Commercial CAS programming environments: a brief comparison

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Image restoration

• Signal-processing model of imaging device:

\[ x \xrightarrow{A} y \]

• Problem: given measurement \( y \), retrieve underlying signal \( x \)

• Typically linear model (\( A \) is a matrix)
Algorithm research: discussion

• Creativity
• Reproducibility
• Interoperability
• Productivity

⇒ Best platform?
CAS comparison

• Application example: implement and document toy algorithm for image restoration

• Demo of 4 CASs:
  - Matlab
  - Mathematica
  - Maple
  - Jupyter (non-commercial)
Matlab Live Editor

- Introduced recently (R2016a)
- Basic functionality, easy to learn
- Matlab language targeted towards linear algebra
Mathematica Notebook

- Mathematica 11 just released
- For large software projects, the Mathematica documentation recommends using the Wolfram Workbench (based on Eclipse)
Maple Document/Worksheet

- Maplesoft advertises two possibilities for advanced coding:
  - Code Editor
  - Maple IDE (based on Eclipse)
Jupyter Notebook

- Web server for browser-based edition of documents that interleave code and explanatory text
- Support for Python and 40+ other languages
Summary

- Dominant CASs seem to be converging towards interactive documents
- Mathematica and Maple: head-to-head race
  - Very similar feature set
  - Image-processing libraries have some limitations
- Historically Matlab has been very popular among signal-processing engineers; over the past few years, Python has gained popularity thanks to its extensive libraries