



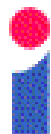
Herbrand Award

CADE 2007

Alan Bundy

School of
informatics

University of Edinburgh



The DReaMers (Discovery and Reasoning in Mathematics)

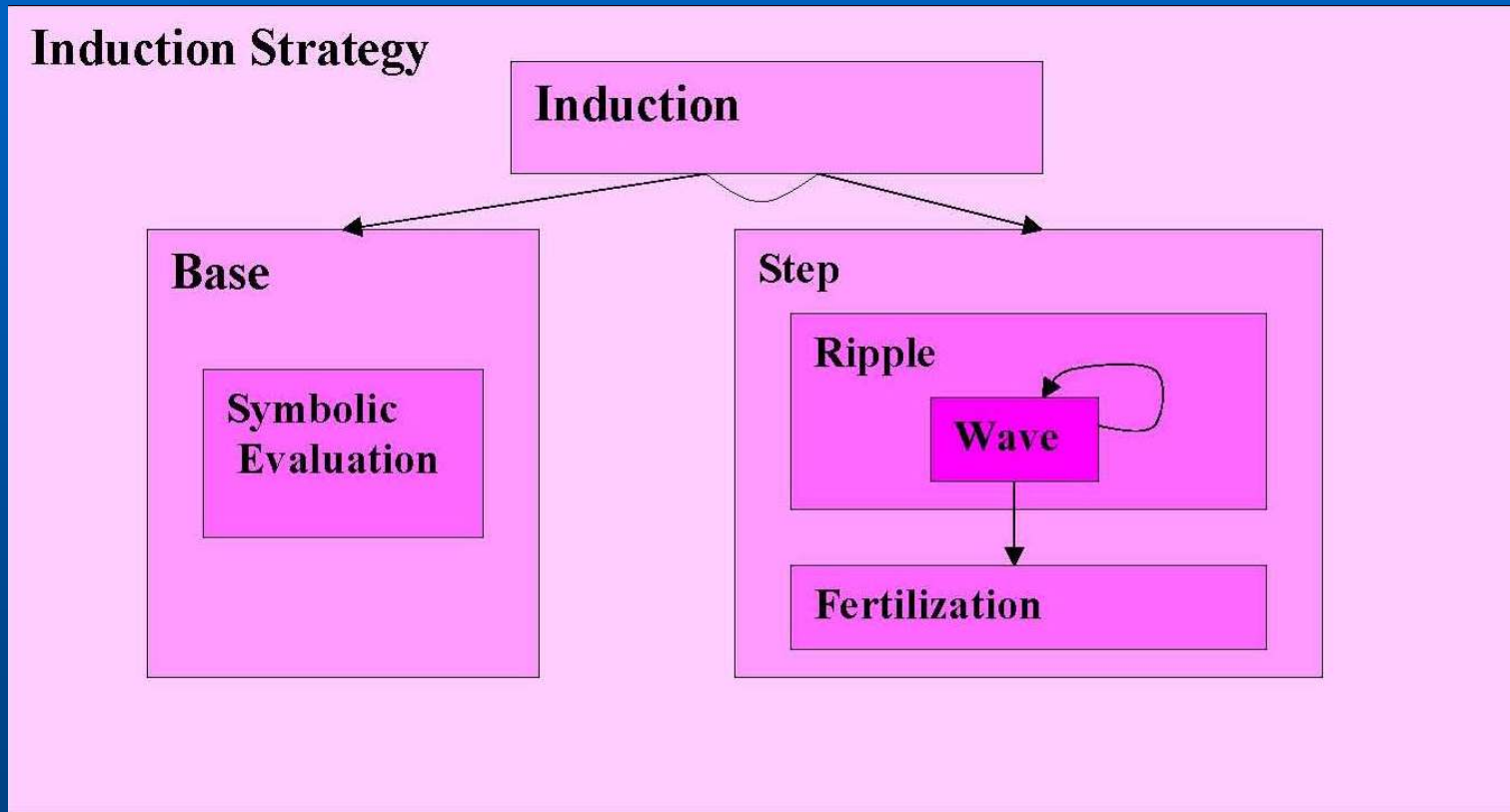
- **Characterised by combination of AI and theoretical computer science.**
- **Formed in mid 70s.**
- **Current 'Platform Grant'**
 - **Spread over 4 Universities:**
 - **Edinburgh, Heriot Watt, Imperial, Liverpool.**
- **Long standing collaborations with:**
 - **Saarbrücken, Genoa, Trento, Darmstadt, Birmingham, Cambridge, Austin, etc.**

What We DReaM About



- Computational analysis, development, interaction and application of **mathematical reasoning processes**.
- **Processes include:** meta-level reasoning, proof planning, proof patching, analogy, symmetry, abstraction, reflection, diagrams, learning, formalisation, interfaces, concept/conjecture formation.
- **Applications to** formal methods, mathematical aids, semantic web, etc.

Example 1: Proof Planning & Hiproofs



Example 2: Planning and Diagnosis

- **Proof plan failure can be exploited productively**
 - Analyse the form of failure.
 - Suggest patch to proof plan.
- **For instance, Rippling critics suggest:**
 - Change of induction rule;
 - Intermediate lemma;
 - Generalisation of theorem;
 - Case split.

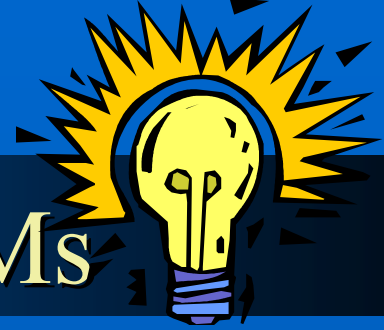


Example 3: Repairing Ontologies

- Failure may be in signature rather than theory,
 - i.e requiring change of functions, arities, types, etc,
 - e.g. heat \mapsto energy + temperature.
- **ORS** repairs signatures to react to planning failures.
 - Multi-agent world
 - Plan actions executed by cooperating agents.
 - Failure due to agents' mismatching ontologies.



Some Continuing & Future DRearMs



- Theory planning: proof planning applied at theory level.
- Proof engineering: managing large proof construction, maintenance and exploration.
- Hiproofs: tool for top-down development of proofs.
- Applications to APIs/protocols, exception freedom and pointer programs.
- Reasoning about representational change.

My Thanks To DReaMers ...



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20 July 2007

And my wife Josie 8

What were they laughing at?



20 July 2007

