This Working Group is, according to long-lasting activities of RISC, dedicated to technological and conceptual foundations of teaching and learning mathematics under the title

Convergence on Mathematics Assistants (ConvMathAssist)

Scope and goal:

Concepts and tools from computer mathematics are being merged for educational purposes in various ways: mechanized mathematics assistants (MMA) hiding drawbacks of computer algebra systems (CAS), MMA exploiting the power of computer theorem provers (CTP), CTP built upon CAS, dynamic geometry systems (DGS) integrating CTP, single-stepping systems (SSS) building upon CAS or upon CTP, and graphing tools for all kinds of functions combined with CAS etc.

And the practice of education adds to the variety of concepts and tools resulting in an abundance of e-learning tools and e-content uncountable and unmanageable for educators. Thus teachers are confused about the variety offered on the internet and elsewhere. And publishers, software houses, individual developers, teachers etc add to this variety repeating much of what has already done, and often missing employment of basic and general math tools.

Mathematics, however, as a thinking technology, has already converged to widely accepted foundations in logics --- it seems high time to consider how to converge the tools towards their common foundations. Thus this workshop addresses three goals:

1. Clarify differences and common grounds in concepts and technologies of the various MMA, in particular common grounds in respective views of mathematics and logics.
2. Inform educators about what to come from computer mathematics within the next years, and stimulate their suggestions for improvements on the MMA.
3. Foster broader two-way communication between MMA developers and math educators.

The workshop brings together tool developers and experts of the respective backgrounds in mathematics, logics and technology with experts in didactics and teachers, who are interested in more than one of the following questions:

- **Convergence by extending application areas**: To which areas could the application of a specific MMA be extended to (university – high school, mathematics/computer science – biology/chemistry/physics/...) ?
- Which extensions or changes of the MMA would be required for which application area ?

- How supports a MMA changing representation (algebraic / geometric / graphic) of one and the same mathematical concept ? One or two-way change ?

- **Convergence on common foundations**: How can mathematics and logics underlying an MMA be made comprehensible for users ?
- To what extent does a MMA expose the underlying mathematics and logics to the user or hide it in order to protect from intricacies ? To what extent for users at which level ? Can the exposure be gradually increased ?
- How can details be hidden: by "filtering" off from representation, by "fixing" in specific tools for specific problems, by appropriate transformation from internal to external representation, etc ?
- How much can the formulation/specification/handling of a task assigned to an MMA vary between informal/intuitive and formal/rigorous ways ?
- How does a specific MMA support mathematical reasoning: by rigorous formal feedback, by providing informative illustrations, by motivating experiments ?

- **Convergence in user requirements**: To what extent can a MMA resemble “paper and pencil work” ?
- Can systems explain themselves (show examples, make underlying concepts transparent to the user) ?
- How can algorithms of symbolic computation, indispensable for applied mathematics (integration, cancellation of multivariate polynomials etc), be made self explanatory ?
- How can geometric constructions be conceived as “abstract operations” in spite of their concrete representation in a DGS ?

Submission of papers to this Session should proceed via the ordinary submission procedure of CADGME but should be marked by "Session ConvMathAssist".

Program Committee:

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