LSD and the ODA framework

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Empirical Modelling

empirical = based on observation and experiment

empirical = given in experience

modelling because it is intended to support an activity that relies upon establishing a correlation between the experience offered by the computer and some external experience moment by moment ... and thus is (as if) carried out in a situation in which there is a referent

Fundamental concepts 1

an observable

some feature of a situation to which a value or status can be attributed. Empirical procedures and conventions are involved in identifying a particular observable and assigning its value. Not all the observables associated with a situation need be present in a particular state.

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Fundamental concepts 2

an agent

a family of observables whose presence and absence in a situation is correlated in time, that is typically deemed to be responsible for particular changes to observables. All changes to the values of observables in a situation are typically construed as due to actions on the part of agents.

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Fundamental concepts 3

a dependency

a relationship between observables that pertains in the view of a particular agent. It expresses the observation that when the value of a particular observable x is changed, other observables (the dependants of x) are of necessity changed in a predictable manner as if in one and the same action. The changes to the values of x and its dependants are indivisible in the view of the agent. That is: no action or observation on the part of the agent can take place in a context in which x has changed, but the dependants of x have yet to be changed.

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Fundamental concepts 4

The identification of observables, dependencies and agents and all matters concerning their integrity and status is an informal empirical activity (“What EM is”)

It is arguably an activity that is implicit in all system construction, whatever development method or programming paradigm is used

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LSD

An LSD account for an agent classifies observables:

oracle - an observable to which it responds
state - an observable that it owns
handle - an observable conditionally under its control
derivate - an observable determined by a dependency

+ **protocol** = list of privileges of the form

enabling condition -> sequence of actions
where an action is a redefinition,
an agent invocation or a deletion

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Central heating LSD account ✔

agent boiler

state	boilerOn, currentBoilerTemperature
oracle	desiredBoilerTemperature
handle	currentBoilerTemperature, flameNeeded

derivate
  needsToHeat = currentBoilerTemperature < (desiredBoilerTemperature - tolerance)
protocol
  needsToHeat -> flameNeeded = true

Can optionally give types to observables: bool / real etc

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Central heating LSD account ✖

agent boiler

state	roomTemp
oracle	roomVolume
handle	roomTemp

derivate
  heating(on) -> turnOff = 0
  ScaleType "C" -> ScaleType "F"

  boilerTemp = outsideTemp || (boilerMaxTemp - radiatorTemp)
protocol
  lowBoilerTemp -> heating on

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Old vs new LSD terminology

	Old (pre-1992)	New (post-1992)
owned	#	state
can change	state	handle
can observe	oracle	oracle
indivisible relation	derivate	derivate
repertoire of actions	protocol	protocol / privileges

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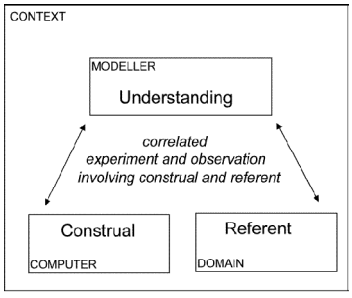
Empirical Modelling as *Construction*



Basic premises behind LSD

- Any programmed (as opposed to coincidental) synchronisation of concurrent action has to be mediated in some way by observables known to the agents
- In any meaningful use of LSD, there must be some experience currently in mind that supplies the observables to which the account refers: these relate to *what you expect to happen* as in the construal and/or *what you observe to happen* in the referent
- Many agent viewpoints are represented; to be reconciled if we are to interpret an LSD *account* as a *specification*

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Issues to be addressed by an LSD account

- What are the key observables of a system that explain its behaviour?
- What are the agents in the system?
- How are the observables associated with agents?
- How does an agent register changes of state in its environment?
- In what circumstances does an agent have privileges to change state?
- What observables can an agent change?

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Characteristics of an LSD account

- Closer to user-interface concerns than formal specification: expressing what an agent observes of a system and how its actions can potentially affect the system state
- Modelling and simulation from an LSD account intimately connected with experiment and observation
- Explicitly modelling the components and communication
- Analysis of agent characteristics not leading directly to an executable model – doesn't define an unambiguous behaviour

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Potential transitions in the EM process

Overall: artefact → construal → model → program

- account → specification
- provisional → assured
- private → public
- experiential → propositional
- concrete → abstract

These are the kinds of shift in perspective represented in animating an LSD account in the ADM …

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