Lurch:
Software for teaching mathematical proof

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Purpose

We are developing a new piece of mathematical software based on this idea:

*If your word processor can check your spelling and grammar, why can’t it check your mathematics?*

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Outline

• How is Lurch like/unlike existing software?
• Current version: Lurch Lite v0.1
  • Demonstration
  • Results of classroom testing
• Upcoming version: enables student writing
  • Demonstration of math word processing
• Opportunities for involvement
Example: Fitch
by Barwise, Etchemendy, Allwein

Fitch: Untitled 1

File  Edit  Proof  Goal  Window  Help

∀x P(x)
 ¬P(c)
 ¬¬P(c)
 P(c)
 ∀x P(x)
 ⊥

∃x ¬P(x)
 ¬¬P(c)
 ⊥
 P(c)
 ∀x P(x)
 ⊥

∃x ¬P(x)
 ¬¬P(c)
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 P(c)
 ∀x P(x)
 ⊥

∃x ¬P(x)
 ¬¬P(c)
 ⊥
 P(c)
 ∀x P(x)
 ⊥

∃ Intro
 ¬ Intro
 ⊥ Intro
 ¬ Intro
 ∀ Intro
 ¬ Intro
 ⊥ Intro
 ¬ Intro
Lurch Lite v0.1

• Freely available now for Win, Mac, & Unix
  http://lurch.sourceforge.net

• Three implicit-validation libraries
  • Propositional logic
  • Differential calculus
  • Circle-dot formal system game

• Class-tested in Fall 2008
  and released in Spring 2009
Demo

Current Release
Classroom Testing

Student Quotes

• “It helped me learn how to do proofs through trial and error.”

• “…I liked using Lurch because I was able to see what was needed for rules to work.”

• “It told me if I was right or wrong”

• “It was also easier to move lines around than erasing everything on paper.”
Classroom Testing
Likert Scale Responses

• I used Lurch for experimentation; I tinkered to learn the results of various actions. 4.6
• The constant feedback Lurch provides about my work is valuable. 4.2
• It was helpful that proofs in Lurch looked just like proofs in our textbook. 4.2
• Learning to use Lurch took a lot of time that I could have spent learning logic instead. 2.2
Problems

- Original goal: “If your word processor can check your spelling and grammar, why can’t it check your mathematics?”

- Mission statement starts with this sentence:

  Lurch should be as indistinguishable from the ordinary activities of mathematics as possible, except for the additional services it provides.

- It is possible to do a proof in Lurch by experimental clicking and typing, without thinking.
Demo

Next Release

(stay informed -- see email pad)
Next Steps

1. Combining validation with word-processing
   *Programmers wanted! (starting any time)*

2. Release next version
   *Sign up to be informed when it happens*

3. Adding new math topics using that new version
   *Mathematicians wanted! (fall/spring)*
For more information...

• Project website:

http://lurch.sourceforge.net

• Includes current version, introductory videos, future plans, opportunities for involvement, etc.