On the development of Mathematica-based question type plugin for Moodle

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We have developed the e-Learning system "MATH ON WEB(MOW)".

http://www.las.osakafu-u.ac.jp/lecture/math/MathOnWeb/

Summary of MOW is:

- Mathematica and webMathematica based e-Learning systems which are developed under support of national subsidy(GP).
- Consisted of WMLS and WASM, both are standalone systems and the number of question data is more than 1000.
- Usually, teachers recommend (not force) the students use the system and conduct small tests from the contents.

Why we have developed MOW:

- In the university, linear algebra(L.A.) are quite important and for both of the STEM + some non-scientific courses (e.g. data science course) L.A. is required.

- Topics related to matrices and equations and parametri -zations of a plane($\subset \mathbb{R}^3$) disappeared from the high school textbook(education guideline). Moreover, in the future, because of the national policy focusing on education of statistics and information, high school students may not learn topics of vectors in the case of non-science courses.

- L.A. of the 2nd semester includes some abstract topics, e.g. abstract vector spaces, direct sums, linear maps, and the concept of matrix representation...

$\Rightarrow$ Afterclass learning environment is required.

MOW has the following problems:

- The systems are standalone and not linked to Moodle-based LMS of our university. Almost all teachers are not admin, so they cannot check whether students are solving quizzes or how they make mistakes until after the elapses of about 5 or 6 weeks since the beginning of the semester.

- When the version of the OS got up in the future, there was no budget for according modification of the system, and continued use of the system has became difficult recently.

We can take one of the following solutions.

- Convert question data to STACK (I have done more than half, but not all!)
- Develop MOW plugin of moodle and use it!
- Use another question type of Moodle(I mention in the another talk later).

STACK is a really powerful plugin, but debugging is a little difficult because of some restrictions and some functions overwidden by original functions.

One confuses grammar when using different programming languages, Mathematica and Maxima.

Mathematica can handle string processing highly.

⇒ we wanted to use tentatively *Mathematica*.

Now examples

http://webmathm.las.osakafu-u.ac.jp/bank/

Conclusion and future works

We have developed MOW plugin, almost compatible MOW.

But it is still alpha status, so we want to fix so that

- it can deal multiple output of Mathematica automatically, so one can use TeXForm not OneLineTeXForm for easy debugging.
- one can use MathJax/KaTeX on the input form area.
- one can use size and/or other options in the input forms.
- it has no other bugs!

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