

Data and Knowledge Representation Lecture 6



Last Time We Talked About

- Major KR schemes
 - Semantic Network
 - Frame-based Representation
 - Production Rules

Today We Will Talk About

- Process
 - Finite state machine
 - Flow chart
 - Petri Net

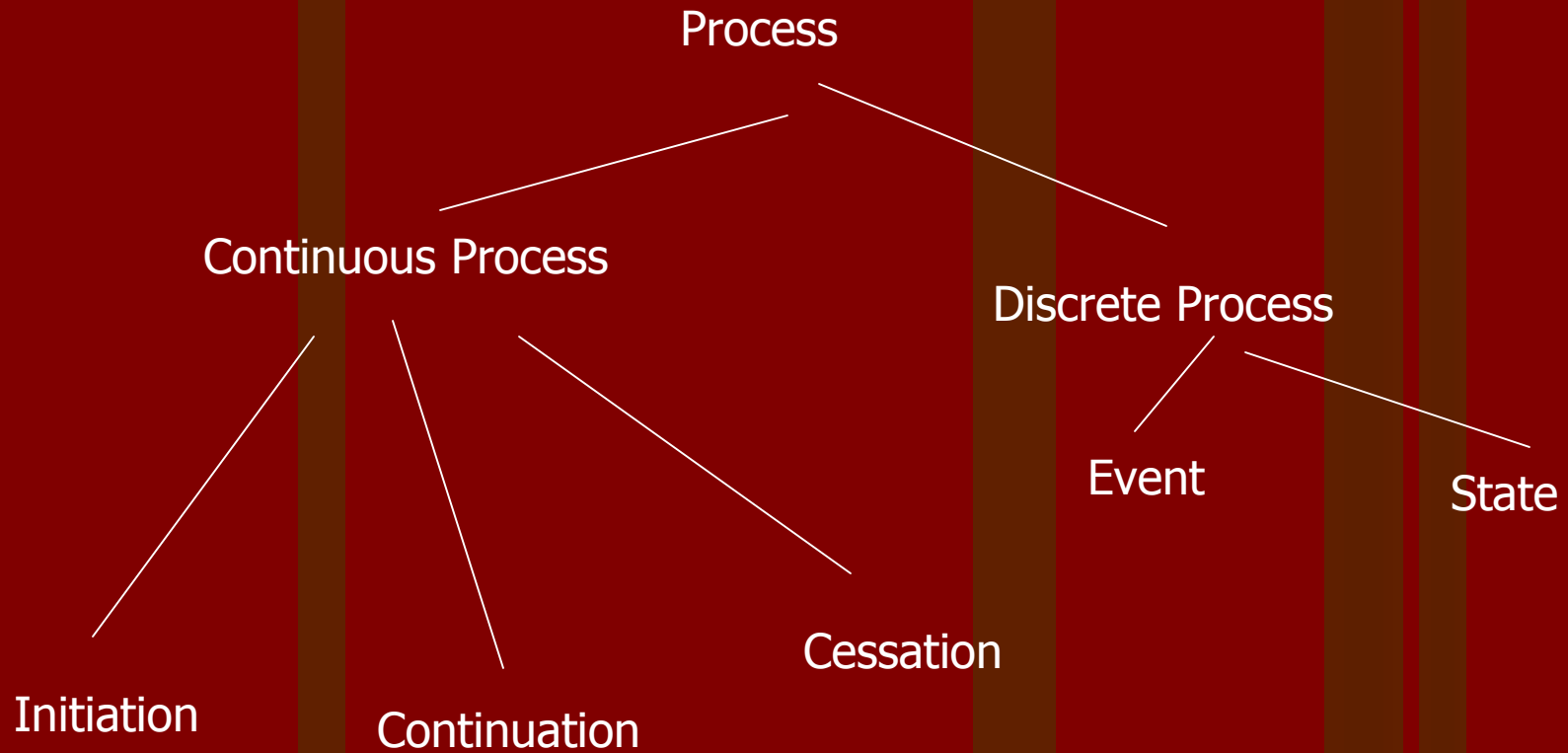
Process

- Object: continuant
 - E.g. diagnosis, medication, data repository
- Process: occurrent
 - E.g. diagnose, treat, retrieve

Describing Process

- Predicate logic
 - treat (Dr. Jones, Ms. List)
- Frame-based system
 - Patient Frame has a slot "primary care" or "attending physician"
- There are more about "treat" to specify
 - When, where, how, why, what result


Types of Process




Example

- Continuous Process
 - Aging
- Discrete Process
 - Out patient visit (make appointment, check in with nurse, see a doctor, have test/receive medication)


Basic Distinctions

- Discrete or continuous
 - Linear or branching
 - Independent or ramified
 - Immediate or delayed
 - Sequential or concurrent
 - Predictable or surprising
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Basic Distinctions

- Normal or equinomial
 - Flat or hierarchical
 - Timeless or time-bound
 - Forgetful or memory-bound
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Process, Procedure and History

- Sequence of events and state
 - Process: one event or state is current
 - Procedure: abstract (pattern or script of processes)
 - History: record of a past process
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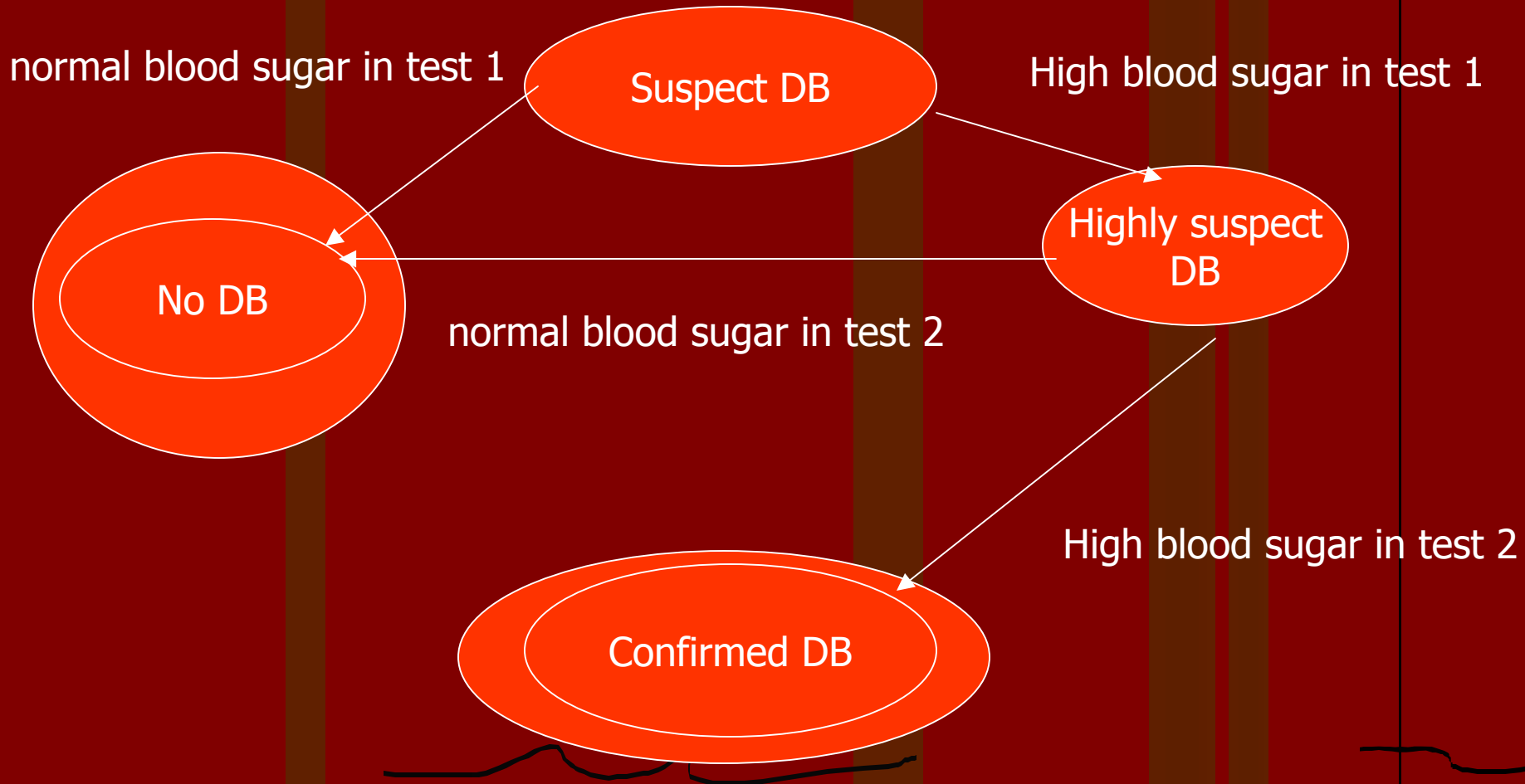
Finite State Machine (FSM)

- Discrete process (continuous process can be simulated with fine time steps)
 - State transition diagram
 - Formal Definition:
 - A finite set of states: Q
 - A finite set of inputs: I
 - A transition function $F(Q, I) \rightarrow Q$, F can be a partial Function
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FSM

- Basic components: state (circle), transition (arrow), input (label on the arrow)
- End state can be marked with double circles

FSM



Flow Chart


- Event (box) and decision (diamond)
- Arrow (transition) and label on the arrow (condition for decision)
- Start and end can be specified with box

Petri Net

- A finite set of places (circle)
- A finite set of transactions (line)
- A finite set of arrows connecting either places to transactions or transactions to places



Petri Net

- Marking: assign a non-negative integer to each place. (dot/token)
 - Firing: a transaction take place after enabled
 - Firing sequence: the sequence of transaction firings for a given PN with a given initial marking
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Petri Net

- Conflict
- Starvation
- Deadlock

Petri Net

- Assign values to tokens
- Define functions for transaction
- Specify scheduling policies
- Times Petri Net

Exercise

Overweight patients should be instructed either exercise regularly or keep a healthy diet for 3 months. When one fails, try both for 3 months. When both fail, a patient should be given medication x for 2 months.

Reading

- Sowa Chap. 3