A transparent mathematics engine and gains for flexible tutoring

*ISAC*-project:  www.ist.tugraz.at/projects/isac

Agenda

1. Stepwise problemsolving — a gap in tutoring mathematics
2. *ISAC*'s math engine is transparent and works stepwise!
3. Authoring *ISAC*'s knowledge base — invitation for cooperations
4. Discussion
A transparent mathematics engine 
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Agenda

⇒ ... — a gap in tutoring mathematics

2. ISAC’s math engine is transparent and works stepwise!

3. Authoring ISAC’s knowledge base — invitation for cooperations

4. Discussion
1. — a gap in tutoring mathematics

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Which step will the student take?

\[
\frac{d}{dx}(1 + x + x^2) = \\
= \frac{d}{dx}1 + \frac{d}{dx}x + \frac{d}{dx}x^2 = \\
? = 0 + \ldots \\
? = \ldots + 1 + \ldots \\
? = \ldots + 2 \cdot x
\]
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1. Stepwise problem solving — a gap in tutoring mathematics
   ⇒ ISAC’s math engine . . .
3. Authoring ISAC’s knowledge base — invitation for cooperations
4. Discussion
2. **ISAC’s math engine** ...  

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- solves problems autonomously ...  
  *Thus is ready for user guidance*
- in steps similar to paper & pencil work ...  
  *Thus generates the dialog dynamically*
- and is transparent w.r.t the knowledge.  
  *Thus generates explanations dynamically*
2. **ISAC’s math engine**

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⇒ **solves problems autonomously**

*Thus provides for user guidance*

- in steps similar to paper & pencil work

*Thus generates the dialog dynamically*

- and is transparent w.r.t the knowledge.

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2. **ISAC’s math engine** of . . .

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1. Stepwise problem solving — a gap in tutoring mathematics
2. ISAC’s math engine is transparent and works stepwise!
   ⇒ **Authoring ISAC’s knowledge base — ...**
3. Discussion
3. Authoring ISAC’s knowledge base

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- the core of the knowledge (by computer mathematicians !)
  - equation solving
  - simplification
  - calculus
- knowledge of applied math (by lecturers, course designers !)
  - electrical engineering
  - mechanics
  - high-school math
  - ...