FBU CPU DESIGN

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I-INTRODUCTION:

A basic processor design with memory, a CPU, and a top-level module for a system with switches, buttons, LEDs, and seven-segment displays are described in Verilog code. This code is intended to implement a simple processor that can carry out a set of instructions kept in memory.

2-SYSTEM ARCHITECTURE:

In this project, we used the Avionchip simulator.

3-SOFTWARE USED:

We used Vivado Design Suite to visualize and run our code. Vivado Design Suite is software tool for designing and programming FPGAs, offering a comprehensive environment for tasks like synthesis, simulation, implementation, and debugging of digital circuits.

4-RESULTS:

Processor Operations: Thıs project describe a simple processor with basic operations such as load, store, add, subtract, multiply, divide, jump, etc. However, the exact set of supported operations depends on the instructions encoded in the

10-bit memory words. Our CPU has 4 main units:

- Registers

- Memory (RAM)

- Processing Unit (ALU)

-Control Unit

This processor will have a design that works in 5 different states, depending on the value of the register named state.The implementation of the FB-CPU project has provided valuable insights and knowledge in the field of digital design and processor architecture. Here are the key aspects and gains obtained throughout the project:

Register:

A clear understanding of register management in processor design. Implemented and comprehended the functions of essential registers - state, PC, IR, and ACC. These registers play crucial roles in the execution and control of instructions.

Memory:

Practical knowledge of memory components and their role in a processor. Integrated the Memory Address Register (MAR), Memory Data Registers (MDRIn and MDROut), and RAMWr signals to facilitate effective communication with the memory unit. Understood the significance of RAM in storing instructions and data.

Arithmetic Logic Unit (ALU):

Applied ALU principles to perform arithmetic operations within the processor. Implemented three fundamental arithmetic operations - addition, subtraction, and multiplication - within the ALU. Gained insights into the importance of the ALU in executing diverse instructions.

Control Unit Implementation:

Learned the critical role of the control unit in managing data flow within the processor. Recognized the necessity of a control unit to facilitate seamless communication between the Arithmetic Processing Unit and RAM. Focused on completing the design for states 2 and 3 to ensure the processor's operational functionality.

In conclusion, this project has provided a comprehensive foundation in digital design principles, processor architecture, and practical implementation of a functional processor. The gained knowledge and skills will serve as a solid platform for future endeavors in the realm of computer architecture and digital system design.

5-PROJECT TEAM:

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6-REFERENCES:

<https://github.com/TalhaSemihGunduz/FB_CPU>

<https://youtu.be/c3VqKWFyUhw?feature=shared>

7-REFERENCES FİLE:

http://www.levent.tc/