

Maplets for Calculus

A Model for Multi-Use Mathematical Software

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Outline

- Accessing Maplets for Calculus
- Acknowledgements
- Overview/Demonstration of Maplets for Calculus (M4C) Project
- Discussion
 - Demonstration vs. Tutorial vs. Assessment
 - Mathematical Notation
 - Accessibility (Platform)
 - Open Source vs. Commercial
- Introduction to MYMathApps
 - MathLex
 - Lessons
- Concluding Thoughts

Accessing Maplets for Calculus

- University of South Carolina

- <http://m4c.math.sc.edu/>

- NOTE:

- Requires access to Maple.
 - To run using USC's MapleNET server, be sure to click the green button next to Use MapleNET 12 in upper right hand corner of the M4C window.
 - If login required, use TIME2014 for both username and password.

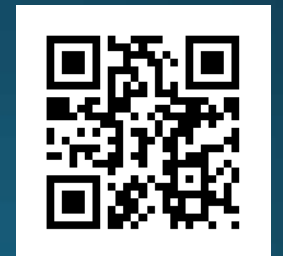
- Texas A&M University

- <http://m4c.math.tamu.edu/>

- Free sub-collection of 16 Maplets from the M4C.

- NOTE:

- Requires local access to Maple.



Acknowledgements

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 - Dr. Raymond Patenaude (USC 2013)
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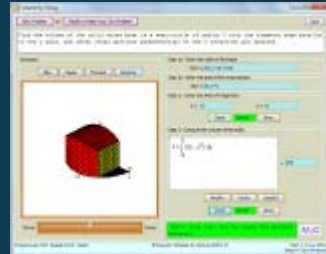
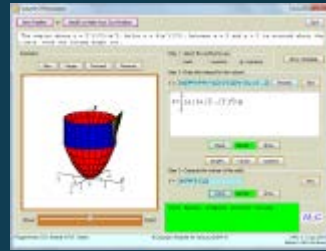
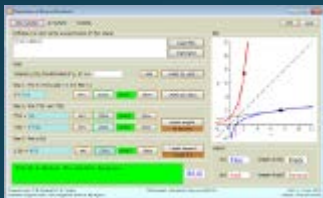
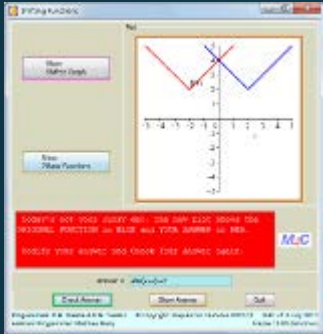


Overview of Maplets for Calculus

- A Maplet is a Java applet authored within the CAS Maple.
- M₄C is a collection of more than 200 Maplets on topics in precalculus, single-variable calculus, differential equations, multivariate calculus, and a few games.
- Many started as student projects in Honors courses at TAMU.
- Requires access to Maple (or MapleNET or MaplePlayer).

Overview/Demonstration of M4C

- Graphical feedback is provided to reinforce understanding.
[Shift] [VolOfRev] [VolBySlicing]
- Student work is checked step-by-step and symbolically.
[AbsValLinEq]
- Problems algorithmically generated or user entered (if appropriate).
[DerivativeDrill]
- Customized feedback – including hints – related to response.
[DerivInvFn] [RRFillCone] [ODESeparable]



Additional Benefits of Using M4C

- Common collection of resources for multiple pedagogical purposes:
 - Lecture Demonstration
 - Group / Lab Exercise [[USC MATH 142](#)]
 - Tutorial
 - Assessment
- Common interface with consistent mathematical notation (Maple).



Disadvantages of Using M4C

- Assessment is not integrated / automatic
 - Require students to turn in screenshot of worked example.
 - Can be manufactured (click Show, then Check).
 - Prepare quiz based on screenshot of one (or a few) example.
 - Instructor still has to grade and record scores.

Disadvantages of Using M4C

- Mathematical notation is not always intuitive
 - Maple is case sensitive
(a and A are different objects)
 - Must use Pi
(not pi or PI or 3.14 or ...)
 - Must use exp and ln for exponentials and logarithms
(not e[^] or log or ...)
 - Must use arcsin for inverse sine
(not asin or sin[^](-1) or ...)

Disadvantages of Using M4C

- Requires access to Maple (or MapleNET) from a device that runs Java.
 - Maple is available for Windows, MacOS, Linux
 - Java does not run on iPads or most tablets or most smartphones

Disadvantages of Using M₄C

- Not free
 - Available from <http://MYMathApps.com/>
 - \$29.95 for users with a current Maple license
 - \$39.95 for the version that runs under the Maple Player
 - Special pricing for multi-user licenses are available
 - NOTE:
 - The sub-collection of 16 free Maplets is also available from MYMathApps.com via USC's MapleNET server.



Introduction to MYMathApps

- <http://mymathapps.com/demos/>
- MathLex
 - Open source web-based mathematical expression editor
- MYMA Lessons
 - Reimplementation of the M₄C in Javascript and HTML₅
 - Fully functional on iPads, tablets, and smartphones



MathLex

- <http://mathlex.org/>
- Undergraduate Thesis for Matthew Barry (TAMU 2014)
- Open source web-based mathematical expression editor
- Input via palettes and/or keyboard
- Some similarities with LaTeX (delimiter is &, not \)
- In addition to presentation, retains content
- Output to LaTeX, Sage, or a language of your choice
- Easily incorporated into any website desiring math input



MYMA Lessons

- <http://mymathapps.com/demos/lessons/>
- Reimplementation of the M₄C in Javascript and HTML₅
- Fully functional on iPads, tablets, and smartphones
- Retains advantages of M₄C



Additional Prototypes

- Still use Maple for development and prototyping of new interactions and functionality.
 - Grading
 - Rating
 - [AccVelPos]

Concluding Thoughts

- Pedagogically optimal utilization of technology in mathematics requires the same level of standardization as mathematics itself.
 - Notation
 - Terminology
 - Open communication and sharing of ideas
 - Tools to simplify (automate) routine tasks

Concluding Thoughts

- There are places for open source and for commercial products.
- Finding a balance between these two worlds is its own challenge.
- Development would benefit if contributions were recognized as significant professional accomplishments in the same sense as traditional research.

Concluding Thoughts

- The continuing evolution of the Maplets for Calculus project is showing some progress in some of these directions. We do not claim to have all of the answers, but hope that by sharing our experiences we can move closer to a time when all of our best ideas can be easily implemented and shared with others.
- We are looking forward to continuing to participate in this journey!

Thank you for your attention and interest, and particularly to the conference organizers.

- For additional discussion, please contact either author.

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