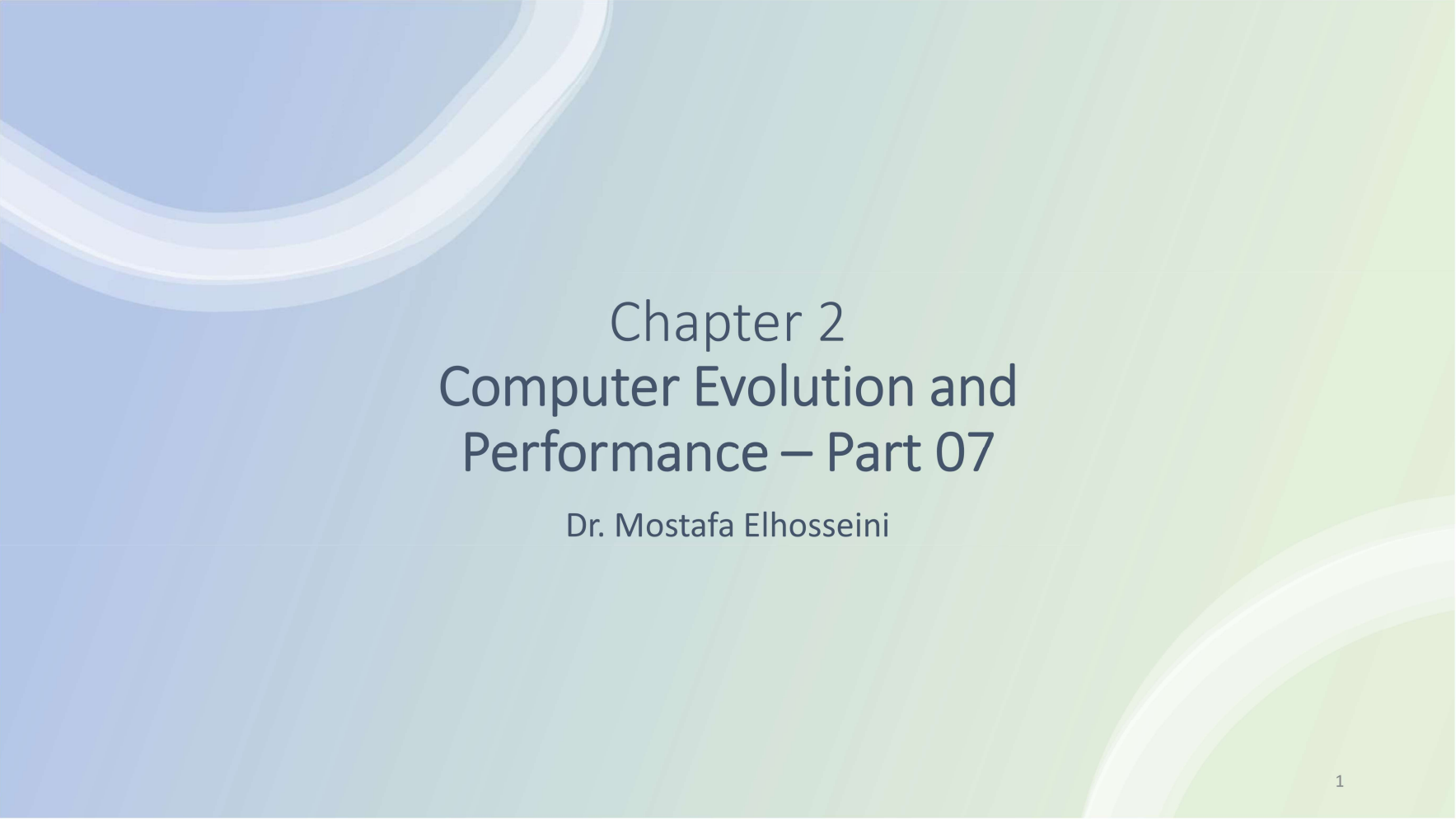




Chapter 2 Computer Evolution and Performance – Part 07

Dr. Mostafa Elhosseini

CISC / RISC – Embedded Systems

Dr. Mostafa Elhosseini

| Agenda

- 🌀 Intro
- 🌀 CISC
- 🌀 RISC
- 🌀 Embedded Systems

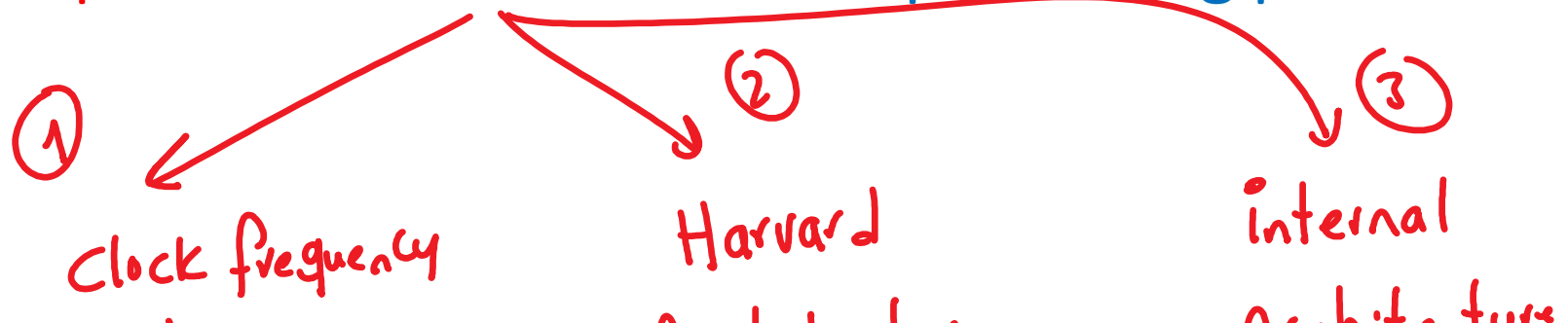
Complex Instruction Set Computer

Reduced

as a result

↓
add

| How to increase the CPU processing power



Clock frequency



Power



heat ↑

Harvard
Architecture

Von Neumann
Architecture

Instruction
Architecture



CISC



RISC

4

| Complex Instruction Set Computer CISC

function

- Since the 1960s, in all mainframe and microcomputers,

- Since the 1960s, in all mainframe and microcomputers, designers put as many instructions as they could think of into the CPU
- Naturally, Microprocessor designers followed the lead of minicomputers and mainframe designers
- Because these microprocessors used such a large number of instructions, many of which performed highly complex activities

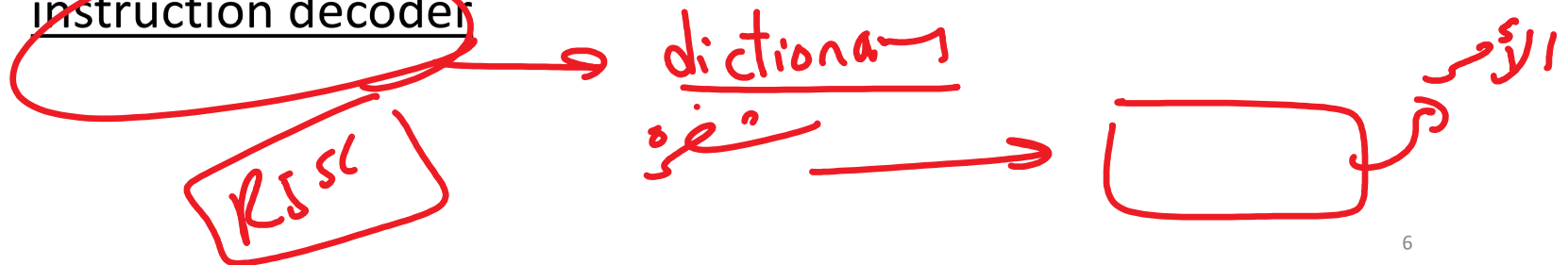
large
Complex
Instruction set

5

✓ ↙ ↘ ↙
Complex Instruction Set Computer CISC

| Complex Instruction Set Computer CISC

- According to several studies in 1970s, many of these complex instructions (i.e., Hardware) were never used by programmers and compiler
- The huge cost of implementing a large number of instructions into the microprocessor, plus the fact that a good portion of the transistors on the chip are used by the instruction decoder



| Reduced Instruction Set Computer RISC

1 byte

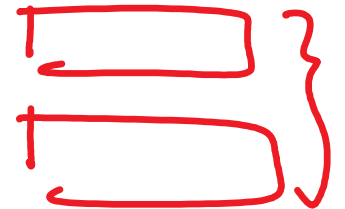


- RISC processors have a fixed instruction size

- In a CISC microcontrollers such as 8051, instruction can be 1, 2, or even 3 bytes → the variable instruction size makes the task of the instruction decoder **very difficult** because the size of the incoming instruction is never known

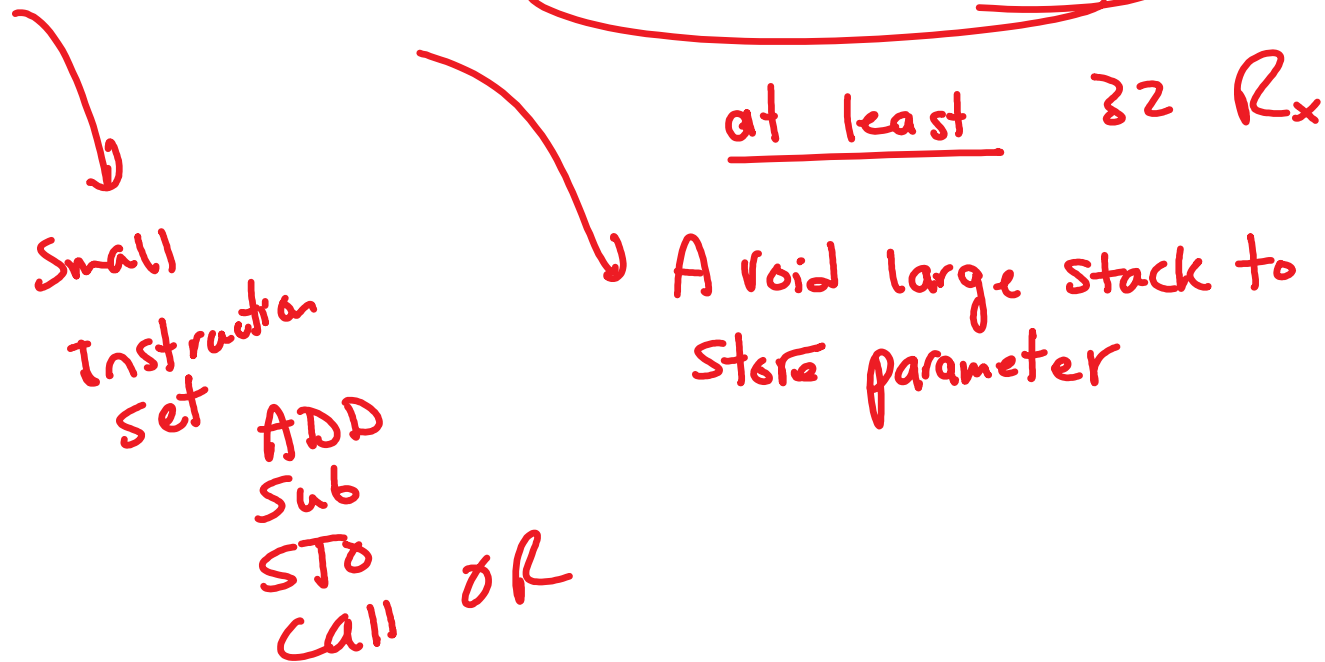
instruction

- In RISC: the CPU can decode the instructions quickly



| Reduced Instruction Set Computer RISC

- RISC architecture has a large number of registers



| Reduced Instruction Set Computer RISC

- Limited number of instructions is one of the criticisms leveled at RISC processor because it makes the job of assembly language programmers much more tedious and difficult compared to CISC

95%
of instruction

With one
clock cycle

RISC $\Rightarrow$ high-level

Program too large $\rightarrow$ need memory

→ clock cycle

9

Embedded System

نظام مدمج

- An embedded system is controlled by its own internal microprocessor (or microcontroller) as opposed to an external controller.
- Typically, in an embedded system, the microcontroller's ROM is burned with a purpose for specific functions needed for the system.

Write

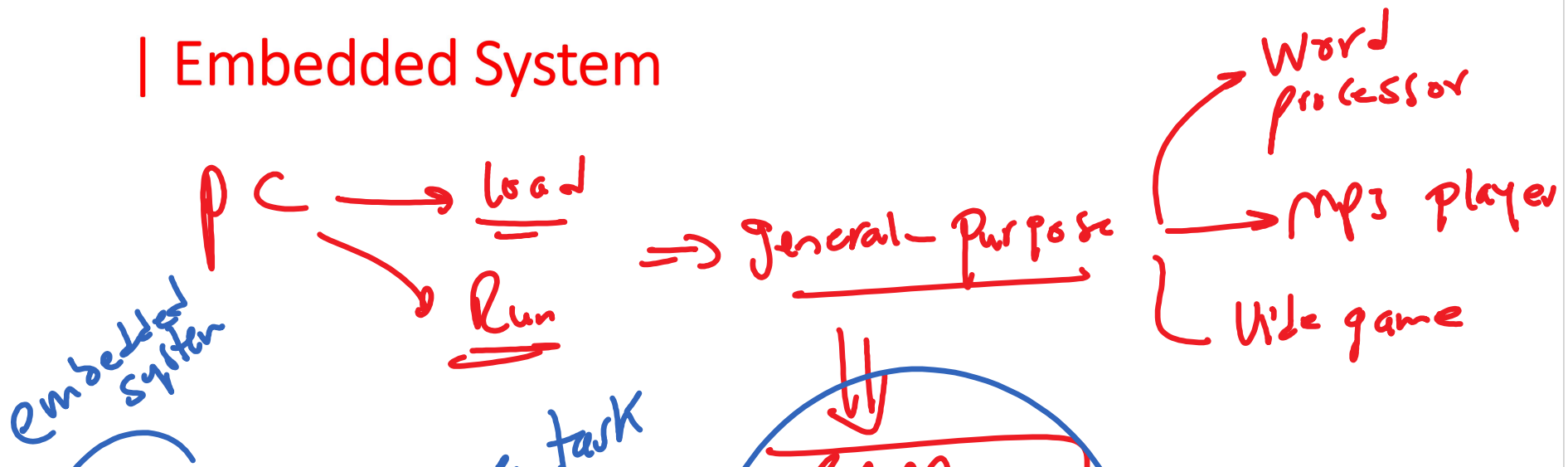
embedded system

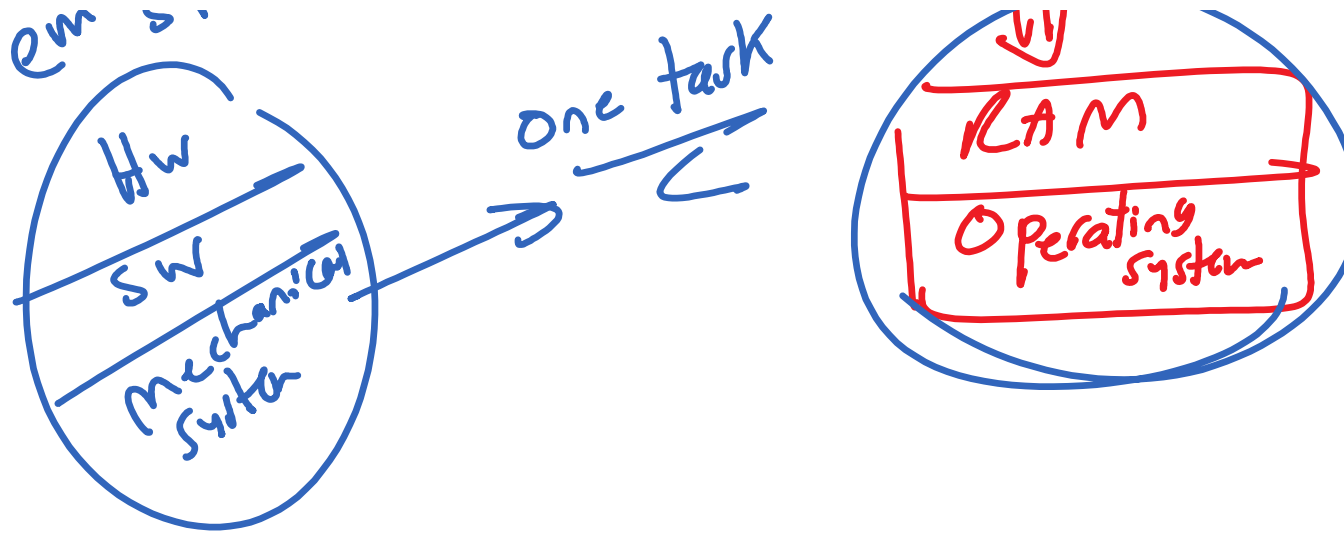
→ printer

em^c System → I

10

| Embedded System





11

| Embedded System



■ Special-purpose computers.

- The software application and hardware are embedded together and are designed to do a specific task.

- The software application and hardware are embedded together and are designed to do a specific task.
- The Kindle, digital camera, vacuum cleaner, mp3 player, flash stick memory, mouse, keyboard, and printer
- In most cases embedded systems run a fixed program and contain a microcontroller.