Introduction

COMPSCI 2SD3
Concurrent Systems

Term II

2021/22

Concurrency	**Parallelism**
Concurrency is the task of managing multiple computations at the same time.	**Parallelism** is the task of running multiple computations simultaneously.
Concurrency can be done using a single processing unit.	**Parallelism** needs multiple processing units.
Concurrency increases the amount of work finished at a time.	**Parallelism** improves the throughput and computational speed of the system.

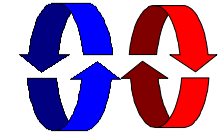| Concurrency	Parallelism
Concurrency deals with a lot of things simultaneously.	**Parallelism** does a lot of things simultaneously.
Concurrency embodies the non-deterministic control flow approach.	**Parallelism** embodies the deterministic control flow approach.
Debugging **concurrent** systems is very hard.	Debugging **parallel** systems is also hard, but simpler than debugging concurrent systems.

What is a Concurrent Program?
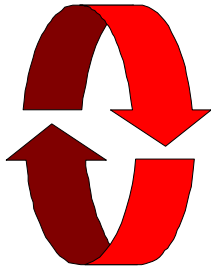
A **sequential** program has a single thread of control.
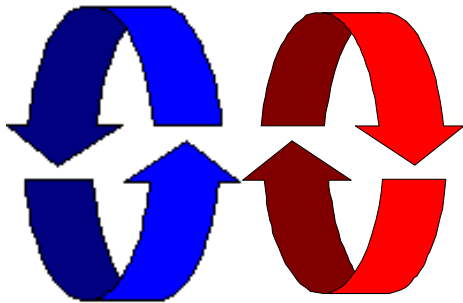
A **concurrent** program has multiple threads of control allowing it perform multiple computations in parallel and to control multiple external activities which occur at the same time.

Why Concurrent Programming?

◆ Performance gain from multiprocessing hardware

 ● parallelism.

◆ Increased application throughput

 ● an I/O call need only block one thread.

◆ Increased application responsiveness

 ● high priority thread for user requests.

◆ More appropriate structure

 ● for programs which interact with the environment, control multiple activities and handle multiple events.

Do I need to know about concurrent programming?

Concurrency is widespread but error prone.

♦ Therac - 25 computerised radiation therapy machine

Concurrent programming errors contributed to accidents causing deaths and serious injuries.

♦ Mars Rover

Problems with interaction between concurrent tasks caused periodic software resets reducing availability for exploration.