Computer Architecture Project 3 Report

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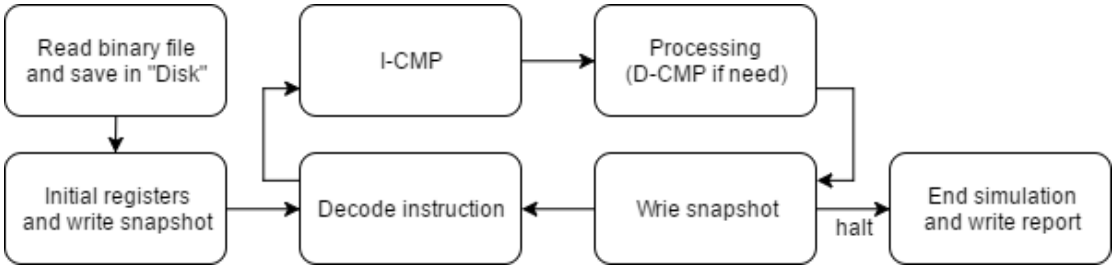
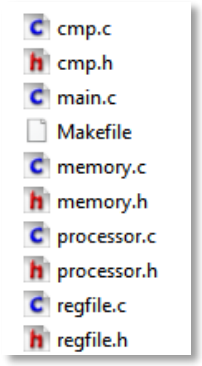
1) Project Description

1-1) Program Flow chart:



1-2) Detailed Description:



The file I used in this project are copy from project 1 except two “cmp” file.

I. Project 1 part:

I changed some function that can help me to write the trace file, and add the I-CMP check function before running the process, if the process need to handle the data, then call the D-CMP function.

However, when I changing the project 1 file, I deleted some important things that may make my program output the incorrect snapshot file. And because I have not noticed that, so my 1st submission program cannot pass many test case.

II. CMP part:

```
//Config value
typedef struct _variable {
    int memSize;
    int pageSize;
    int cacheSize;
    int blockSize;
    int set;
} variable;

typedef struct _PTE {
    int ValidBit;
    unsigned int PhysicalPageNumber;
} PTE;

typedef struct _TLB {
    int ValidBit;
    unsigned int VirtualPageNumber;
    unsigned int PhysicalPageNumber;
    int Cycle;
} TLB;

typedef struct _Cache {
    int ValidBit;
    unsigned int Tag;
    int MRU;
} Cache;

typedef struct _Memory {
    int ValidBit;
    int Cycle;
} Memory;

variable I_var, D_var;
PTE *iPTE, *dPTE;
TLB *iTLB, *dTLB;
Cache **iCache, **dCache;
Memory *iMem, *dMem;
```

<- the structure created in cmp.h

```
unsigned int iPTE_entries, dPTE_entries;
int iPTE_HIT, iPTE_MISS, dPTE_HIT, dPTE_MISS;
unsigned int iTLB_entries, dTLB_entries;
int iTLB_HIT, iTLB_MISS, dTLB_HIT, dTLB_MISS;
unsigned int iCache_entries, dCache_entries;
int iCache_HIT, iCache_MISS, dCache_HIT, dCache_MISS;
unsigned int iMem_entries, dMem_entries;

void initCMP();
void initPTE();
void initTLB();
void initCache();
void initMem();
void checkITLB(unsigned int Vaddr);  //I
void updateILTB(unsigned int VPN);
int checkIPTE(unsigned int VPN);
void updateIPTE(unsigned int VPN);
void checkICache(unsigned int PhysicalAddr);
void checkDTLB(unsigned int Vaddr); //D
void checkDTLB(unsigned int Vaddr);
void updateDLTB(unsigned int VPN);
int checkDPTE(unsigned int VPN);
void updateDPTE(unsigned int VPN);
void checkDCache(unsigned int PhysicalAddr);
void writeReport();
```

For the “cmp” file function, to check the i-cmp, we will call checkITLB function, and the other function to help the judge or update value if need, and for the d-cmp is also similar to the i-cmp.

I copy the i-cmp function and change some value, then it became d-cmp function. But I missed some value in D-Cache and unfortunately the open test case cannot test out the problem.

For each initial function, I set the entries value of each, and follow the project description said to calculate out, and we can use the value to create a cache array.

III. Makefile part:

```
CC = gcc

CMP: main.o cmp.o memory.o regfile.o processor.o
  $(CC) -o $@ main.o cmp.o memory.o regfile.o processor.o
main.o: main.c cmp.c cmp.h memory.c memory.h regfile.c regfile.h processor.c processor.h
  $(CC) -c -g main.c
cmp.o: cmp.c cmp.h memory.c memory.h processor.c processor.h
  $(CC) -c -g cmp.c
memory.o: memory.c memory.h regfile.c regfile.h
  $(CC) -c -g memory.c
regfile.o: regfile.c regfile.h memory.c memory.h
  $(CC) -c -g regfile.c
processor.o: processor.c processor.h cmp.c cmp.h regfile.c regfile.h memory.c memory.h
  $(CC) -c -g processor.c
clean:
  rm -f main.o cmp.o memory.o regfile.o processor.o
```

Just using a simple way to include all the file that I need to compile the target "*.o". And also the clean up function.Test case Design

2-1) Detail Description of Test case:

```
    lw    $1, 0($0)
    addi  $2, $0, 1
    addi  $3, $0, 1
A:add   $2, $2, $3
    bne   $1, $2, A
    lw    $5, 11($1)
    add   $1, $1, $5
B:addi  $2, $2, 2
    bne   $1, $2, B
    sub   $6, $1, $2
    sub   $6, $1, $5
    halt
    halt
    halt
    halt
```

dimage.bin

Offset(h)	00	01	02	03
00000000	00	00	04	00
00000004	00	00	00	05
00000008	00	00	00	05
0000000C	00	00	00	01
00000010	00	00	00	02
00000014	00	00	00	03
00000018	00	00	00	04

A simple test case to do test try some loop, but because my program in 1st submission having some problem, so it cannot challenge other program.