

Computer-mediated communication: a distributed Empirical Modelling perspective

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Aims of this paper

This paper is concerned with principles, techniques and tools that can be used

- to examine the relationship between communications media technology and human communication
- to make more effective use of telecommunications technology in sharing and distributing cognitive models.

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Contents

- Aims
- Communication and technology in context
- Empirical Modelling (EM)
- Distributed EM for computer-mediated interpersonal communication

The Clayton Railway Accident

- First accident attributable to the telegraph
- Communication without visual/aural contact
- Knowledge about train location distributed
- Richness of social and physical situation
- Relevance of ontological issues

<http://www.dcs.warwick.ac.uk/modelling>

Two perspectives on modelling interpersonal communication

- *As if in the role of an external observer ...*
 - ... possible motivation: to gain an objective view of the events
- *Through the eyes of the participating agents themselves ...*
 - ... possible motivation: to appreciate actions from the individual's point of view

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Knowledge as declaration

vs.

knowledge as evidence

- no external witness to events, different status for witness statements
- findings try to make judgements, resolve conflicts, adjudicate relevance
- evidence is open-ended, is not accepted as objective in character

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Technology and Communication

- simple technology creates a novel complex and dangerous interactive context
- developing use => restricted interactions
 - preconceived structures
- sophisticated technology motivates rich interaction outside preconceived framework

Examples: railway and computer development

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Technology

Communication

- | | |
|---|---|
| • simple technology
<i>hard to analyse</i> | • chaotic processes
combining human and machine interaction |
| • developing use
<i>adapt to be analysable</i> | • rationalisation of social interaction and refinement of machine |
| • mature technology
<i>hard to exploit fully</i> | • potential for richer interaction between human and machine |

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Ethnomethodology (Garfinkel, 1967)

- the empirical investigation of the methods people use to make sense of and at the same time accomplish communication, decision making, reasonableness, and action in everyday life [Roger, 1983]
- social facts are the accomplishment of the members

Ethnomethodologists don't want to import any of their own assumptions of social facts as objects into their descriptions

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Sociological & computational issues

Coser's attack on ethnomethodology (1975):

[Ethnomethodology] underplays the behavioural aspects of goal directed social interaction ... [ignores] institutional factors in general, and the centrality of power in social interaction in particular ... neglects the central area of sociological analysis which deals with latent structures.

cf. emphasis in classical computational models on goal-directed, declarative knowledge, structured interaction

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Empirical Modelling

- emphasises interactive, metaphorical and experiential aspects of computer-based modelling (cf. the computer as a physical artefact / the computer as an instrument)
- gives primary emphasis to modelling **state-as-perceived-by-agent** rather than modelling **system behaviour**
- three fundamental concepts:
observable, dependency and agency

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Observables

Observables are entities

- whose identity is established through experience
- whose current status can be reliably captured by experiment

Can be physical, scientific, private, abstract, socially arbitrated, procedurally defined etc

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Dependency and Agency

An *agent* is an observable (possibly composed of a family of co-existing observables) that is construed to be responsible for changes to the current status of observables

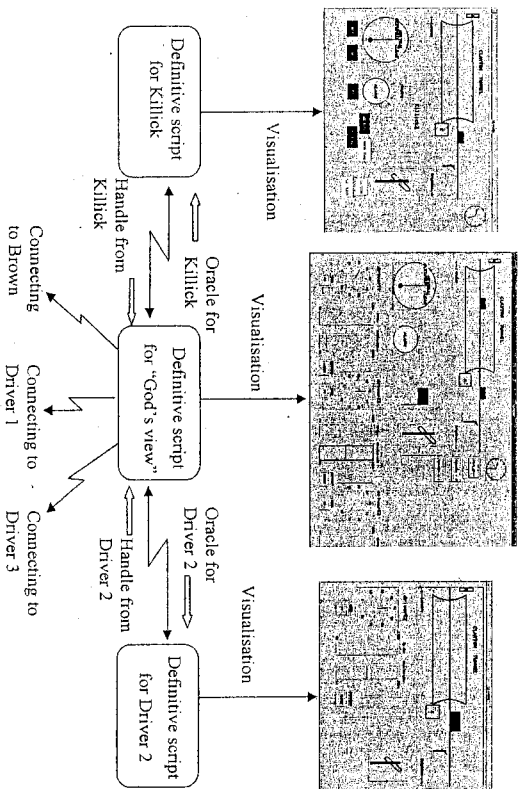
A *dependency* is a relationship between observables that - in the view of a state-changing agent - expresses how changes to observables are indivisibly linked in change

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Interactive situation model (ISM)

- is an interactive, computer-based model rather than a conventional computer program
- is associated with an open-ended space of scripts that can be derived from any particular instance of the script through meaningful interaction
- is shaped by and shapes the modeller's insight into the referent

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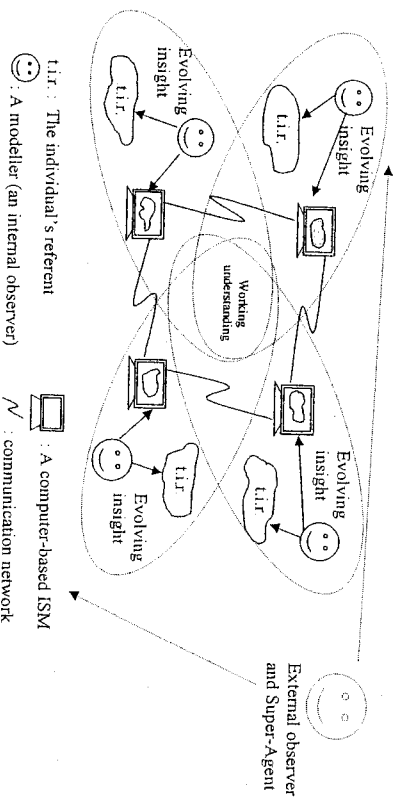
Semantics of ISMs

- “one experience knows another”
William James, David Gooding, Mark Turner
- supports the empirical processes by which *conjunctive relations* are identified and organised
- cf construal: can't be grasped independently of the exploratory behaviour that produce it or the ostensive practices that convey it

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Distributed Empirical Modelling

- extends single agent Empirical Modelling
- embraces social and communication issues
- ontology suited for distributed cognition
- augmented communication via redefinition
 - frameworks for interaction and communication:
e.g. *broadcast, private, interference* modes
 - classification of observables based on agency:
oracles and handles



A framework for distributed EM

Conclusions

- Need for principles to support generation of virtual environments and analysis of their properties
- Need to complement classical research with new ways of thinking about communication and computation
- Importance of developing on the theme of *one experience represents another*

Distributed cognition (Hutchins, 1995)

- cognitive science has difficulties in connecting minds to the outer environment. Much more attention has been paid to processes that can go on inside the human head without interaction with its environment
- All divisions of labour, whether the labour is physical or cognitive in nature, require distributed cognition in order to coordinate the activities of participants
- The cognition for a group activity is a process socially distributed between individuals and artefacts
- The group performing the cognitive task may have cognitive properties that differ from the cognitive properties of any individuals

A critical point in re-enacting the Clayton Tunnel Railway accident

