

## Human Computing - A Vision

The hope is that, in not too many years human brains and computing machines will be coupled together very tightly and that the resulting partnership will think as no human brain has ever thought ....

JCR Licklider *Man-Computer Symbiosis* 1960

## New Ways of Thinking about Computers

- Understanding (versus goal) -oriented perspective
- A modelling machine as well as a programmable machine; modelling within ODA framework
- Computer as reliable, interpretable, state-changing machine: requires complement of the human
- Computation not only 'evaluation of a function' but presentation of *something* in the world (semantics)
- Each feature above calls for the human as an essential partner in computation

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## New Ways of Using Computers

- Warehouse management (Chen, PhD) has employees involved in 'participative business process re-engineering'
- Restaurant management (Rasmequan, PhD) manager makes booking decisions while interacting with model of restaurant bookings
- Human 'user' as essential participant (with machine) in computation: games, social, Web2.0
- Not really 'new', eg. spreadsheets; also very many EM models can be thought of this way: Clayton Tunnel, Sudoku, Heapsort, Jugs, VCCS etc.

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## Humans as Computers

- Hobbes: 'When a man *reasoneth*, he does nothing else but conceive a sum total, from *addition* of parcels;....For reason, in this sense, is nothing but *reckoning*, that is adding and subtracting....(Leviathan, 1651)
- Computationalism: the brain/mind is a computer; cognition is computation, etc
- (Cf. M. Scheutz, *Computationalism*, 2002)

## Early Vision...

People 'track' during every conscious moment ... alignment processes, in which the alignment error serves as datum for its own annihilation, are forever being carried out in the familiar operations of living ... The needs and nature of the interpretive and computing equipment cannot finally be separated from those of tracking controls.

George Philbrick, 1945 [cf Charles Care PhD thesis]

Editor of the 'Lightning Empiricist' 1950 - ?

Consider this principle in movement, in perception, and in thinking. It calls for **integration** of human and machine.

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## What is Computing?

- There is a machine view – the algorithmic view and 'theory of computation' concerned with processes **between** input and output
- Read Brian Cantwell-Smith's exciting paper on *Foundations of Computing* 2001
- There is a broader view, in need of theory, to account for human practice **surrounding** i/o

## What might Computing be?

- We can use computers to explore and identify new patterns of interaction, construals, & interpretations
- Such activity is *prior* to programming
- This motivates model development on the basis of the meanings derived from the comparison of experiences of the artefact and the world
- The modeller mediates the correlation of artefact and referent: through experiment and observation they establish meanings and understanding

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## Early Computing

- In the 1930's and 1940's computing was carrying out a 'definite method' (algorithm) which Turing had (surprisingly) defined
- War-time and the scientific applications
- Lyons teashops and LEO, the first office computer, in 1951

## Machine Computing

- Machine metaphor and engineering paradigm
- Semantics of conventional computing has been on relating **program to process** in computer, not so much on relating **program and process to world**
- Essence of computing seen to lie in the algorithmic or the automatic – so the specification of a process (a behaviour) is taken as primary
- The **whole** of the computation is an automated thing

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## Human Computing

- Not something humans alone can do, nor is it computing for human affairs, nor 'soft' computing, nor HCI, nor human-centred computing
- It is computing that only proceeds with the essential and continuous engagement of human cognitive processes, a 'symbiosis' of the human and electronic
- In this view the computation is **distributed across automated agency and human agency**
- Most computing has not been of this kind, some of it already is, and much of it will be in the future

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## More Vision ....

The main aims are 1) to let computers facilitate formulative thinking ... and 2) to enable men and computers to cooperate in making decisions and controlling complex situations without inflexible dependence on predetermined programs.

CR Licklider *Man-Computer Symbiosis*. 1960

## Bibliography

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