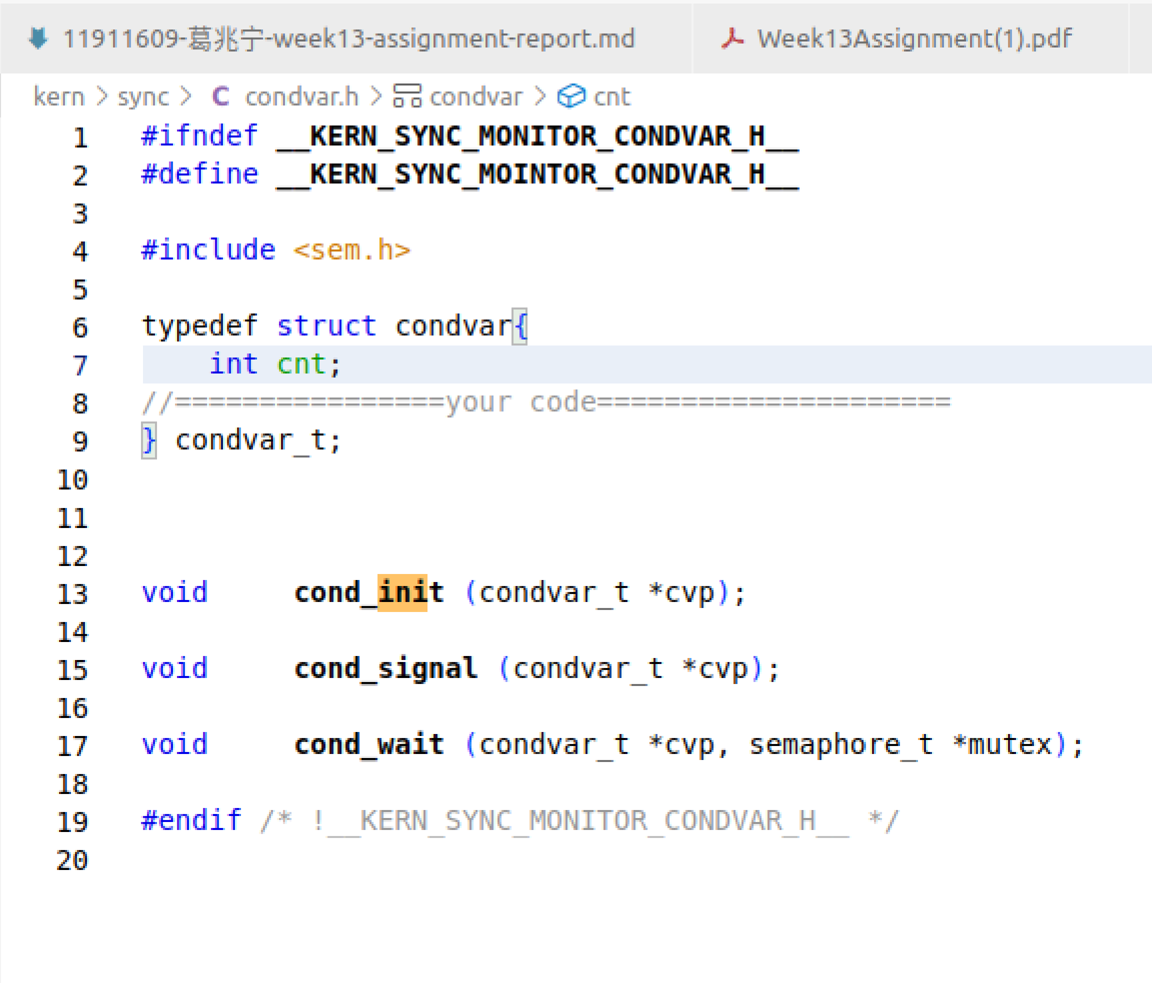
(3)

- explicit I/O instructions: those instructions are always privileged that only OS can use it, this protect the I/O from the abused by the malicious processes.
- memory-mapped I/O: it need OS load or store an address, so only with OS-granted process can use the I/O

Q2

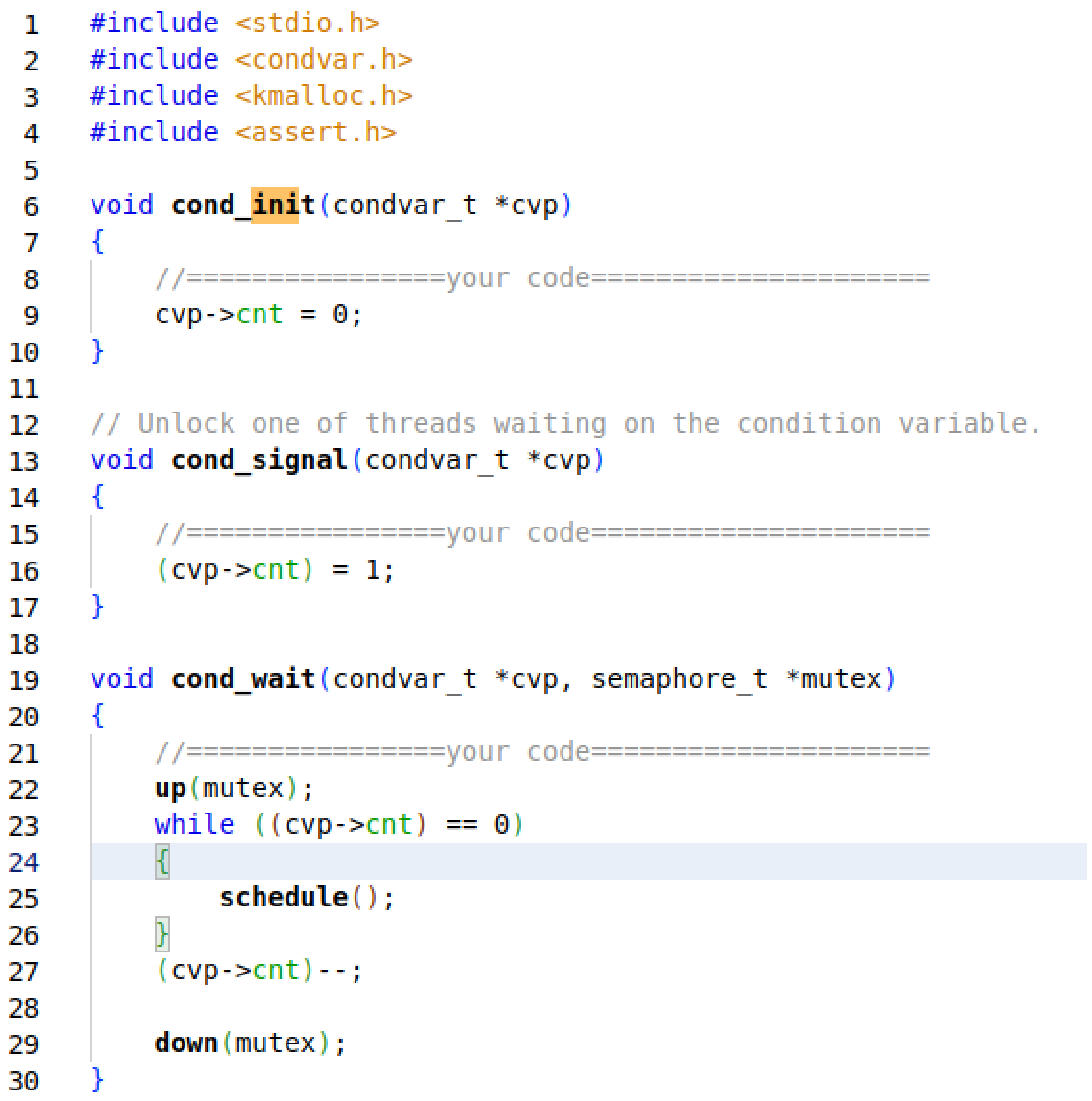
- Design ideas: Use only an integer to judge whether the thread should switch to the other thread(process, because I check that the test still use the process structure).
- code:

- condvar.h:


11911609-葛兆宁-week13-assignment-report.md
Week13Assignment(1).pdf
kern > sync > condvar.h > condvar > cnt

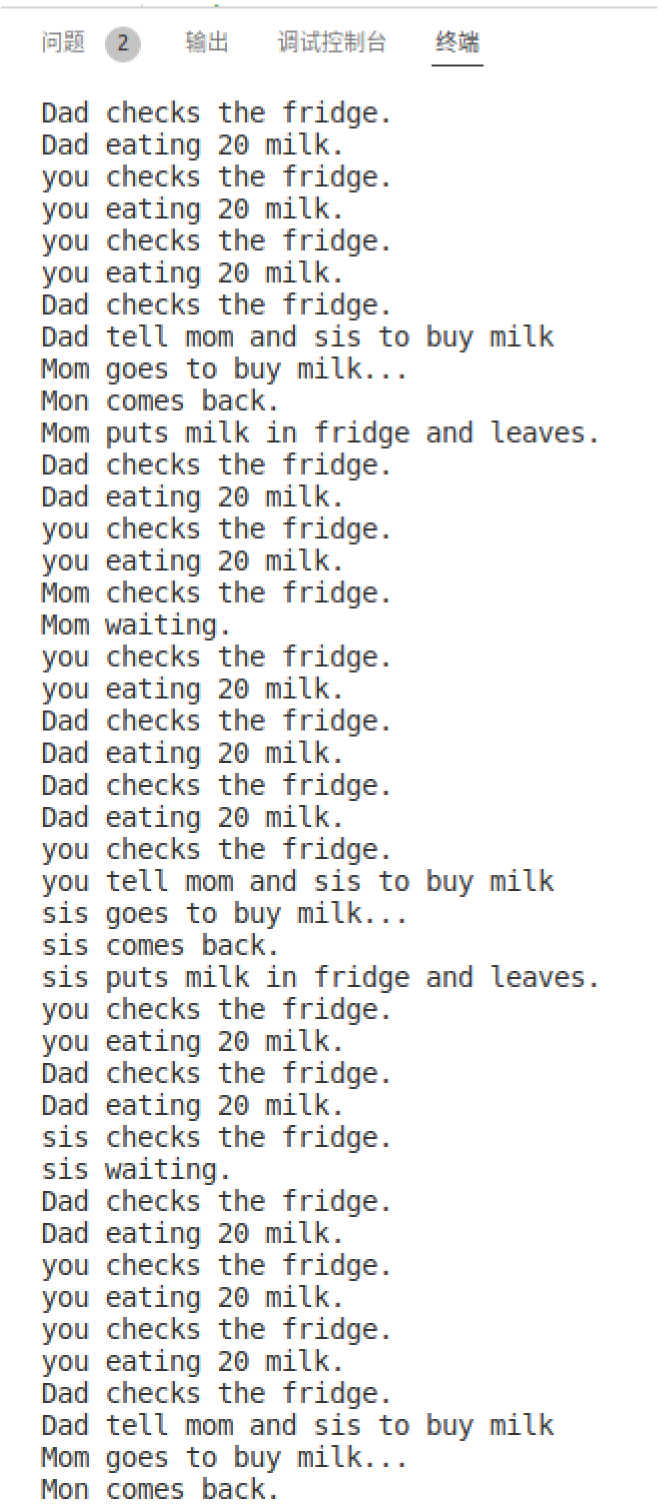
```
#ifndef __KERN_SYNC_MONITOR_CONDVAR_H__
#define __KERN_SYNC_MOINTOR_CONDVAR_H__

#include <sem.h>

typedef struct condvar{
    int cnt;
//================your code=====================
} condvar_t;



void     cond_init (condvar_t *cvp);

void     cond_signal (condvar_t *cvp);

void     cond_wait (condvar_t *cvp, semaphore_t *mutex);

#endif /* !__KERN_SYNC_MONITOR_CONDVAR_H__ */
```

- condvar.c:



```c
#include <stdio.h>
#include <condvar.h>
#include <kmalloc.h>
#include <assert.h>

void cond_init(condvar_t *cvp)
{
    //===============your code====================
    cvp->cnt = 0;
}

// Unlock one of threads waiting on the condition variable.
void cond_signal(condvar_t *cvp)
{
    //===============your code====================
    (cvp->cnt) = 1;
}

void cond_wait(condvar_t *cvp, semaphore_t *mutex)
{
    //===============your code====================
    up(mutex);
    while ((cvp->cnt) == 0)
    {
        schedule();
    }
    (cvp->cnt)--;

    down(mutex);
}
```

- result:



```
Dad checks the fridge.
Dad eating 20 milk.
you checks the fridge.
you eating 20 milk.
you checks the fridge.
you eating 20 milk.
Dad checks the fridge.
Dad tell mom and sis to buy milk
Mom goes to buy milk...
Mon comes back.
Mom puts milk in fridge and leaves.
Dad checks the fridge.
Dad eating 20 milk.
you checks the fridge.
you eating 20 milk.
Mom checks the fridge.
Mom waiting.
you checks the fridge.
you eating 20 milk.
Dad checks the fridge.
Dad eating 20 milk.
Dad checks the fridge.
Dad eating 20 milk.
you checks the fridge.
you tell mom and sis to buy milk
sis goes to buy milk...
sis comes back.
sis puts milk in fridge and leaves.
you checks the fridge.
you eating 20 milk.
Dad checks the fridge.
Dad eating 20 milk.
sis checks the fridge.
sis waiting.
Dad checks the fridge.
Dad eating 20 milk.
you checks the fridge.
you eating 20 milk.
you checks the fridge.
you eating 20 milk.
Dad checks the fridge.
Dad tell mom and sis to buy milk
Mom goes to buy milk...
Mon comes back.
```

Q3

- Design ideas: use the conditional varible to decide the order, use mutex to lock the thread.

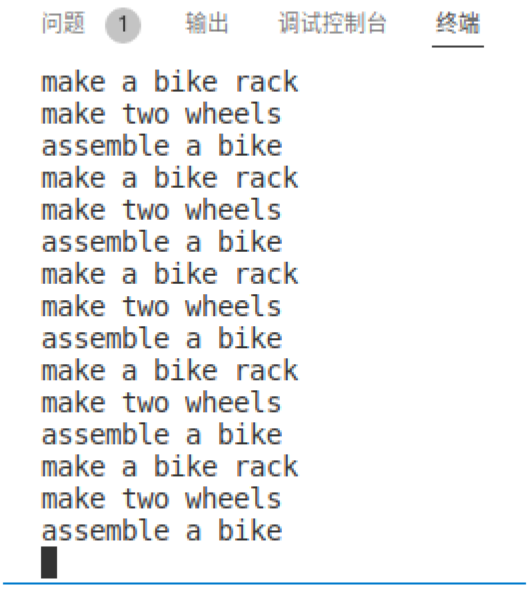
- code:

  - check_exercise.c:

```
// kern/sync/check_exercise.c

# include <stdio.h>
# include <proc.h>
# include <sem.h>
# include <assert.h>
# include <condvar.h>

struct proc_struct *pworker1,*pworker2,*pworker3;
semaphore_t mutex;
condvar_t cvp[2];

void worker1(int i)
{
    while (1)
    {
        down(&mutex);
        cprintf("make a bike rack\n");
        cond_signal(&cvp[0]);
        up(&mutex);
       do_sleep(10);
    }
}

void worker2(int i)
{
    while (1)
    {
        down(&mutex);
        cond_wait(&cvp[0],&mutex);
        cprintf("make two wheels\n");
        cond_signal(&cvp[1]);
        up(&mutex);
        do_sleep(10);
    }
}

void worker3(int i)
{
    while (1)
    {
        down(&mutex);
        cond_wait(&cvp[1],&mutex);
        cprintf("assemble a bike\n");
        up(&mutex);
        do_sleep(10);
    }
}

void check_exercise(void){

     //initial

    for(int i=0;i<2;i++)
    {
        cond_init(&cvp[i]);
    }
```

```
        sem_init(&mutex,1);
        int pids[3];
        int i =0;
        pids[0]=kernel_thread(worker1, (void *)i, 0);
        pids[1]=kernel_thread(worker2, (void *)i, 0);
        pids[2]=kernel_thread(worker3, (void *)i, 0);
        pworker1 = find_proc(pids[0]);
        set_proc_name(pworker1, "worker1");
        pworker2 = find_proc(pids[1]);
        set_proc_name(pworker2, "worker2");
        pworker3 = find_proc(pids[2]);
        set_proc_name(pworker3, "worker3");
    }
```

- result:



```
make a bike rack
make two wheels
assemble a bike
make a bike rack
make two wheels
assemble a bike
make a bike rack
make two wheels
assemble a bike
make a bike rack
make two wheels
assemble a bike
make a bike rack
make two wheels
assemble a bike
```