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# Unicore Simulator Interim Report

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# Project Review

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- Realize CPU controller and datapath with **five** level pipeline
- Realize at least one level cache, **Havard architecture**.
- Realize dynamic memory management.
- Support of some system library functions.
- Debugger utils and Performance Analysis utils support.

# Expected Progress

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- 1-2 weeks ELF parser module, Register heap module, Memory module. (Finished in 1st week)
- 3-4 weeks CPU module. (Finished in 4th week)
- 5-6 weeks Cache module(Finished in 3rd week), Loader module. (Finished in 2nd week)
- 7-8 weeks Debugger module and some latter works.(To be finished in 1-2 week)

More infomation about our project progress, see our svn:

<http://code.google.com/p/minic/wiki/MINICintroduction?tm=6>

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# Project Introduction

# Module View

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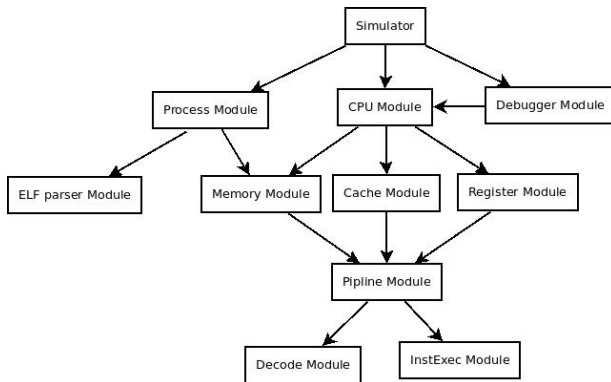
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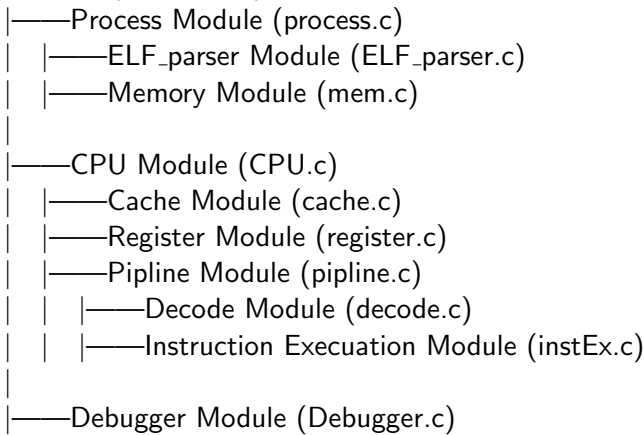
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## Simulator (simulator.c)





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# Module Analysis

# Process Module

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Struct of Process:

```
typedef struct {  
    int status; //Process status  
    uint32_t entry; //The entry of a program  
    PROC_STACK* stack; //Process stack  
    PROC_MEM* mem; //Process memory  
} PROCESS;
```

Process is a basic module handles a copy of a progrss in the memory.

# CPU Module

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CPU Module is the most important module, it lays on the top level and handles add the execution of a progress.

Struct of CPU:

```
typedef struct {  
    int cpu_id; //CPU id  
    int mode; //CPU mode, normal or trap  
    REGISTERS* regs; //Register heap  
    CACHE *i_cache , *d_cache;  
    PIPELINE * pipeline; //CPU pipeline  
    PROCESS* proc; //Process running on CPU now  
    CPU_info* cpu_info; //Information of CPU  
                        //from starting  
}CPU_d;
```

# CPU Module(cont.)

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Struct of CPU\_info:

```
typedef struct {  
    int   cycles_total; //total cycles of cpu  
    int   cycles_work; //work cycles of cpu  
    int   bubbles; //bubbles of pipline  
    int   rd_mem_times; //times of read memory  
    int   wr_mem_times; //times of write memory  
    int   cache_visit; //times of cache visit  
    int   cache_miss; //times of cache miss  
} CPU_info;
```

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Struct of Process Memory Management:

```
typedef struct {  
    unsigned int vaddr_offset;  
    unsigned int size;  
    uint8_t *base;  
    int flag;  
}PROC_SEGMENT;  
  
typedef struct {  
    unsigned int seg_num;  
    PROC_SEGMENT * segments;  
}PROC_MEM;  
  
typedef PROC_SEGMENT PROC_STACK;
```

# Cache and Register Module

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Struct of Cache and Register Module:

```
typedef struct {
    int block_num;
    int sign_bits_num;
    PROC_MEM* mem;
    int valid [CACHE_SIZE/BLOCK_SIZE];
    uint8_t data [CACHE_SIZE/BLOCK_SIZE] [BLOCK_SIZE];
    uint32_t mark [CACHE_SIZE/_BLOCK_SIZE];
}CACHE;
```

```
typedef struct {
    int32_t r [32];
    int32_t flag;
}REGISTERS;
```

# Pipeline Module

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Struct of Pipeline:

```
typedef struct{  
    int block; //1 means pipeline block, 0 mean the  
    PIPELINE_DATA* pipeline_data [PIPELINE_LEVEL];  
    int using_regs [31];  
    PROC_STACK* stack;  
    REGISTERS* regs;  
    CACHE *i_cache , *d_cache;  
} PIPELINE;
```

# Total Lines

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Project has 1987 lines until now.(Exclude blank lines)

```
love@love-laptop: ~/minic/simulator
文件(F) 编辑(E) 查看(V) 终端(T) 帮助(H)
love@love-laptop:~/minic/simulator$ python count_line.py .
instEx.h : 6 lines.
pipeline.c : 171 lines.
pipeline.h : 48 lines.
ELF_parser.h : 13 lines.
test.c : 10 lines.
cache.c : 141 lines.
process.c : 54 lines.
debugger.h : 20 lines.
cache.h : 28 lines.
instEx.c : 654 lines.
decode.c : 206 lines.
register.h : 23 lines.
simulator.c : 79 lines.
process.h : 19 lines.
register.c : 73 lines.
mem.c : 123 lines.
debugger.c : 32 lines.
CPU.h : 25 lines.
mem.h : 32 lines.
inst.h : 45 lines.
decode.h : 6 lines.
CPU.c : 53 lines.
ELF_parser.c : 126 lines.
----Total : 1987 lines.----
love@love-laptop:~/minic/simulators
```



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# Summary Before Mid-term Check

# Project Bottleneck

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Some problems when do the project

- ① Keeping each module independent is important but difficult.
- ② System library function handling is yet left to be realized.
- ③ Some instructions are not realized because of lacking manual.
- ④ Instruction execution module is hard to test and verify, because constructing test set is sometimes ambiguous.
- ⑤ Too many modules leads to high maintenance cost.
- ⑥ Some potential bugs need to be resolved.

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Future work in next 1-2 weeks:

- Complete Debugger module and high level console.
- Finish verification outline.
- Construct high-level test set(generate by c files) and low-level test set(generate by assembler files).
- Discuss and solve the problem of system library function call.
- A complete program compiled by uncore32-linux-gcc(the given compiler from lab) can be run completely in out simulator.

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Q&A