

# Simulation designs

**Harry Perros**

*Computer Science Department*

*NC State University*

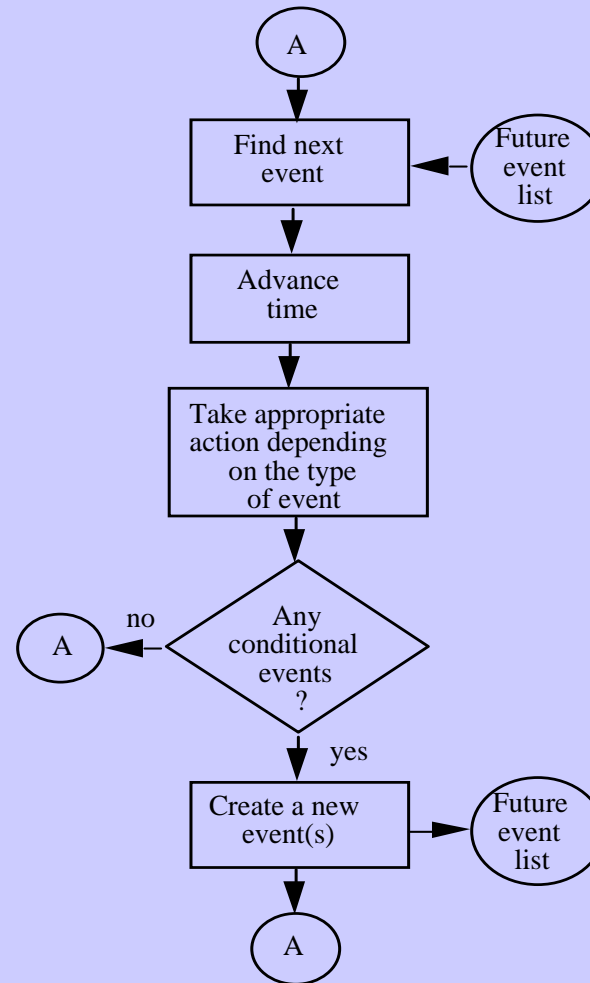
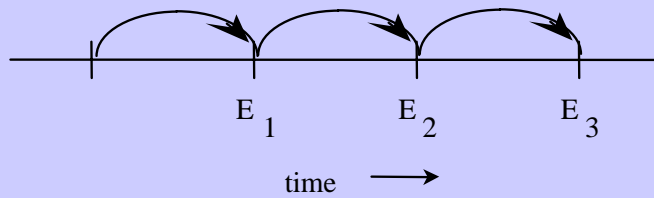
*hp@csc.ncsu.edu*

*<http://www.csc.ncsu.edu/faculty/perros//index.html>*

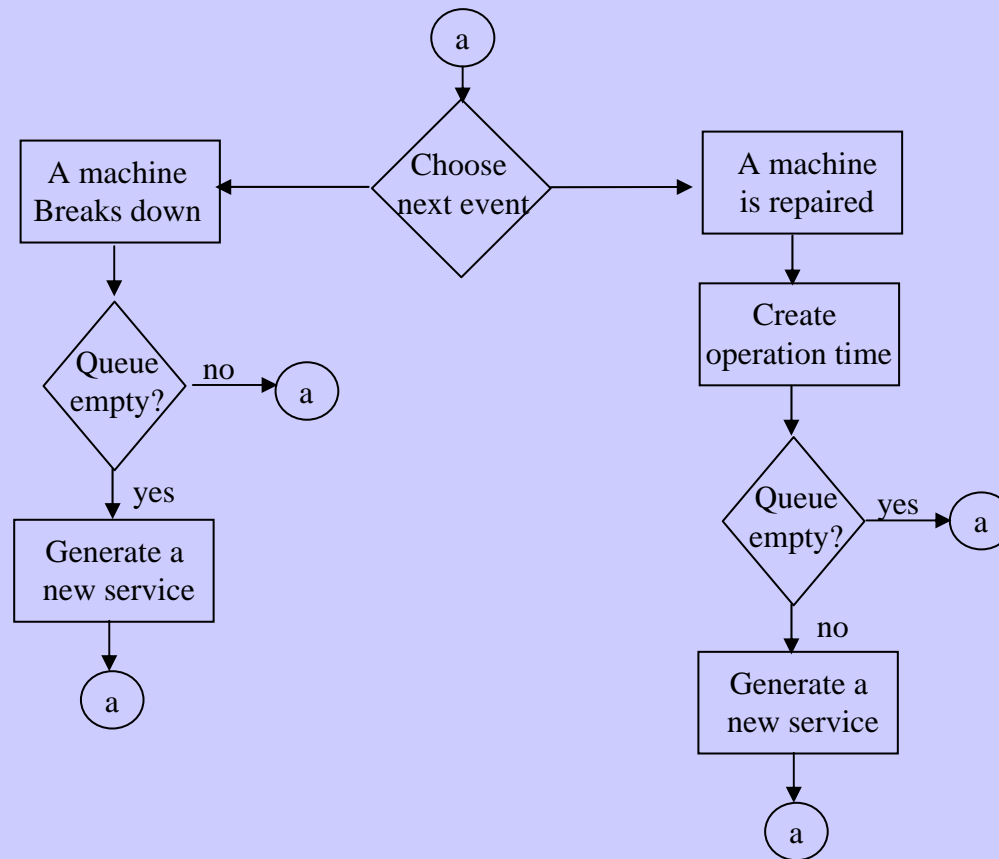
# Simulation designs

- There are various ways to track the occurrence of events in a simulation, such as
  - *Event-advance design*
  - *Unit-time advance design*
  - *Activity-based*
- Also some combination of the above depending on the structure of the problem under study.

# Event-advance design



# Example: machine repairman model



# Future event list

- This is the collection of all events scheduled to occur in the future, i.e. events with a clock greater than the current time.
- The list contains:
  - Time of occurrence (i.e. value of the event's clock)
  - Type of event
  - Other information that can be used to take appropriate action

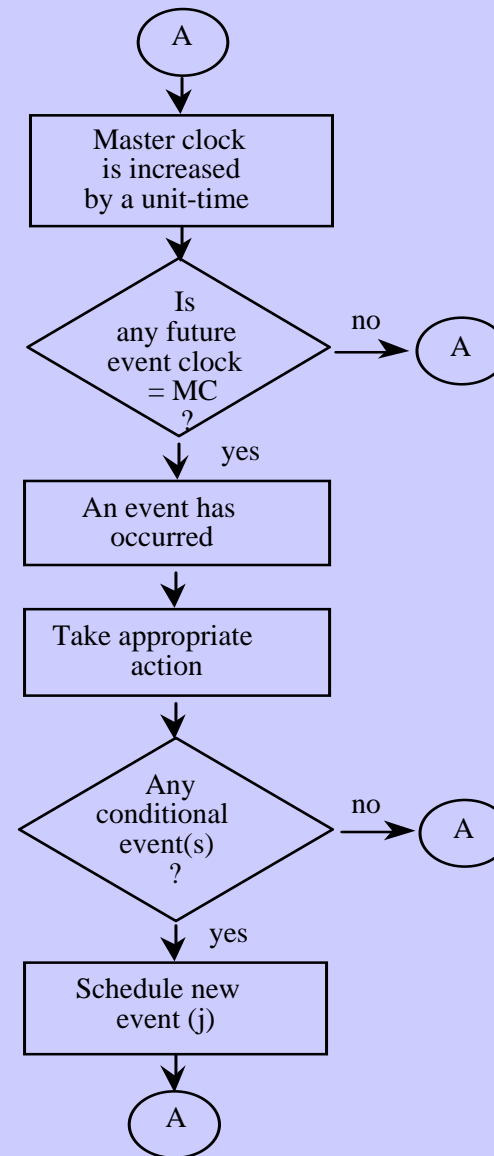
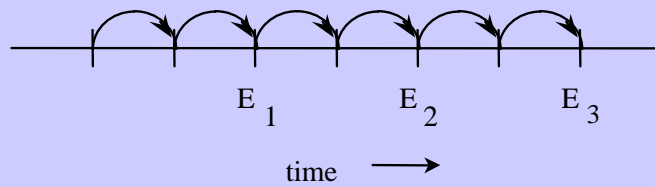
# Manipulating the event list

- There are two actions that are performed on this list:
  - Locate the next event
  - Insert new events
- In large simulations, there may be hundreds of events. Manipulating this list can be CPU intensive.
- Special data structures can be used to store and manipulate the event list.

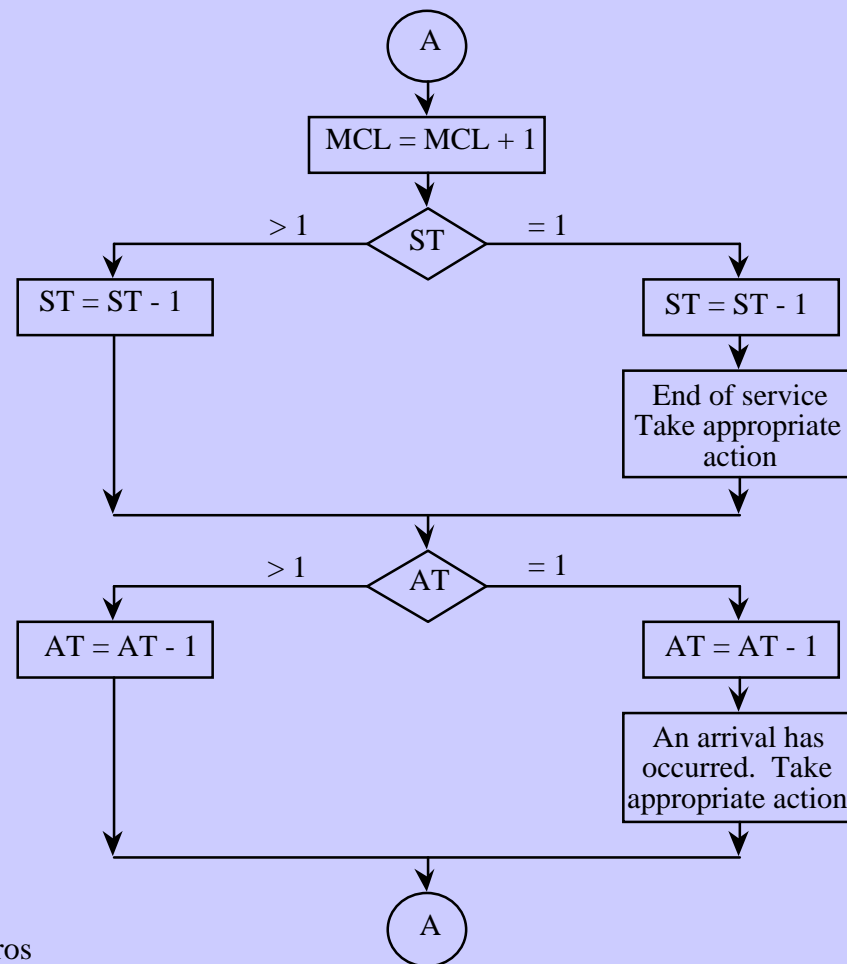
# Data structures

- Sequential arrays
- Linked lists
- Heaps

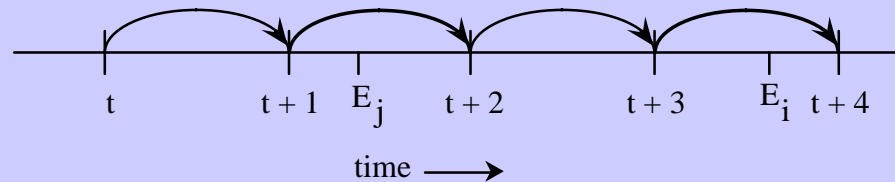
# Unit-time advance design



# Example: A single server queue



# Selecting a unit time



- If too small, then simulation will loop non-productively.
- If it's too large, then the estimates maybe inaccurate.
- It can be set to be half of the smallest variate generated

# Event-advance vs unit-time advance

- The unit-time design is advantageous when there are lots of events and they occur close to each other (preferably within a unit time).
- The event-advance design is preferable when there are few events and they occur far apart from each other