Modelling Concurrent Systems Notes

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Contents

1 Introduction to Concurrent Systems

1.1 Lecture 1 - Specification and Implementation

The main topics that are covered in this course:

- Formalising specifications as well as implementations of concurrent systems
- Studying the criteria for deciding whether an implementation meets a specification
- Techniques for proving whether an implementation meets a specification

Both specifications and implementations can be represented by means of **models of concurrency** such as **Labelled Transition Systems (LTSs)** or **Process Graphs**.

Definition 1.1.1: Process Graphs and LTSs

A **process graph** is a triple $(S, I, \rightarrow)$, defined by the following:

- S is a set of **states**
- $I \in S$ is an **initial state**
- $\rightarrow$ is a set of triples (s, a, t) with $s, t \in S$, and a an **action** drawn from a set `Act`

A **Labelled Transition System(LTS)** is a *process graph* without the initial state (but sometimes LTS is used as a synonym for process graph i.e. with the initial state)

Sometimes we will use process graphs with a fourth component $\checkmark \subseteq S$ indicating the **final** states of the process: those in the system can terminate successfully