Summary for chapter 8.

8-1. The architecture for a simple computer is typically divided into a datapath and a control. The datapath is defined by three basic components: 1. a set of registers 2. the microoperation performed on data stored in the register 3. the control interface.

8-2. Computer system often employ a number of storage registers in conjunction with a shared operation called an arithmetic/logic unit. (ALU)
ALU perform operations and the result of this operation is transfered to a destination register.
The datapath and control units are two separate parts of the processor. The datapath contains the digital logic that implements the various microoperations. This digital logic consists of buses, multiplexers, decoders, and processing circuits.

8-3 The logic microoperations and basic arithmetic is performed by the combinational circuit inside the ALU.
We perform the design of ALU in three stages. First, we design the arithmetic section, second, we design the logic section, At the final step, we combine the two to form the ALU.

8-4 The shifter.
The basic shifter performs two types of transformation on data: the right shift and left shift. We can use multiplexers to construct a combinational shifter.

8-5 A typical datapath has more than four registers, the computer we use in daily life are often have 32 or 64 registers.
Different techniques are required to construct a bus system with a large number of registors.

8-6 In 8-5, we use variables to control data, in this section, we control those variables to select the microoperation for the data path.

8-7 The simple computer architecture helped us to understand that in a programmable system, a portion of the input to the processor consists of a sequence of instructions.
The operating system rely on those basic instructions to perform, and instructions are usually stored in memory.
The programmable system also has an important register call program Counter (PC)
To Execute instructions, the control unit first obtain instructions from memory, then activate the necessary steps of microoperations in the data path

8-9
The book introduced the computer that fectches and execute an instruction in a single clock cycle, it is called the single-cycle Computer.
A combinational circuits called instruction decoder provides all the control words for the data path base on the instructions.

Six instructions for the single-cycle computer are introduced on page 464.

8-9. In contrast of the single-cycle hardware control, the multiple-cycle control using multiple clock cycles in each instruction.

The data generated in current cycle usually stored in the register for a later cycle and the execution of instructions like this are usually not visible by user. Thus, when operater, the instruction always need to hold a register for its own usage.

In the sequence control circuit, the state control register has a set of states like a set of flip-flops in other sequence circuits.