STACK + JSXGraph

Pekka Alestalo, Miko Karjalainen

Aalto University, Helsinki, Finland

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2. International JSXGraph Conference
1. What is STACK? (Pekka Alestalo)
2. Introduction to bind_point commands (video by Miko Karjalainen)
What is STACK?

- **STACK** = the System for Teaching and Assessment using a Computer algebra Kernel
  - [https://www.ed.ac.uk/maths/stack](https://www.ed.ac.uk/maths/stack)
  - STACK Documentation

- Created by Chris Sangwin in 2004 (formerly University of Birmingham, now University of Edinburgh)

- Main developers: Sangwin, Matti Harjula (Aalto University, Finland), Tim Hunt (Open University, UK)
We started using STACK at Aalto University in 2009, initiated by Antti Rasila.

Today used in practically all basic math courses, but also in Physics and Economy courses.

Fall term 2020: circa 200 000 STACK problems solved by Aalto students.

Jan-Feb 2021: Calculus MOOC course with materials and exercises using STACK and JSXGraph within the ITEMS project lead by Alfred Wassermann:

https://itemspro.eu/
Properties of STACK

- Producing Math and Science exercises with
  - algebraic input (numbers, formulas, expressions)
  - (mostly) familiar syntax for typing expressions
  - syntax validation before answer is submitted
  - SI units possible in answers
  - randomized parameters so that every (?) student has a different but equivalent problem
  - automatic checking and immediate feedback
  - model solution adapted to the parameters of each student
  - automatic recording of points and statistics
  - students’ input saved for the teacher
  - exercises and sets of exercises that adapt to the students’ progress (stateful problems)
Why STACK?

- STACK is free!
- Automatic checking with MAXIMA can handle equivalent expressions.
- Randomized problems give more pedagogical freedom; e.g. it is possible to give more weight to the exercises in grading the course.
- Randomized problems move students’ discussion from the correct answer to the solution method.
- Large groups of students can be handled as easily as small.
- Students can do the exercises wherever they have internet access.
- Abacus network for sharing STACK problems (and other materials)

[https://abacus.aalto.fi/](https://abacus.aalto.fi/)