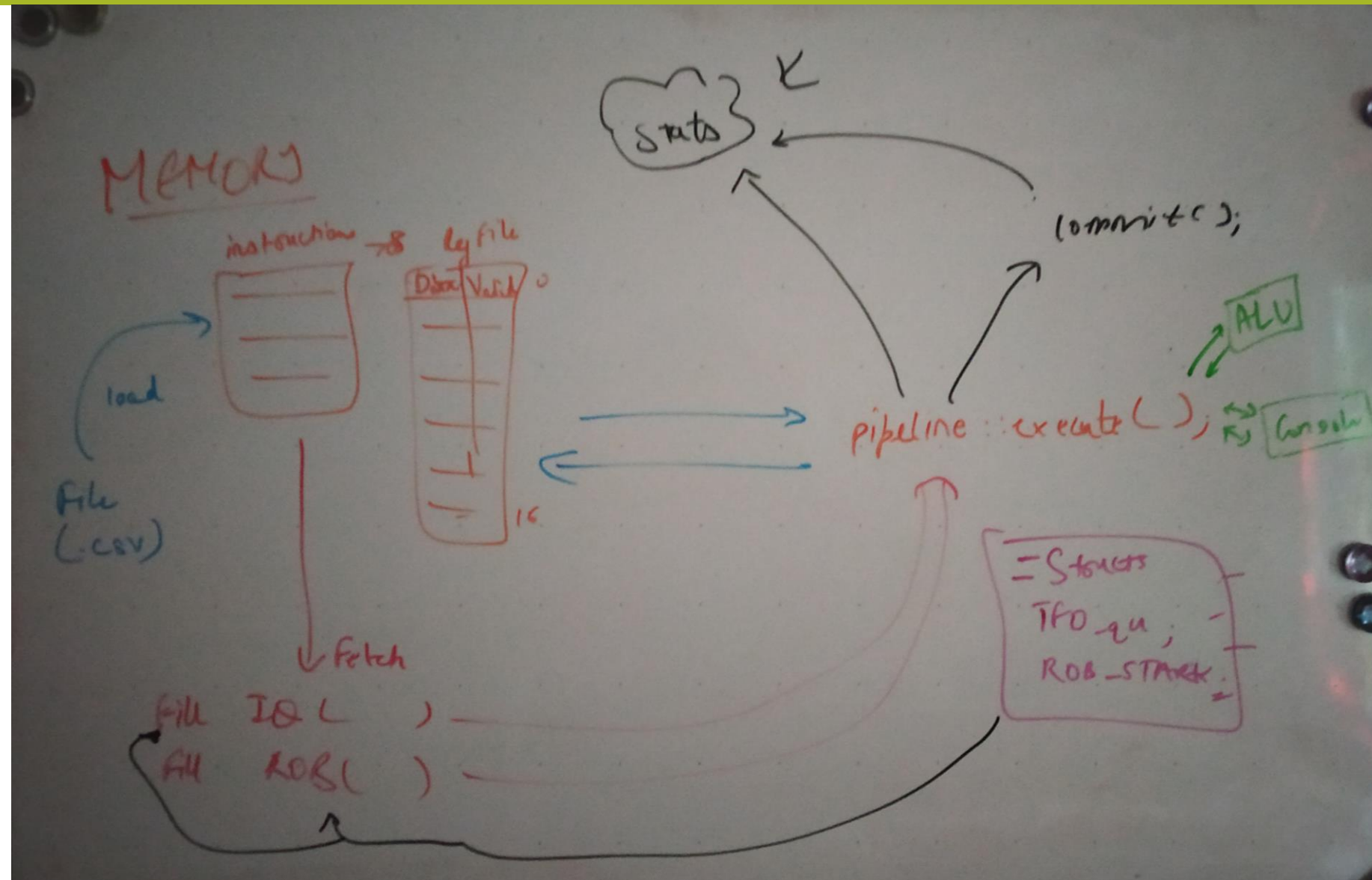


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~/Desktop/final_1571/pipeline.cpp - Sublime Text (UNREGISTERED)
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IQueue.cpp x IQueue.h x memory.cpp x TFO_queue.cpp x pipeline.cpp x memory.h x instruction.cpp x TFO_queue.cpp x instruction.h x main.cpp x ReorderBuffer.h x fter.cpp x
1 // pipe it is
2
3 #include "pipeline.h"
4 int FETCH_WIDTH = 1;
5 int COMMIT_WIDTH = 1;
6
7 pipeline::pipeline() {
8     //constructor
9     debug = 0;
10    finished = 0;
11    PC = 0;
12 }
13
14 pipeline::~pipeline() {
15     //destructor
16 }
17
18 void pipeline::set_debug_mode() {
19     debug = 1;
20 }
21
22 void pipeline::fetch() {
23     if(debug == 1)
24         cout<<endl<<endl<<"-----Fetching-----"<<endl;
25     int i=0;
26     while(i<FETCH_WIDTH) {
27         unsigned int temp = m.get_instructions(PC);
28         inst.decode(temp, debug); // this will decode the instruction
29         ROB_ID.push_ROB(temp);
30         if(debug == 1) {
31             cout<<"#<<PC<<" instruction: "<<temp<<endl;
32             cout<<"type: "<<inst.get_type()<<endl;
33         }
34         convert inst to IO push(ROB_ID,inst); // this will convert the decoded inst and push it to the queue
35     }
36 }
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```

Overview:

```
IQueue.cpp x IQueue.h x memory.cpp x TFO_qu.h x pipeline.cpp x memory.h x makefile x instruction.cpp x TFO_qu.cpp x instruction.h x
1 OBJS    = main.o IQueue.o memory.o pipeline.o ReorderBuffer.o Statistics.o TFO_qu.o instruction.o ALU.o
2 SOURCE  = main.cpp IQueue.cpp memory.cpp pipeline.cpp ReorderBuffer.cpp statistics.cpp TFO_qu.cpp instruction.cpp ALU.cpp
3 HEADER  = IQueue.h memory.h pipeline.h ReorderBuffer.h TFO_qu.h instruction.h ALU.h
4 OUT     = tool
5 CC      = g++
6 FLAGS   = -g -c
7 LFLAGS  = -lstdc++
8
9 all: $(OBJS)
10     $(CC) -o $(OUT) $(OBJS)
11
12 main.o: main.cpp
13     $(CC) $(FLAGS) main.cpp ←
14 IQueue.o: IQueue.cpp
15     $(CC) $(FLAGS) IQueue.cpp ←
16 memory.o: memory.cpp
17     $(CC) $(FLAGS) memory.cpp
18 pipeline.o: pipeline.cpp
19     $(CC) $(FLAGS) pipeline.cpp ←
20 ReorderBuffer.o: ReorderBuffer.cpp
21     $(CC) $(FLAGS) ReorderBuffer.cpp
22 statistics.o: statistics.cpp
23     $(CC) $(FLAGS) statistics.cpp ←
24 TFO_qu.o: TFO_qu.cpp
25     $(CC) $(FLAGS) TFO_qu.cpp
26 instruction.o: instruction.cpp
27     $(CC) $(FLAGS) instruction.cpp
28 ALU.o: ALU.cpp
29     $(CC) $(FLAGS) ALU.cpp ←
30
31 clean:
32     rm -f $(OBJS) $(OUT)
```



CONNECTIVITY

Memory

Register_file:	
data	Valid
0	1
0	1

```
1 #ifndef MEMORY_H
2 #define MEMORY_H
3
4 #include<iostream>
5 #include<fstream>
6 #include<string>
7 #include<vector>
8 using namespace std;
9
10 struct Register_file {
11     int data;
12     bool valid;           // 1 means valid for reading
13     // 0 means invalid for reading and awaiting instruction's result
14 };
15
16 class memory {
17     vector<unsigned int> instruction_memory;    // list of instructions read from csv
18     Register_file rf[16];                     // our register aka RAM
19 public:
20     memory();
21     memory(const int size, const string str);
22     ~memory();
23     unsigned int get_instructions(const int);
24     bool read_csv(const string );
25     int reg_at_read(const int );              // reference because reg needs to be written by elo.
26     bool reg_at_write(const int, const int);  // writing at Register_file 1st int is position and the other int is number to be written
27     bool reg_is_valid(const int);
28     bool is_inst_left(const int);             // to check if there are more instructions to fetch.
29     void free_it();                           // to free the memory
30 };
31
32 #endif
33
34
```

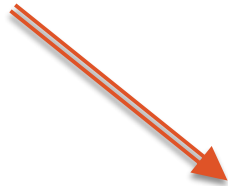
Instructions

```
IQueue.h x TFO_qu.h x pipeline.cpp x ALU.h x ALU.cpp x IQueue.cpp x TFO_qu.cpp x memory.h x makefile x instruction.h x ma
1 #ifndef INSTRUCTION_H
2 #define INSTRUCTION_H
3
4 // #include "memory.h"
5 #include <bitset>
6 #include <string>
7 #include <iostream>
8 using namespace std;
9
10 class instruction {
11     int inst_type;
12     int src1;
13     int src2;
14     int dest;
15     int op_code;
16     int imm_value;
17
18 public:
19     instruction();
20     instruction(unsigned int n);
21     instruction(const instruction& i);
22     bool decode(unsigned int inst, int debug); // to decode this thhing to all the private members we have
23     int get_src1() const;
24     int get_src2() const;
25     int get_opcode() const;
26     int get_type() ;
27     int get_dest() const;
28     int get_immediate() const;
29 };
30
31 #endif
32
33
```

No setters

TFO_qu

- Instruction



IQueue

queue<TFO_qu>

```
Activities Sublime Text ~./Desktop
File Edit Selection Find View Goto Tools Project Preferences He
IQueue.h x TFO_qu.h x pipeline.cpp x ALU.h x ALU.cpp x
1 #ifndef TFO_QU_H
2 #define TFO_QU_H
3
4 class TFO_qu {
5     int type, src1, src2, op_code, dest, imm;
6     bool valid1, valid2;
7     int ROB_ID;
8 public:
9     //getters:
10    int get_type() const;
11    int get_dest() const;
12    int get_imm() const;
13    int get_opcode() const;
14    int get_src1() const;
15    int get_src2() const;
16    int get_v1() const;
17    int get_v2() const;
18    int get_id() const;
19
20    //setters:
21
22    void set_type(const int) ;
23    void set_dest(const int) ;
24    void set_imm(const int) ;
25    void set_op_code(const int) ;
26    void set_src1(const int) ;
27    void set_src2(const int) ;
28    void set_v1(const int) ;
29    void set_v2(const int) ;
30    void set_id(const int) ;
31
32
33
34
35
36
37
38    TFO_qu(); //constructor
39    TFO_qu(const TFO_qu &q1); // copy constructor
40    ~TFO_qu(); // destructor
41 };
42 #endif
Line 25, Column 17
```

Activities Sublime Text Aug 8 07:04:30

~/Desktop/final_1571/IQueue.h - Sublime Text (UNREGISTERED)

File Edit Selection Find View Goto Tools Project Preferences Help

IQueue.h x TFO_qu.h x pipeline.cpp x ALU.h x ALU.cpp x IQueue.cpp x TFO_qu.cpp x memory.h x makefile

```
1 #ifndef IQUEUE_H
2 #define IQUEUE_H
3
4 #include "TFO_qu.h"
5 #include <iostream>
6 #include <iomanip>
7 #include <queue>
8 using namespace std;
9 class IQueue: public TFO_qu {
10     std::queue<TFO_qu> IQ;
11 public:
12     IQueue();
13     ~IQueue();
14     bool TFO_pop(); // to pop an instruction from queue.
15     bool TFO_push(const TFO_qu &q1); //to push
16     bool TFO_update(bool v1, bool v2); // to update/broadcast the valid bits in next instru
17     void print(); // for debug to be honest.
18
19     bool empty();
20
21     TFO_qu get_front(); // to return head of the queue
22     int get_id() const; // to return id,
23 };
24
25 #endif
```

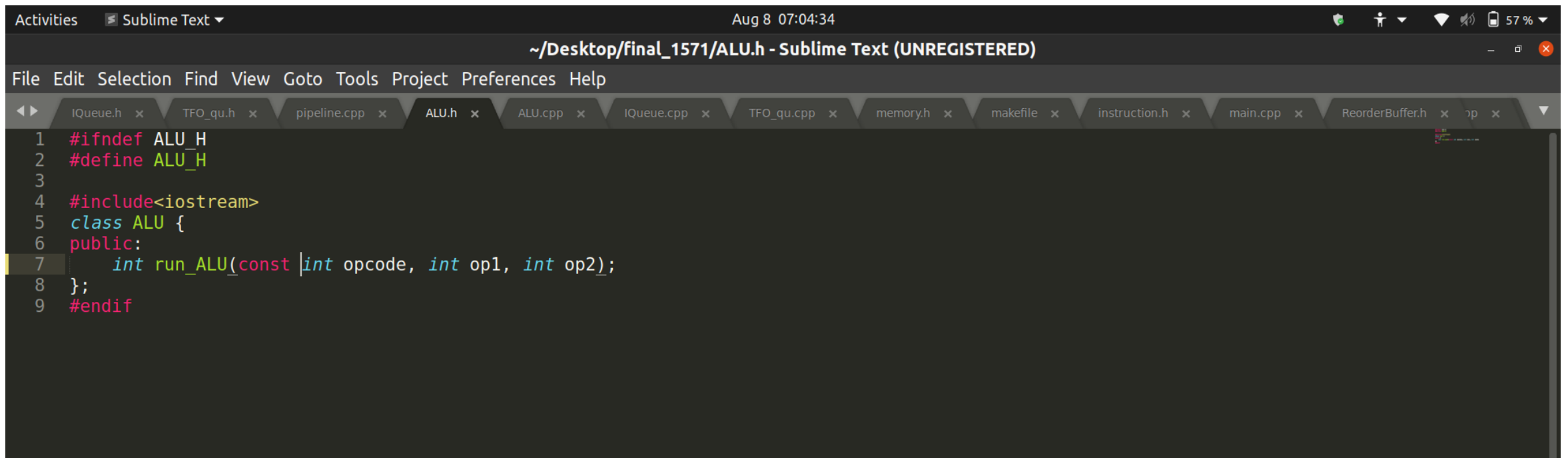
Line 6, Column 17

IQUEUE

pipeline

```
1  #ifndef PIPELINE_H
2  #define PIPELINE_H
3
4  #include "instruction.h"
5  #include "IQueue.h"
6  #include "memory.h"
7  #include "ReorderBuffer.h"
8  #include "Statistics.h"
9  #include "TFO_qu.h"
10 #include "ALU.h"
11 #include <iostream>
12 #include <string>
13
14 using namespace std;
15
16 class pipeline {
17     instruction inst;           // just one instruction
18     IQueue IQ;                  // this is a queue of instructions      -- this is a list
19     memory m;                   // our memory unit                      -- we will load file here
20     ALU alu;                    // our ALU unit
21     ReorderBuffer ROB_ID;       // Our list of Reorder Buffer sets      -- this is also a list
22     Statistics stats;           // our stats class -- have to make some graphs
23     int PC;
24
25     bool debug;                 // for debug mode
26     bool finished;              // like finished signal in hardware or other machines.
27 public:
28     pipeline();
29     //pipeline(int );           //-- if needed later
30     ~pipeline();
31
32     void fetch();                // to fetch the instructions
33
34     void execute();
35     void execute_R();            // helper functions for execute()
36     void execute_I();           // ""
37     void execute_J();           // ""
38     void execute_P();           // "" -- 'i' is the index of IQ that we gonna execute.
39
40     void commit();              // to commit to the demon
41
42     bool load_memory(string str); // to load file
43     void update_stats();         // to update statistics
44     bool is_finished();          // to check finished signal or to terminate the run.
45
46     bool convert_inst_to_IQ_push(int ROB_ID); // convert from instruction to IQueue type
47     bool update_IQ();            // to update validity in Queue.
48
49     void free_for_next();        // to free mem. iq and ...
50
51     void set_debug_mode();       // to set to debug mode, default is normal mode.
52 };
53
54 #endif
```

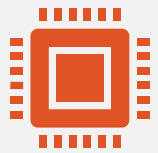

ALU



The screenshot shows a Sublime Text editor window with the title bar indicating the file path is `~/Desktop/final_1571/ALU.h - Sublime Text (UNREGISTERED)`. The editor displays the content of `ALU.h` with the following code:

```
1 #ifndef ALU_H
2 #define ALU_H
3
4 #include<iostream>
5 class ALU {
6 public:
7     int run_ALU(const int opcode, int op1, int op2);
8 };
9 #endif
```

The editor's interface includes a menu bar (File, Edit, Selection, Find, View, Goto, Tools, Project, Preferences, Help), a tab bar with multiple open files, and a status bar at the bottom showing system icons and a 57% zoom level.



Most of the classes were tested individually before integrating in the project



Designed with thorough understanding.

Thorough testing

Thank - You