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Artificial Mathematics A Mathematician's Perspective

Antony Maciocia

January 24, 2007



Rigour and Truth

Some Solution

Conclusions



Computer use in Mathematics

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Conclusions



Computer use in Mathematics



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Conclusions



Computer use in Mathematics

Meta-AM

Rigour and Truth



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Conclusions

Computers in Mathematics

• Numerical Simulations



- Numerical Simulations
- Computer Algebra



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 - Difficult to use (interface, legibility of results,...)

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Meta-AM

• The Platonic World of Mathematics

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- The Human Mathematician
 - Limited ability to do numerical computation

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- Astonishingly good at logic
- Have a feel for what's right
- Are finitary

Computer use in Mathematics	Meta-AM	Rigour and Truth	Some Solutions	Conclusions
Rigour				

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 - Understanding not helped by dense logic
 - Lack of interest:

"99% of all mathematicians don't know the rules of even one of these formal systems, but still manage to give correct proofs" [Kreisel]

Computer ι	ise in Mathematics	Meta-AM	Rigour and Truth	Some Solutions	Conclusions

• Rigour \neq semantic proof



C	Computer use in Mathematics	Meta-AM	Rigour and Truth	Some Solutions	Conclusions

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 - to gain insight.
 - to derive satisfaction \longrightarrow aesthetics.
 - provides motivation

Computer use in Mathematics	Meta-AM	Rigour and Truth	Some Solutions	Conclusions
		Truth		

• Validity:

Computer use in Mathematics	

Meta-AM

Rigour and Truth

Some Solution

Conclusions

Truth

• Validity: is it right?



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 - Modern error checking and software design methodology helps.



• Taxonomy: lemma, technical lemma, theorem, proposition, fundamental lemma etc.

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• Cultural norms.



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• Cultural norms. Especially strong in Mathematics



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- \implies Platonism?
- Fashion \longrightarrow irrelevance and forgotten results
- \longrightarrow lack of absolute truth

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Some Solutions

A wish list:

• Seamless computer algebra integration

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Some Solutions

- Seamless computer algebra integration
- Mathematician friendly interface

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Some Solutions

- Seamless computer algebra integration
- Mathematician friendly interface
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 - By domain, relevance, importance ...

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- Knowledge management: ability to organise the information
 - By domain, relevance, importance ...
 - > 20m main results in the literature, > 1000m results overall.
- Ability to assign importance/significance

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Conclusions

• Will there ever be an Artificial Mathematician capable of conjecturing and proving anything?

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• Will there ever be an Artificial Mathematician capable of conjecturing and proving anything? No!

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- Will there ever be an Artificial Mathematician capable of conjecturing and proving results within contemporaneous domains?

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- Will such a machine be used by mathematicians? No! Well, at least not much.

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- Will such a machine be used by mathematicians? No! Well, at least not much.
- Will there ever be a further refinement of the Artificial Mathematician which will also have an appreciation of the importance and beauty of theorems?

- Will there ever be an Artificial Mathematician capable of conjecturing and proving anything? No!
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Conclusions

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