

INTEGRATION OF NEW MATHEMATICAL IDEAS INTO ENGINEERING CURRICULUM: CASE OF TROPICAL MATHEMATICS

V. Kazakevich, S. Kolonitskii, E. Tolkacheva

SPb Electrotechnical University “LETI”

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Problem statement

- It is important to introduce students to current state in mathematics and its applications.
- Our students will be software engineers.

“LETI” – specifics

- Our students will be software engineers
- Classical courses (algebra, calculus etc.): results date to XVIII-XIX c.
- Graph theory, logic, algorithms: some results date to XX-XXI c.
- Connect to applied areas
- Introduce new ideas into engineering practice (over educational process)
- Conservatism of the system of education

Why Tropical Mathematics?

Criteria for successful introduction:

- Recently emerged areas: moderate learning curve, easy unsolved problems
- Relevance
- Immersed in context: educational AND professional
- Available friendly researchers

Tropical Maths courses in other Universities

- All such courses are meant for MATH students
- Focus on the formal side
- Lack of motivational examples
- Examples are often barebones or less (!)

Sources

- Most books in English are written by MATHEMATICIANS for MATHEMATICIANS
- Same problems as with courses
- Many notes in Russian are in wrong context, e.g. algebraic geometry.

Process of integration

Natural growth: from small to large, in stages.

- Scale in the number of students
- Scale in the amount of lessons
- Gradual formation of community
- Legitimization of tropical mathematics

Stage 0

Minicourse by D. Grigoriev
(spring of 2019)



Stage 0: results

- Records, available online
- Discussions after the lectures
- Emergence of a group of interested students

Stage 1

- Students' seminar “Tropical maths and neural nets”
- Seminar “Algorithmic maths”, N. Vasiliev



Stage 1: results

- Familiarization with the term “tropical maths”
- Students started discussing tropics among themselves
- Emergence of a group senior students who can and want to supervise juniors
- Emergence group of department members who work with students on topics related to tropics

Stage 2

- Regularly scheduled seminar
 - A course for year 4 bachelor students
 - A course for year 2 master students
- Research

Stage 2: results

- Every student of our department has heard the term “tropical maths”
- Neural nets became a main example of application
- Tropical maths community has grown and matured
- Methodics are in development

Stage 3 (work in progress)

- Scaling in the size of student group
 - Tropical mathematics are slated to be offered as an elective for all senior-year bachelors of FCST.
 - "Basics of tropical mathematics" course is planned to be introduced for bachelors as our department opens its own bachelor program.
- Scaling in the amount of allotted time
 - A lecture on tropical maths will be given as a part of Computer Maths course



Thank you for your attention!

Discussion