15 Hardware and Virtual Machines 硬件与虚拟机

15.1 Processors, Parallel Processing and Virtual Machines 处理器，并行处理与虚拟机

Complex Instruction Set Computer (CISC) 复杂指令集架构

a type of instruction set architecture. It contains more instructions that are more complex and in more varying formats. Arithmetic instructions can use data in the memory as operands. Example: x86, x86-64.

Reduced Instruction Set Computer (RISC) 精简指令集架构

a type of instruction set architecture. It contains fewer, simpler instructions in a few formats. Only load and store instructions can access the memory. Example: ARM, RISC-V.

pipelining 流水线

instruction-level parallelism that allows several instructions to be processed simultaneously, increasing the number of instructions completed per unit of time.

parallel processing 并行处理

operation which allows a process to be split up and for each part to be executed by a different processor at the same time.

Single Instruction, Single Data (SISD) 单指令流单数据流

a basic computer architecture, which uses a single processor that can handle a single instruction, and which also uses one data source at a time.

Single Instruction, Multiple Data (SIMD) 单指令流多数据流

a basic computer architecture, in which a control unit (CU) controls an array of many ALUs to execute the same instruction using different data inputs. Many GPUs are SIMD.

Multiple Instruction, Single Data (MISD) 多指令流单数据流

a basic computer architecture, in which many processors execute different instructions using the same data set.

Multiple Instruction, Multiple Data (MIMD) 多指令流多数据流

a basic computer architecture, in which many processors execute different instructions using different data sets.

massively parallel computers 大规模并行计算机

a large number of computer processors or separate computers, linked together via network infrastructure and communicate using a message interface, to simultaneously perform a set of coordinated computations.

virtual machine 虚拟机

the **emulation** of a computer system on a host computer system. A virtual machine implementation software (hypervisor) emulates the virtual hard-

ware, and a guest operating system(s) runs on the virtual machine manages it.

15.2 Boolean Algebra and Logic Circuits 布尔代数与逻辑电路

Combinational circuit 组合逻辑电路

a logical circuit in which the output is dependent only on the input values. Examples: almost all the logical circuits encounterd in A level Computer Science, including half adder and full adder.

Sequential circuit 时序逻辑电路

a logical circuit in which the output depends not only on the input values, but also on the previous output via feedback. Examples: flip-flop.

Half adder circuit 半加器

a logical circuit that carries out binary addition on two bits, giving sum and carry.

Full adder circuit 全加器

two half adders combined to allow the sum of several binary bits.

flip-flop 触发器

a logical circuit with two stable states that is used to stores a single bit.