Initiative for an Open Source Formula Editor

Walther Neuper, neuper@ist.tugraz.at
Institute for Softwaretechnology
Graz University of Technology, Austria
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Several academic software developments face a barrier towards more widespread usage: they lack a formula editor meeting specific requirements.

So, several attempts have been made in academia to implement such an editor. The outcomes are all unsufficient so far: they are limited to the respective project, while the effort required for general solutions exceeds the scope of a sub-project in academic R&D projects.

On the other hand, commercial development of specific requirements for a formula editor seems challenging at present: One firm (outside EU) holds 95% of the market and its products cover 95% of present requirements — however, the lacking 5% are expected to mount up rapidly due to novel software developments.

Two requirements not met generally enough by existing formula editors, neither commercial nor open source, are indispensable for specific software under development in academia: (1) support for the inherent extensibility of the language of mathematics and (2) support for embedding formulas into a structured document, for instance a proof document.

The goal of this initiative is to gather a consortium from academia and from industry and to develop a formula editor in a joint project:

• The requirements for the editor shall be defined on agreement between the partners — all their specific requirements should be met by a general/generic product; some notes on requirements are to be found below.

• The envisaged product is perfect at the state of the art; the development effort for such a product is at least 15 (???) man years. Assuming, that an existing product can be used (or an existing project can be extended), the number of man years will decrease accordingly. A pre-study shall clarify the efforts required.

• The resulting product shall be open source and available free of charge for non-profit use. Returns from commercial use shall ensure maintenance of the product for 10 years.

• Fundraising will address agencies supporting industry as well and agencies supporting academia.

This initiative intends to remedy two snags: that promising software developments lack an appropriate formula editor, and that each formula written by a scientist, an engineer or a student in EU delivers a cent abroad.

The initiative shall be seen in context with EU based activities like Symbian 1, an upcoming operating system for mobile devices, etc.

1http://www.symbian.org
**Project partners** (tentative)

- TUM, Isabelle, Makarius Wenzel makarius@sketis.net
- INRIA, Coq proof assistant, Hugo Herbelin Hugo.Herbelin@inria.fr
- Le_ACTIVE_MATH, Paul Libbrecht
- Cinderella, Ulrich Kortenkamp
- GeoGebra, Markus Hohenwarter markus.hohenwarter@jku.at
- MathPiper, Ted Kosan ted.kosan@gmail.com
- TeXmacs, Joris van der Hoeven vdhoeven@lix.polytechnique.fr
- TUG, IICM, Christian Gütl cguetl@iicm.tu-graz.ac.at,
  KMI, Denis Helic dhelic@iicm.tu-graz.ac.at
  IST, Walther Neuper neuper@ist.tugraz.at
- IBM, n.n.
- Siemens, BitMedia, n.n.
- SAP, Achim Brucker Achim.Brucker@sap.com

**Notes on requirements:** In the formula editors (editing means both, rendering and input) available there are two features urgently missing:

1. **Extensibility for new symbols** is essential for mathematics in general: A mathematician extending some theory and introducing, for instance, a new operator, wants to define (pre-, in-, mix-fix) syntax as convenient as the semantics, preferably in a smooth workflow. For scientists and engineers the need for introduction of new symbols also arises for clarification reasons in publications and in education.

2. **Embedding into a structure** as given by proof documents in Isabelle/Isar or in the proof assistant Coq is missing. Computer Algebra Systems (CAS) have developed sophisticated GUIs which allow such embedding: the open source proudct Lyx supports embedding within a LaTeXstructure. However, the structures given in both products, CAS and Lyx, are hardly adaptable to a proof document, a structured calculation etc.

Detailed requirements are to be agreed on; here are some examples raised by educational systems:

- clarify the structure of formulas by several means like
  - boxes around certain sub-expressions
  - different colouring of sub-expressions
- provide user guidance when writing a formula by
  - setting sub-expressions writable / non-writable
  - setting the cursor to a certain sub-expression
  - supporting empty fill-in areas at sub-expressions.
- ...
Notes on existing editors: The list below is restricted to Open source products; 'open source' means that the source code is readily available for download. If the latter is not clear at the moment, such a product is in the list and marked with 'source availability unclear'.

- **Connexions MathML Editor** is written in Javascript and XSLT, allows editing Content MathML or Content with Presentation MathML; source availability unclear.  
  http://cnx.org/matheditor

- **DragMath** Java applet.  
  http://www.dragmath.bham.ac.uk/

- **Formulator Mathml Weaver** is written in C++, works on Content MathML,  
  http://www.mmlsoft.com/hdata/fml_home.php

- **GNU TeXmacs** includes a text editor with support for mathematical formulas; written in C++ and Scheme.  
  http://www.texmacs.org/

- **Jex** is a Java Equation Editor for Openoffice, similar to the Design Sciences Mathtype editor, Java, ?Swing? very promising, if Swing.  
  http://levine.sscnet.ucla.edu/general/software/jex/

- **JLaTeXMath** is a Java API to display mathematical formulas written in \LaTeX.  
  http://forge.scilab.org/index.php/p/jlatexmath

- **KFormula** is a formula editor for KOoffice, purportedly addressed by Symbian recently.  
  http://en.wikipedia.org/wiki/KFormula

- **LyX** supports embedding of formulas into a larger structure given by \LaTeX; ?program language?  
  http://en.wikipedia.org/wiki/LyX

- **MathCast** written in C++, source availability unclear  
  http://en.wikipedia.org/wiki/MathCast

- **MathDox** developed at the Technische Universiteit Eindhoven, is written in Javascript and uses the HTML5 canvas element in combination with jsMath sprite fonts; supports the Open Math standard, i.e. it takes extensibility into account.  
  http://dam02.win.tue.nl/formulaeditor

- **MathMagic** is a stand alone version of the editor used in OpenOffice.org; ?Java? ?Swing?  
  http://www.mathmagic.com/

- **Mirai Math** is a graphical frontend for GNU Octave  
  http://mirai.sourceforge.net/

- **TutorMates** is written in Java, source availability unclear  
  http://www.tutormates.es/


None of these editors meets the requirements sketched above!