



HAL
open science

The Fraunhofer MINT-EC Math Talents Programme

Martin Bracke, Patrick Capraro, Jana Kreckler, Andreas Roth

► **To cite this version:**

Martin Bracke, Patrick Capraro, Jana Kreckler, Andreas Roth. The Fraunhofer MINT-EC Math Talents Programme. CERME 9 - Ninth Congress of the European Society for Research in Mathematics Education, Charles University in Prague, Faculty of Education; ERME, Feb 2015, Prague, Czech Republic. pp.959-960. hal-01287276

HAL Id: hal-01287276

<https://hal.science/hal-01287276>

Submitted on 12 Mar 2016

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

The Fraunhofer MINT-EC Math Talents Programme

Martin Bracke, Patrick Capraro, Jana Kreckler and Andreas Roth

University of Kaiserslautern, KOMMS, Kaiserslautern, Germany, roth@mathematik.uni-kl.de

Fraunhofer MINT-EC Talents supports talented, selected students from ages 16 to 18 and encourages them to develop their own scientific research interests and projects. Those projects are suggested and designed by the students as part of their independent work. It is important, that each project contains theoretical mathematical work alongside technical aspects like the control and construction of electric devices. Members of KOMMS support them by providing mathematical and technical expert knowledge and soft skill training during several workshops and by offering infrastructure for communication and computing.

Keywords: STEM, talent, secondary education, workshops.

SETUP

The programme is a cooperation between KOMMS (Competence Centre for Mathematical Modelling in STEM Projects at Schools, <http://komms.uni-kl.de>), the ITWM (Fraunhofer Institute for Industrial Mathematics, <http://www.itwm.fraunhofer.de>), and MINT-EC (Association of Mathematical and Technical Excellence Centres at Schools, <http://www.mint-ec.de>). MINT-EC certifies secondary schools (Gymnasia), which exhibit a distinctive profile in STEM disciplines. Talented students at ages 16 are selected from these schools, and get the opportunity to work on mathematical-technical projects together during several workshops, parallel to their standard secondary education. The project does not have to end with their final exam; given the quality of the developments made in the two-year course, participation at competitions like “Jugend forscht” (“Youth researches” – a German youth science competition, <http://www.jugend-forscht.de>) is possible and desired. The number of project groups and their participants is determined in an initial workshop. We make sure, that the challenges of each topic include the necessity of

mathematical modelling as well as the actual implementation of software and construction of devices. It is important, that the students themselves decide how to approach their projects and which resources are needed to proceed. The supervisors, who are KOMMS personnel, can then offer support from their experience with modelling and solution of real-world problems. Fraunhofer ITWM provides financial support to purchase necessary hardware components, offers infrastructure for communication via the myTalent portal and also pays for accommodation and transport during workshops. Due to a sponsoring agreement with MathWorks, the students in the current programme have the opportunity to work with the Matlab and Simulink Student Suite. This tool provides enough abstraction from the hardware layer, so the students can focus more on mathematical challenges and have to deal with less implementation issues. During the workshops, the supervisors or external experts offer compact courses for skills in several programming languages or for different types of hardware, if needed. The poster includes a graphical representation of the activities belonging to the MINT Talents programme and displays the involved parties and their tasks.

PROJECT EXAMPLES

Some project examples are explained with concise statements and pictures.

Playing billiards with electronic assistance

A computer software shall help a billiard player to decide which ball is the easiest to play next. A camera is used to capture the development of the game, hence it is necessary to get acquainted with basic methods of image processing. A mathematical model has to be established to rank different possible moves. As an extension, the software should be able to screen

the players' skills in order to generate a profile and to give personalised suggestions.

Automatic steering of model quadcopters

A quadcopter model aircraft is supposed to navigate autonomously in a specified region and to recognise certain objects. Mathematical methods for image processing and strategies for autonomous navigation have to be developed. A swarm model can also include more than one aircraft.

GOALS

Students should emerge from the programme as self-confident young individuals, who will be able to do excellent research in the future. Acquiring expertise in project-oriented work is also the basis for putting their own ideas into market some day. But most importantly, the students learn to work with applied mathematics intuitively and produce visible results from a science, which is often considered to be of an abstract and not application-oriented type. This experience is in general not achieved by means of classic school teaching. The workshop character of the programme additionally teaches a variety of soft skills, which can come in handy in the future academic or job-related lives of the students.