

ISTANBUL TECHNICAL UNIVERSITY
COMPUTER ENGINEERING DEPARTMENT

BLG 222E
Computer Organization
Project 1

PROJECT DATE : 24.05.2023

GROUP MEMBERS:

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Contents

1 INTRODUCTION

In this project our purpose was to design a hardwired control unit. To achieve this we firstly implemented small components of this system. Yusuf did the fetch and decode parts, Hakan did the instructions without memory reference and Emre did the instructions with memory reference. Yusuf also wrote the test bench and tested the system with Hakan.

At first, Yusuf has designed the fetch cycle. Then Hakan and Emre designed the execute part. Hakan and Yusuf then tested the project and corrected the errors.

2 IMPLEMENTATIONS AND EXPLANATIONS

2.1 Fetch Cycle

2.2 Instructions With Address Reference

2.3 Instructions Without Address Reference

2.4 Memory Implementation

3 DESIGN PHOTOS

3.1 Part 1

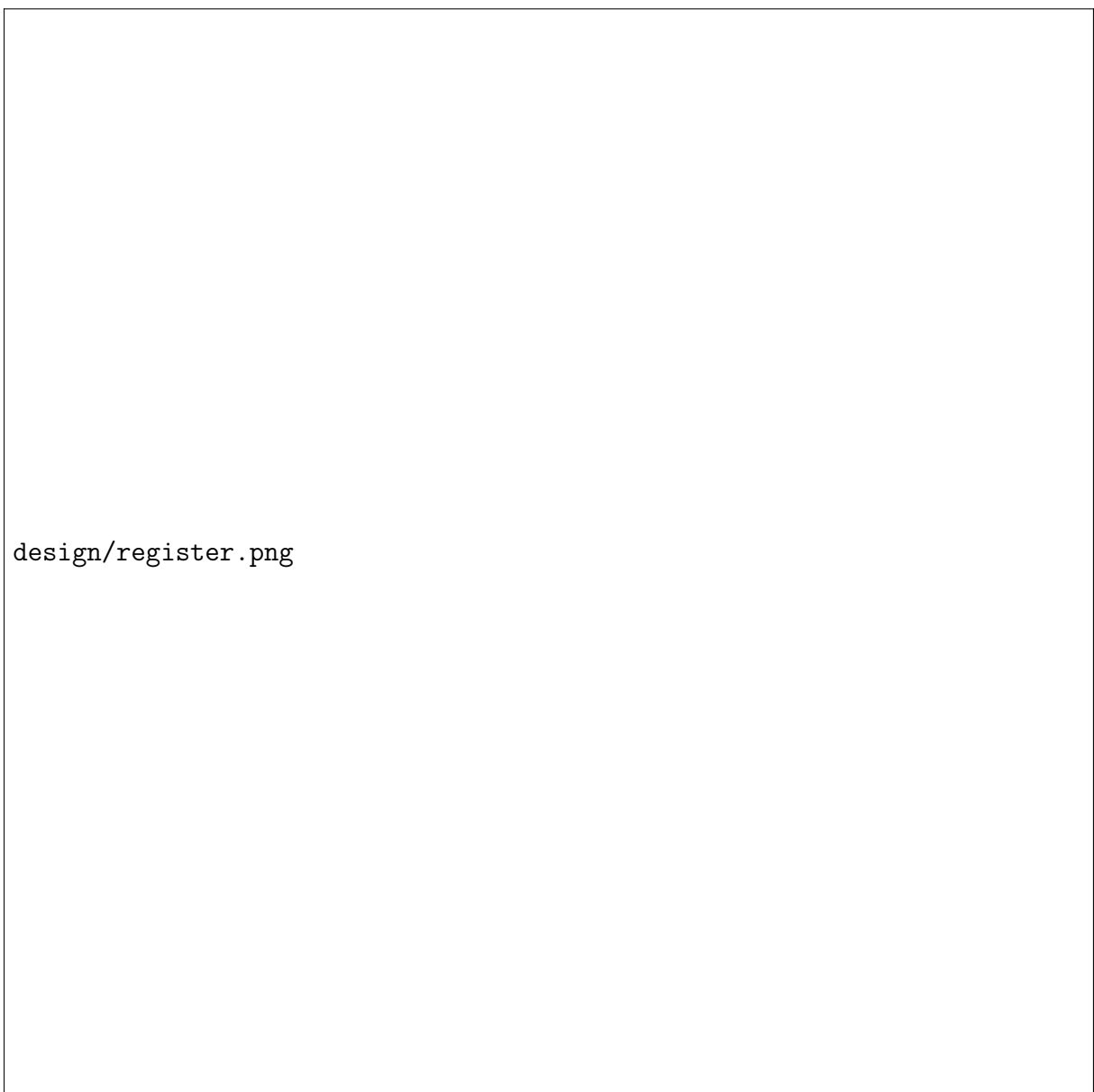
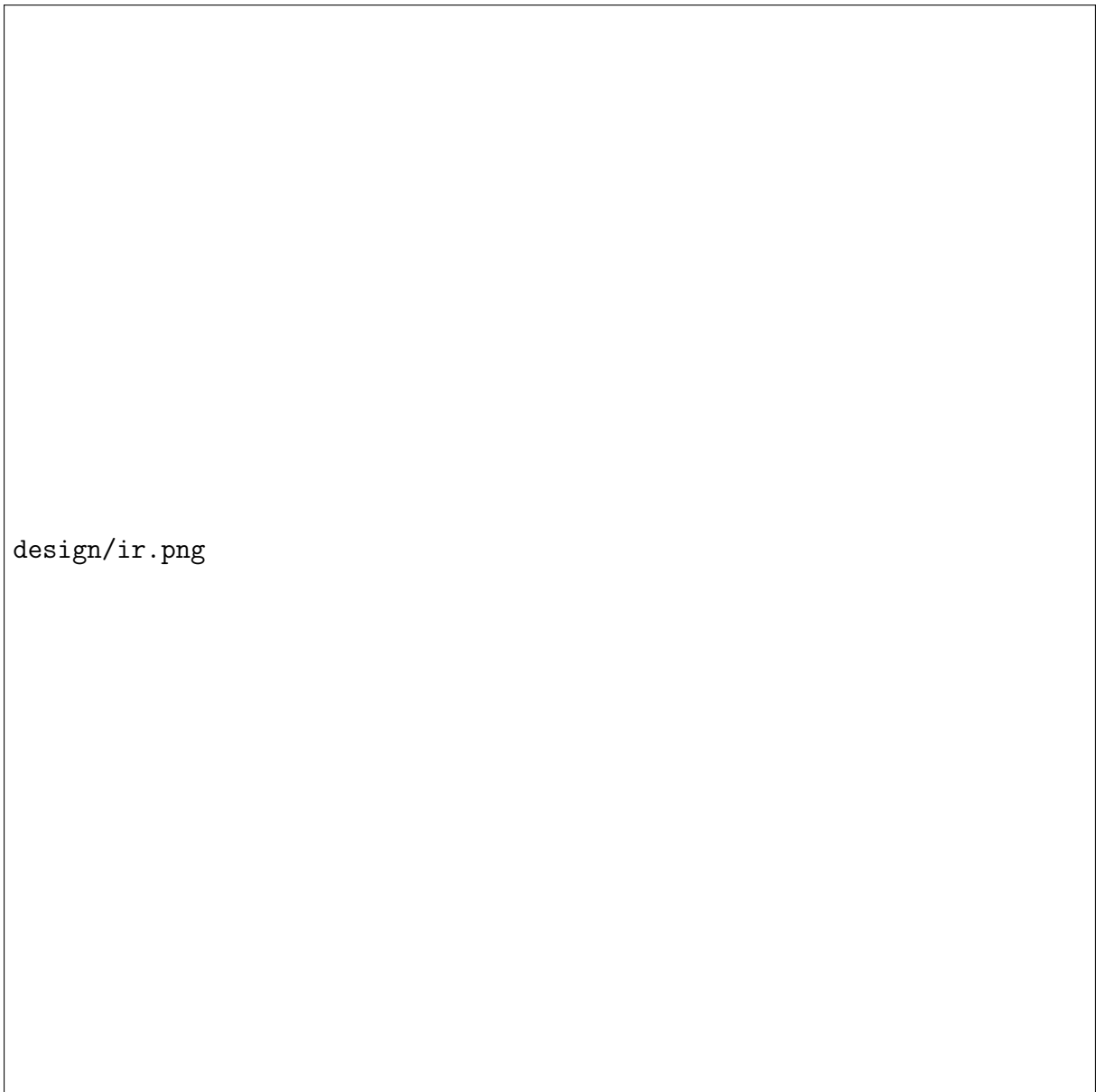


Figure 1: Register Design

3.2 Part 2

3.2.1 Part 2.a



design/ir.png

Figure 2: IR Design

3.2.2 Part 2.b

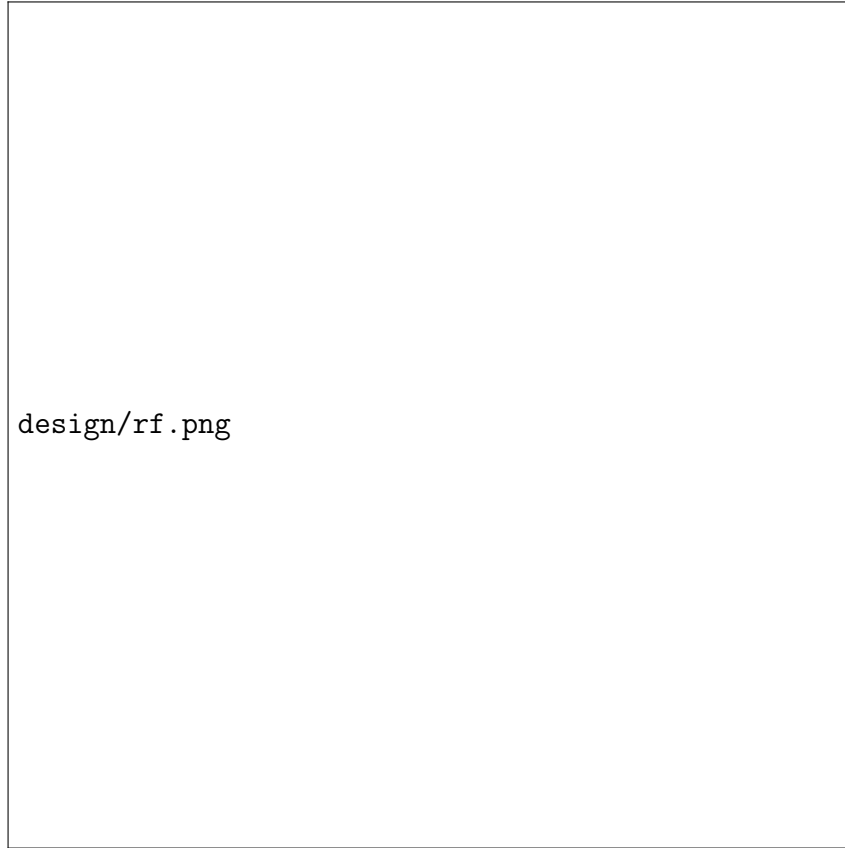


Figure 3: RF Design

3.2.3 Part 2.c

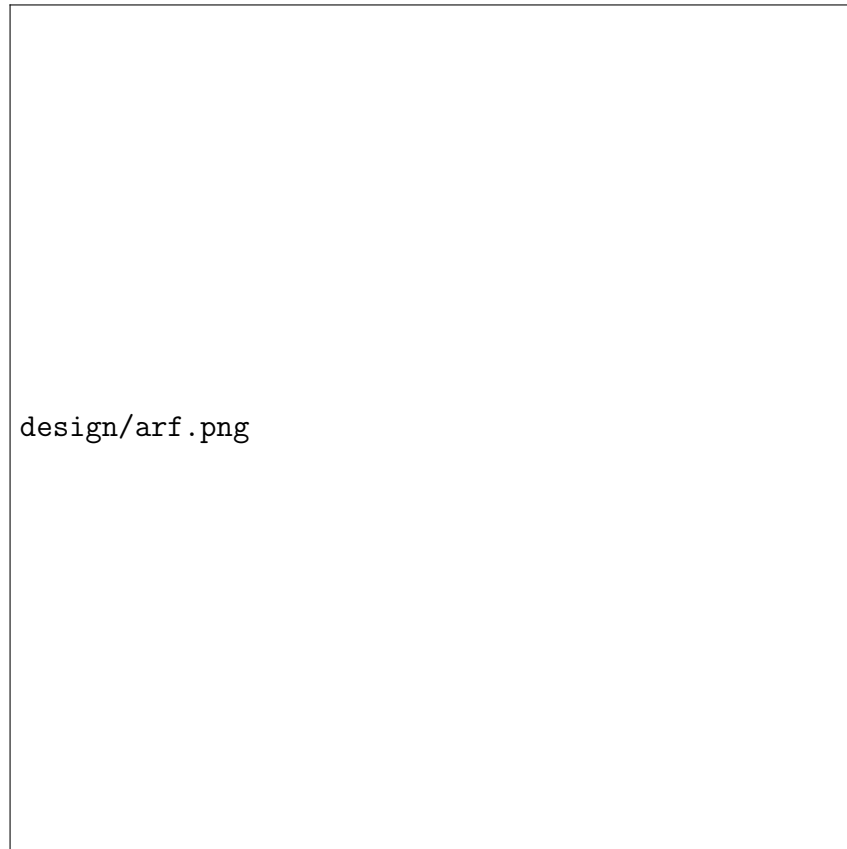


Figure 4: ARF Design

3.3 Part 3

design/alu.png

Figure 5: ALU Design

3.4 Part 4

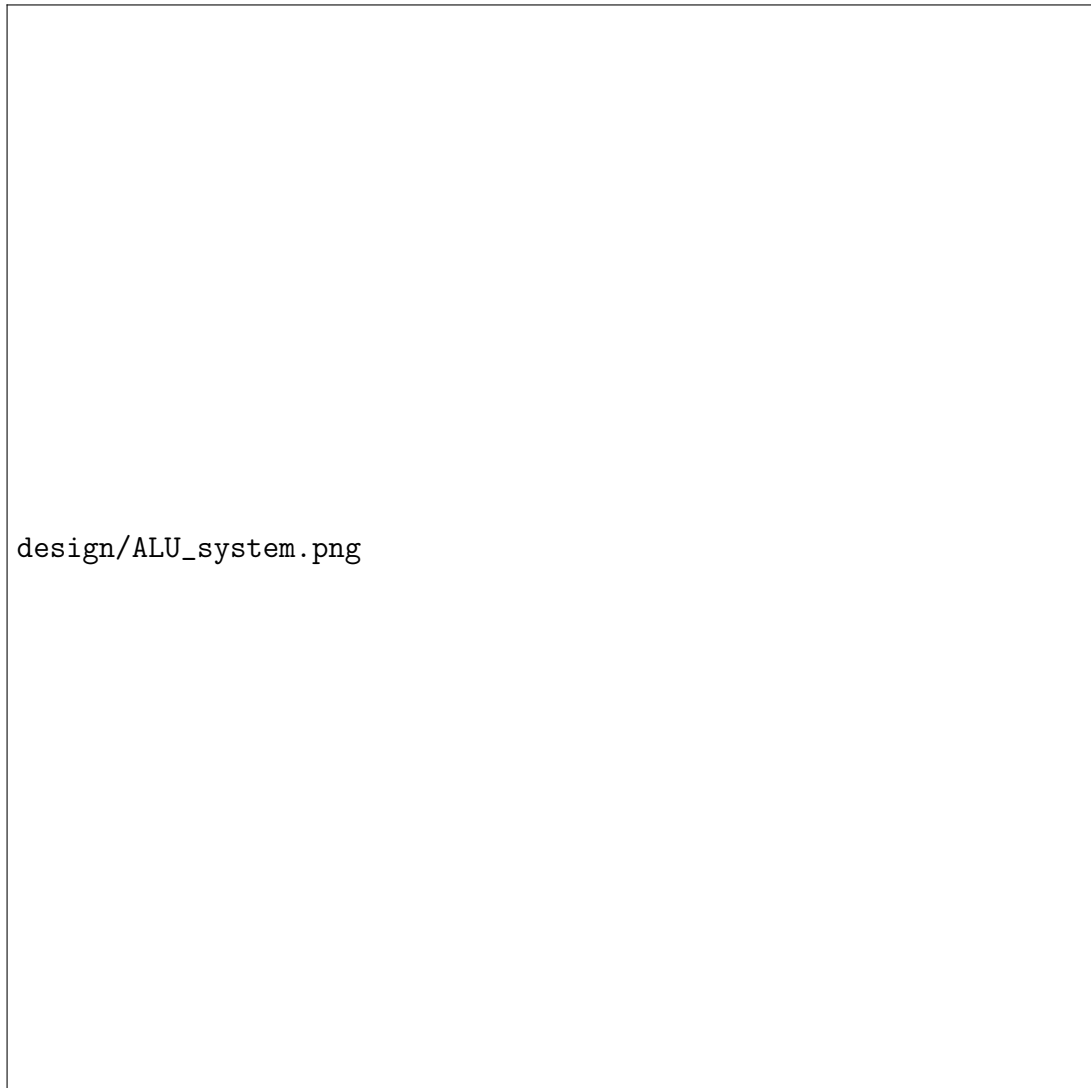


Figure 6: ALU System Design

4 RESULTS

4.1 Part 1

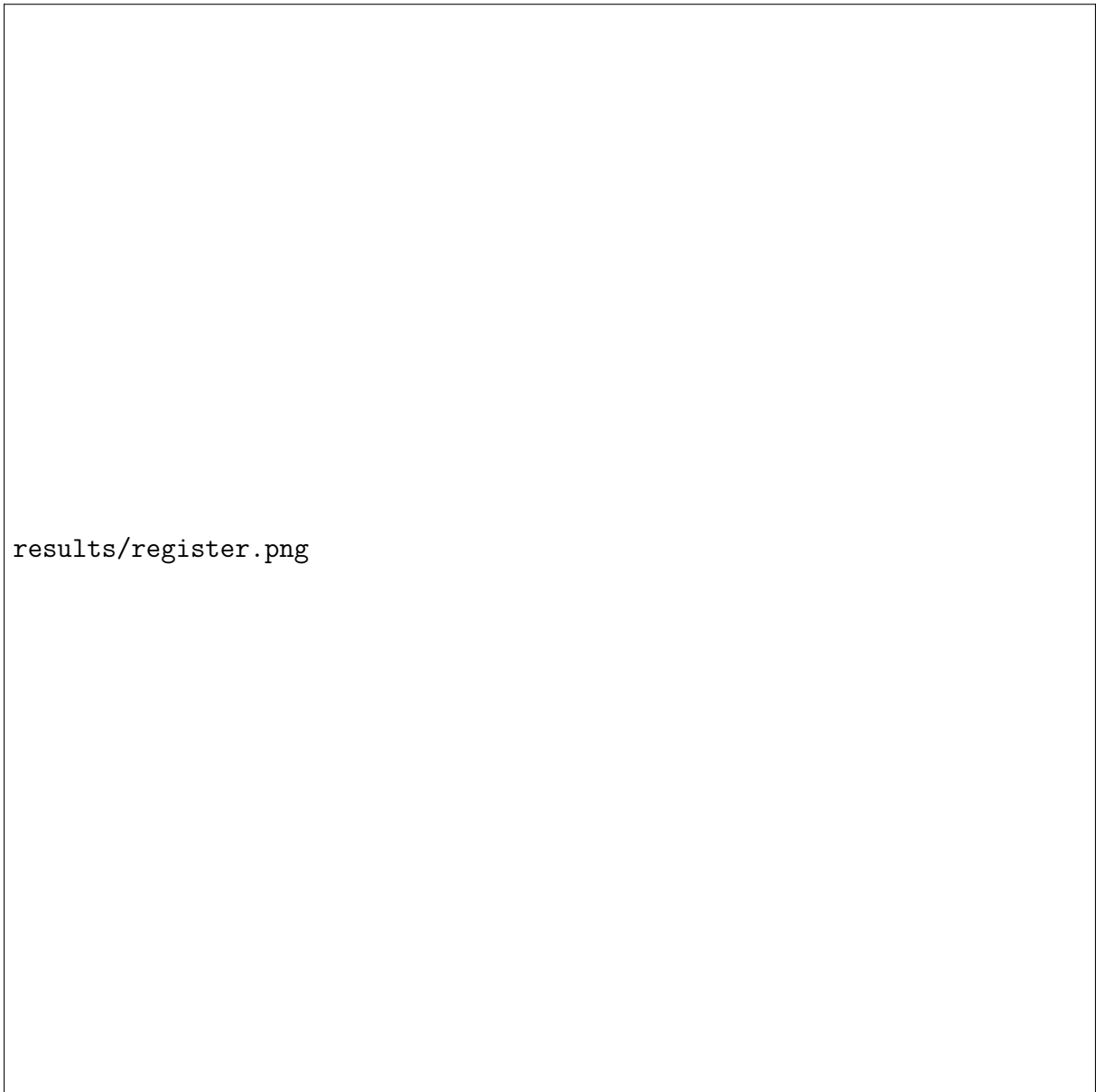


Figure 7: Register Simulation

4.2 Part 2

4.2.1 Part 2.a

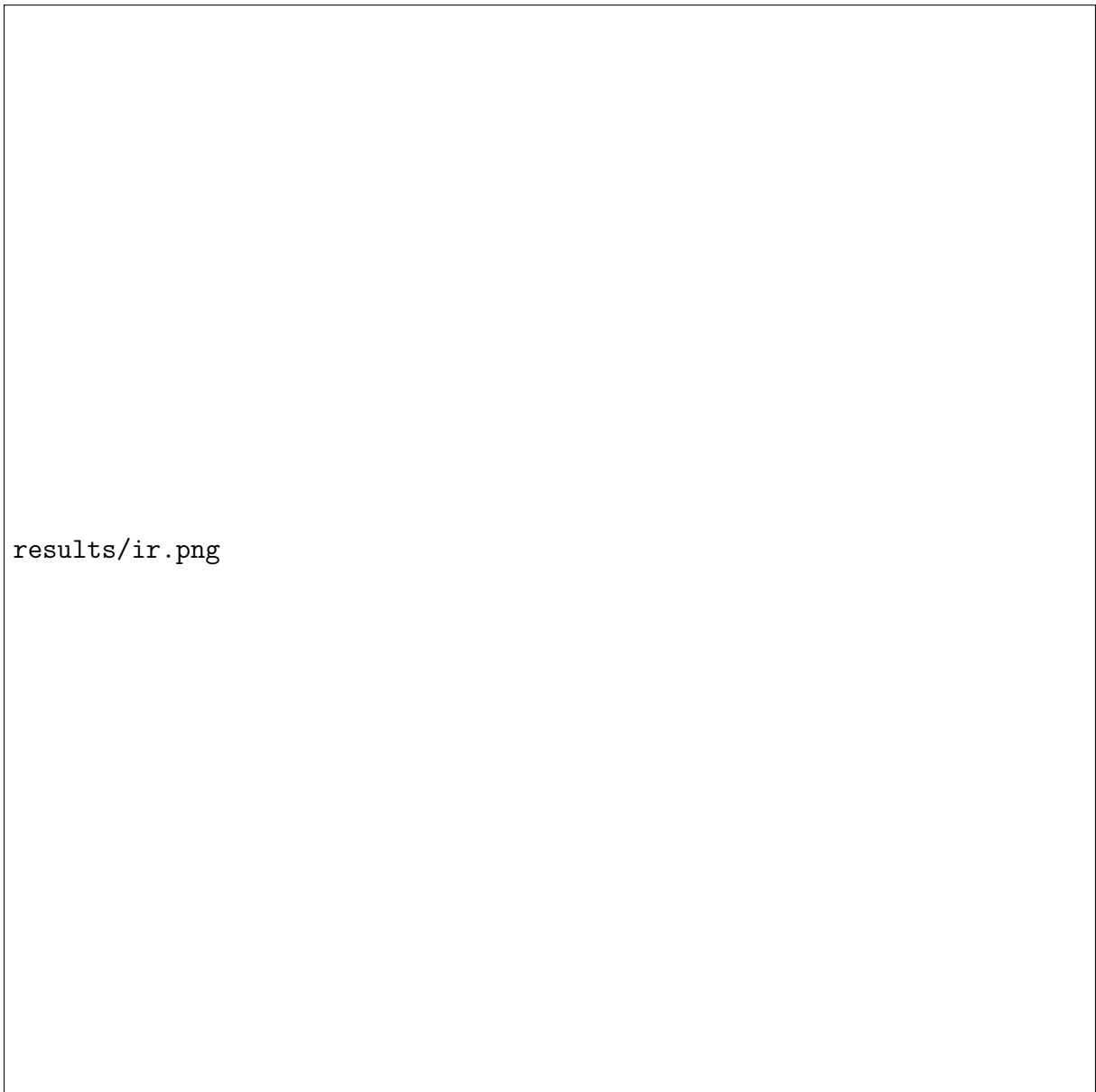


Figure 8: IR Simulation

4.2.2 Part 2.b

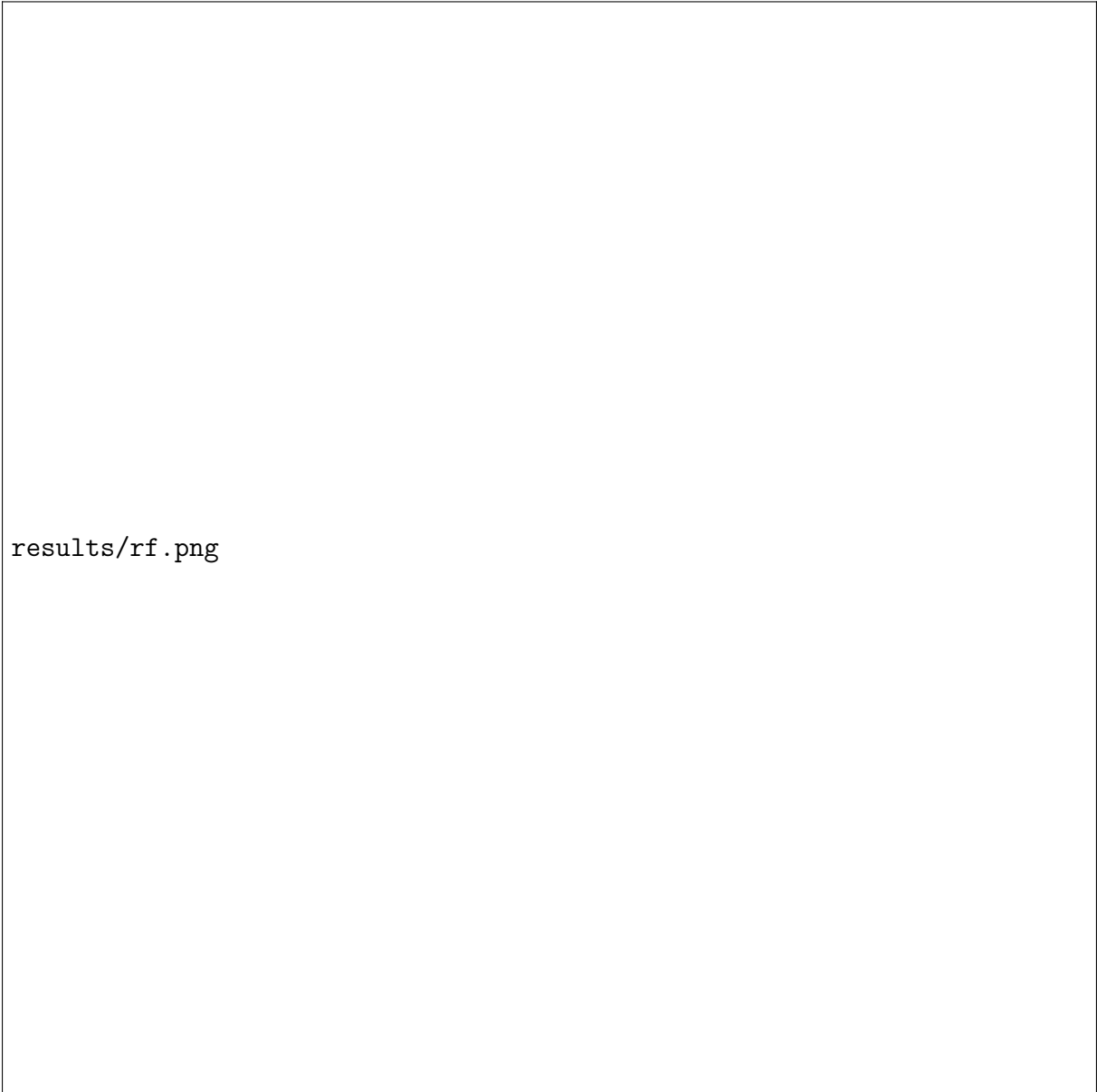


Figure 9: RF Simulation

4.2.3 Part 2.c

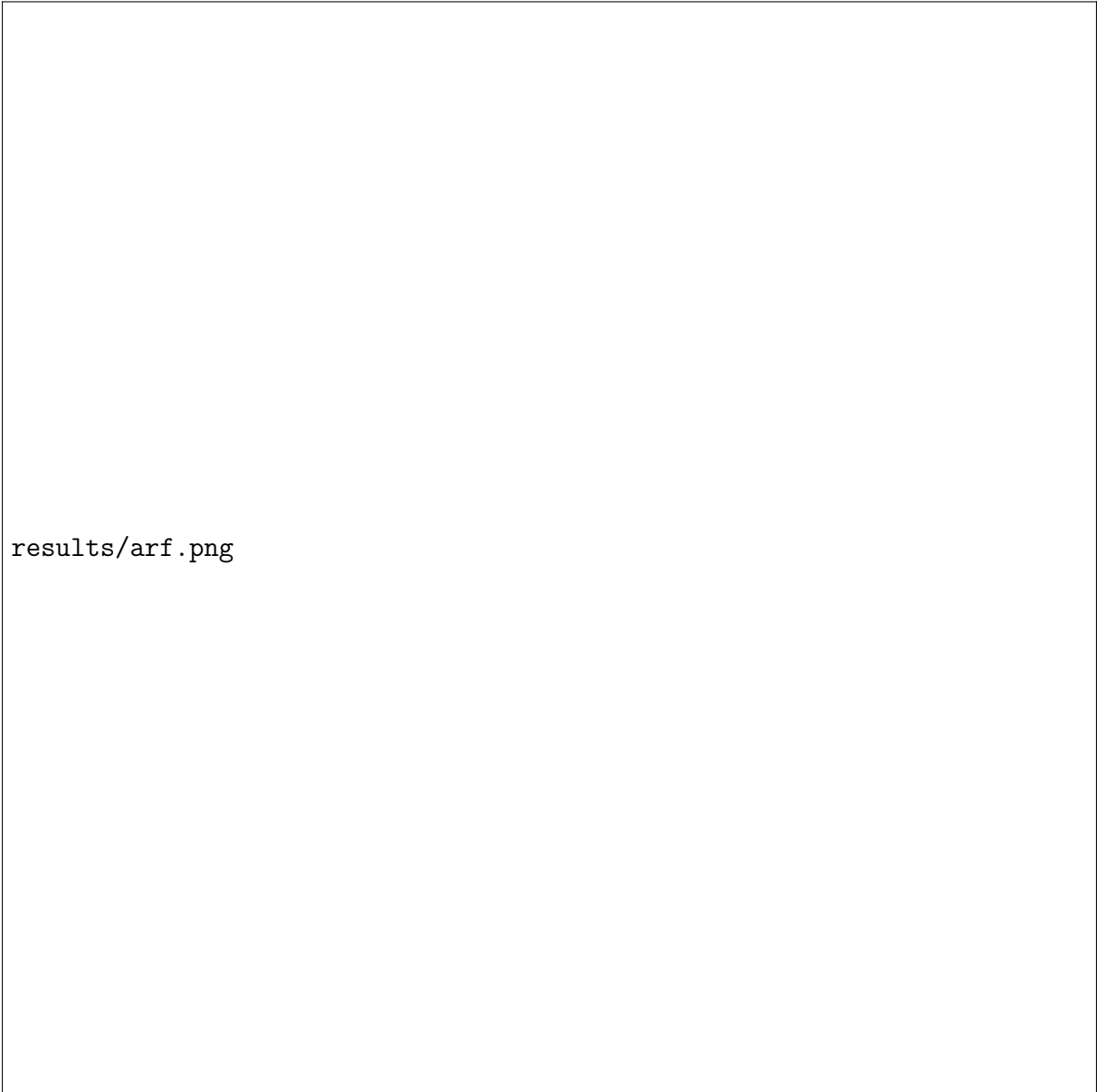
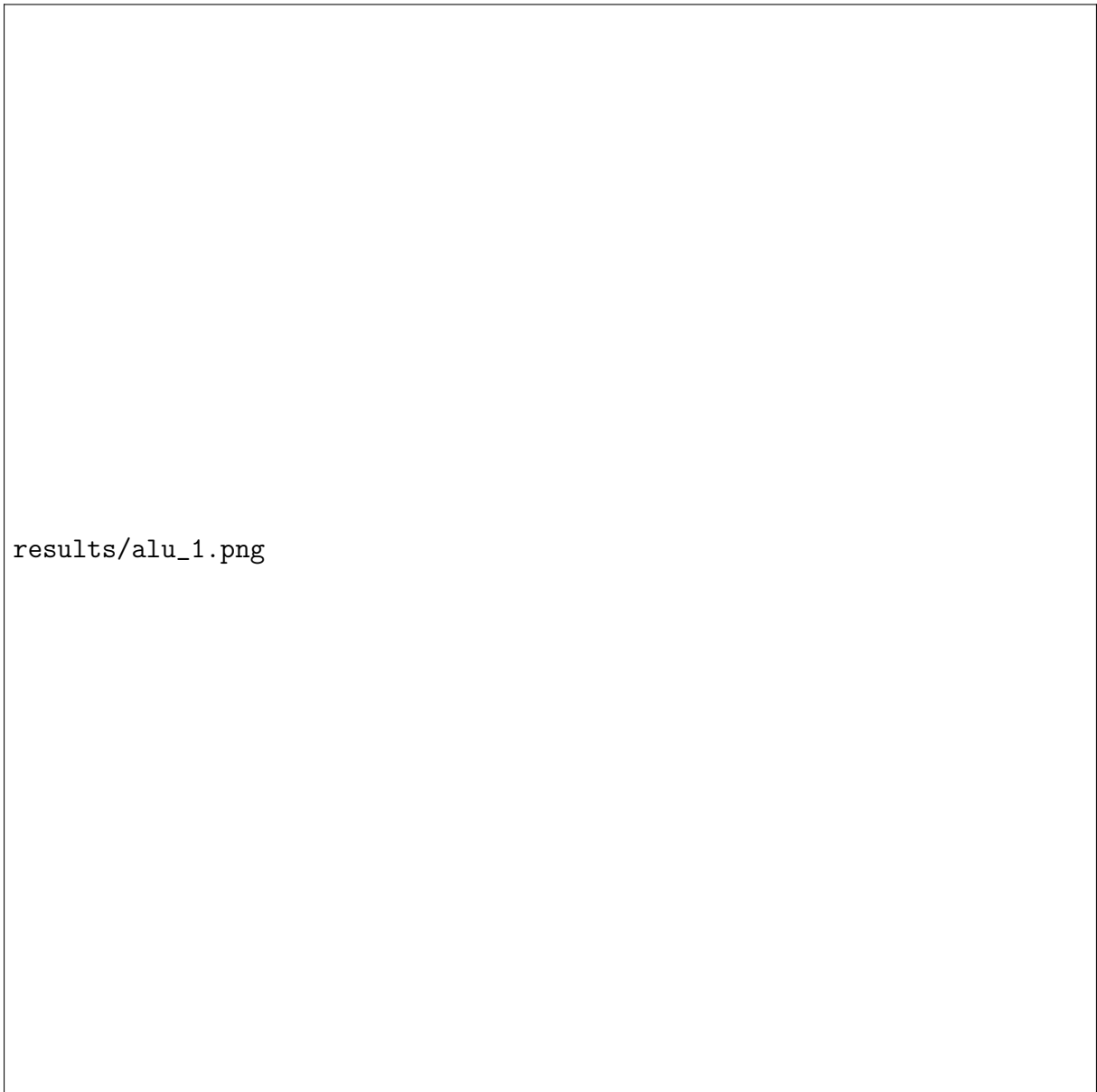


Figure 10: ARF Simulation

4.3 Part 3



results/alu_1.png

Figure 11: ALu Simulation, First Image

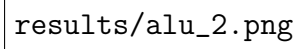
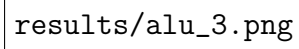
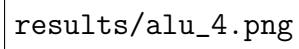
The image is a placeholder for a simulation result, showing the text 'results/alu_2.png' in a monospaced font.

Figure 12: ALu Simulation, Second Image

The image is a large, empty rectangular frame. In the lower-left corner, the text 'results/alu_3.png' is written in a monospaced font. This text likely refers to a file path for a simulation result image that is not visible within the frame itself.

results/alu_3.png

Figure 13: ALu Simulation, Third Image

The image is a placeholder for a simulation result, showing the text 'results/alu_4.png' in a monospaced font. It is located within a large rectangular frame that occupies the upper half of the page.

results/alu_4.png

Figure 14: ALu Simulation, Fourth Image

4.4 Part 4

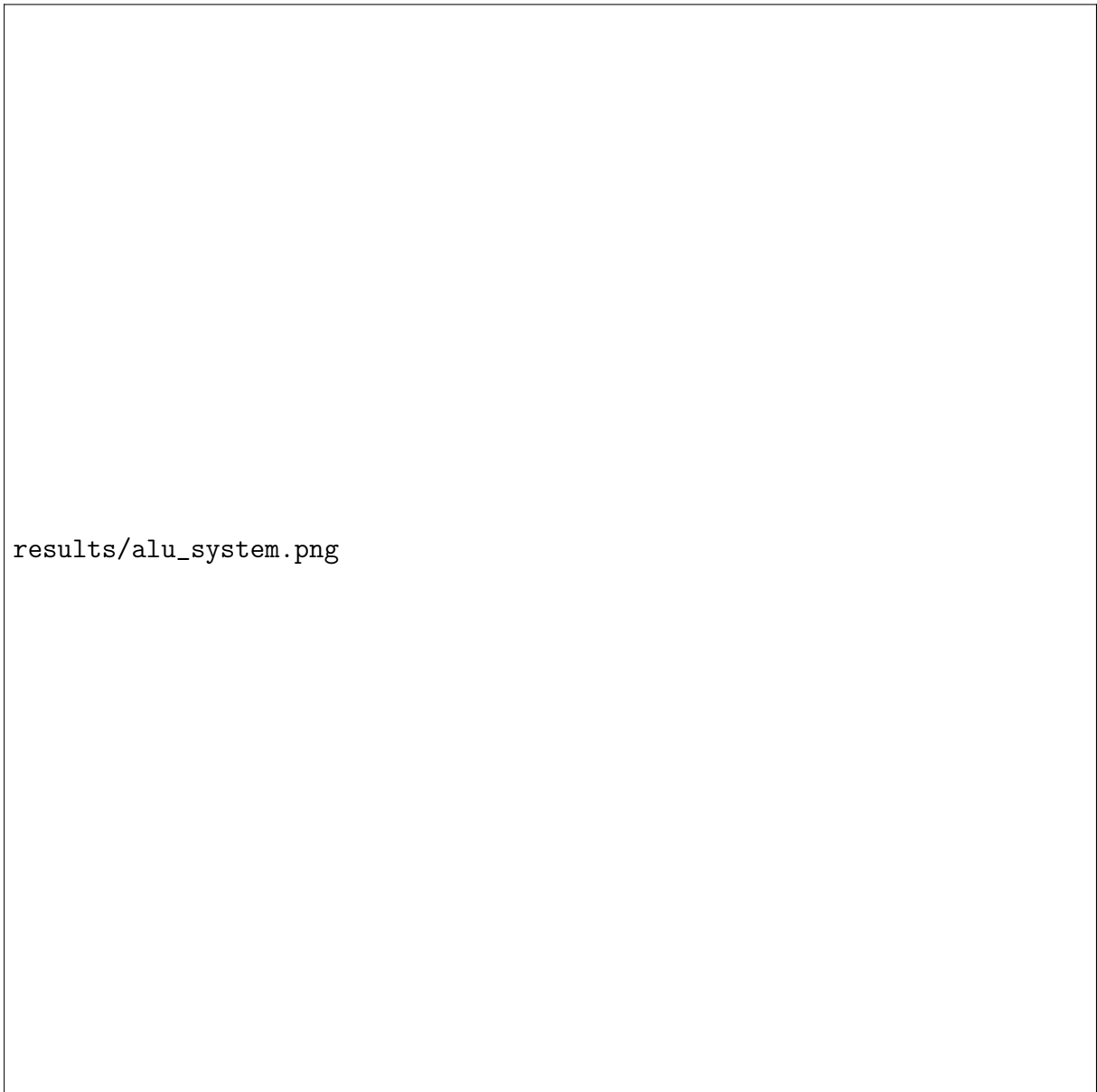


Figure 15: ALU System Simulation

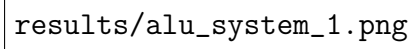
The image shows a screenshot of a TCL console window. The text 'results/alu_system_1.png' is displayed in a monospaced font on a light gray background. The text is positioned on the left side of the window, with a significant amount of empty space to its right.

Figure 16: TCL Console for First Inputs

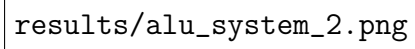
The image shows a screenshot of a TCL console window. The text 'results/alu_system_2.png' is displayed in a monospaced font on a light gray background. The text is positioned on the left side of the window, with a significant amount of empty space to its right.

Figure 17: TCL Console for Second Inputs

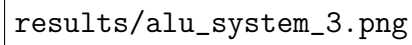
The image shows a screenshot of a terminal or console window. The text 'results/alu_system_3.png' is displayed in a monospaced font, likely representing a command or a file path being entered or shown in the console.

Figure 18: TCL Console for Third Inputs

5 DISCUSSION

5.1 Memory

6 CONCLUSION

In this project we designed a hardwired control unit with the help of the ones we created in the first project.