Formalising Mathematics

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R *I N R I A*

Symbolic computation within Coq

Feit-Thompson effort

Last TPHOLs

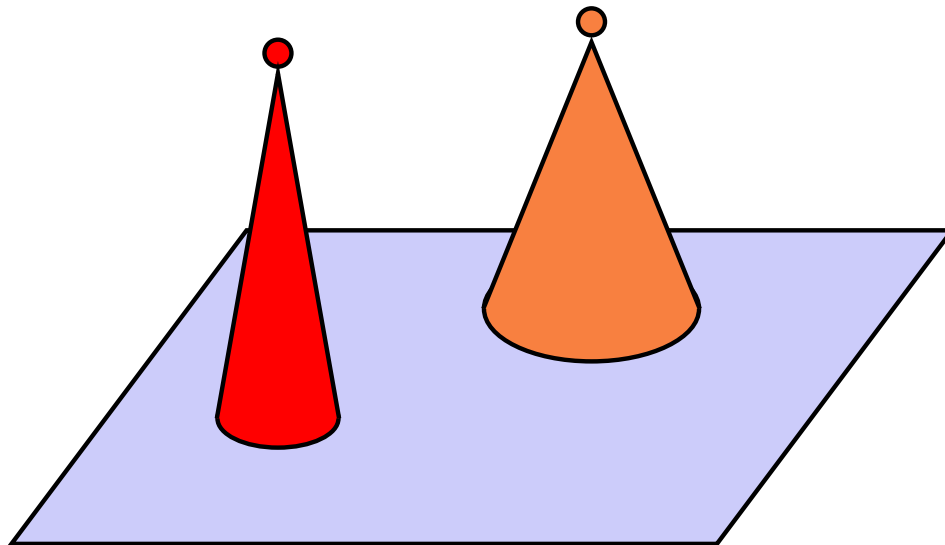POPL $\longrightarrow$ TPHOLs

In Mathematics?

"This community seems quite extremist. Instead one should pick and choose what is interesting to prove formally."

$\longrightarrow$ Semi-formal reasoning

"You'd better change the way you do proofs
otherwise my folks will not like it."

$\longrightarrow$ Interaction

Representing mathematical objects

Computing (CAS) $\leadsto$ Proving (TP)

Two examples:

Sylow's theorems:
from 700 lines to 70 lines

Cayley Hamilton:
$p(A) = 0$ **where** $p(x) = det(xI_n - A)$

Programming $\Longleftrightarrow$ Proving

HOL: a theorem prover inside a programming language

COQ: a programming language inside a theorem prover

Numbers in Coq:

80s: Peano arithmetic

90s: Binary representation

00s: Binary trees + machine words

10s: Gmp, BigNum, …

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Scholarly articles for **computer assisted proof**
   ... in the Lorenz equations: a **computer-assisted proof** - Mischaikow - Cited by 146
   A **computer-assisted proof** of the Feigenbaum ... - LANFORD III - Cited by 173
   Computer assisted proof of chaos in the Rossler ... - Zgliczynski - Cited by 55

Computer-assisted proof - Wikipedia, the free encyclopedia
28 Apr 2009 ... Other mathematicians believe that lengthy **computer-assisted** proofs
should be regarded as calculations, rather than proofs: the **proof** ...
Methods - Philosophical objections - List of proved theorems
en.wikipedia.org/wiki/**Computer-assisted_proof** - Cached - Similar

Computer Assisted Proof for Mathematics: an Introduction using the ...
29 Jul 2008 ... **Computer Assisted Proof** for Mathematics: an Introduction using the
LEGO **Proof** System. Rod Burstall. Abstract: We give brief account of the ...
www.lfcs.inf.ed.ac.uk/reports/91/ECS-LFCS-91-132/ - Cached - Similar

Computer assisted proof of optimal approximability results
Computer assisted proof of optimal approximability results. Full text, Pdf (1.10 MB).
Source, Symposium on Discrete Algorithms archive ...
portal.acm.org/citation.cfm?id=545448 - Similar
by U Zwick - 2002 - Cited by 24 - Related articles - All 3 versions

CiteULike: A **computer-assisted proof** for photonic band gaps
8 Apr 2009 ... JF - Zeitschrift für Angewandte Mathematik und Physik (ZAMP) TI - A
computer-assisted proof for photonic band gaps AU - Hoang, Vu AU - Plum, ...
www.citeulike.org/article/4289855 - Cached - Similar

CiteSeerX — **Computer Assisted Proof** of Optimal Approximability Results
CiteSeerX - Document Details (Isaac Councill, Lee Giles): We obtain **computer assisted**
proofs of several spherical volume inequalities that appear in the ...
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Summary

Plea for Quality

Proving + Computing

Computer Assisted Proofs