

Of Birthdays and Earthquakes – Exploring different domains in various interaction modes with flexible collaborative modelling tools

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Abstract

This interactive event will focus on computational modelling tools as media for infusing innovative learning scenarios. The learner has the opportunity to explore concepts of different domains through interaction with other learners in a distributed computer-supported learning setting. In these learning scenarios, we are using tools that support both free hand input which is not interpreted by the computer together with computer-interpretable “visual modelling languages” or “microworlds” (Pinkwart, et al., 2002). This scenarios are not only of interest for virtual learning applications but also for face-to-face classrooms with networked computing facilities. Ubiquitous computing technology with specialised devices such as big interactive screens (whiteboards) or pen-based tablet computers will be used in practical scenarios.

We will show the possible use of these tools and suitable technology in two different domains of expertise and with different modes of interaction between the users: On the one hand in the context of stochastics exploring the famous “birthday problem” cooperatively, on the other hand in a competitive scenario in the domain of seismic activities, where the center of earthquakes has to be determined.

Objective

The hands-on experience participants will have in this interactive event with prepared material and problem tasks at hand will illustrate features we consider important for flexible learning environments that enable different modelling techniques as well as different modes of interaction for the users:

- a flexible plug-in mechanism for various modelling functions, which makes the modelling tools extensible easily
- enabling various interaction modes for the users, such as collaboration, cooperation, and competition
- integration of elements from various model representations and their mixture with free-hand input

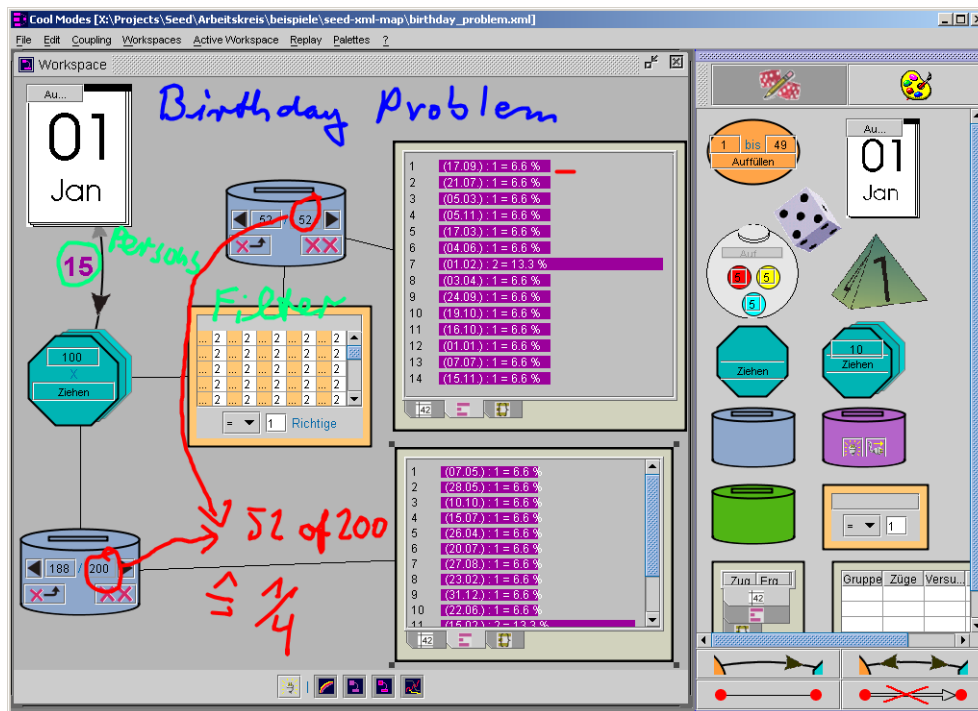
References:

Pinkwart, N., Hoppe, H.U., Bollen, L., Fuhlrott, E. (2002) Group-oriented Modelling Tools with Heterogeneous Semantics. In Cerri, N. et al (Eds.): *Lecture Notes in Computer Science 2363, Intelligent Tutoring Systems* (pp. 21-30). Springer.

Description

We plan to explore two prepared scenarios with participants of this interactive event using the collaborative tools CoolModes and FreeStyler.

The first scenario is the popular “*birthday problem*” within the domain of stochastics. The question underlying this problem is: “What is the probability that in a group of N people ($N=1,2,3,\dots$) there are two people with the same birthday date (day + month, not year)?” The follow-up question is usually “Of how many people must a group consist so that the probability of “two people/same birthday” is higher than 60%?”



The participants will learn how to construct a model *collaboratively* in Cool Modes which represents the birth dates of a given number of people (e.g. 20) by chance. Running this model they have the possibility to explore and evaluate the frequencies of the interesting result “two times same birthday”, which can be seen in the figure below. In a next step this model can be modified to investigate under which conditions the probability for this occurrence is higher than 60%.

The other scenario that will be presented in the interactive event is a *competitive* scenario in the domain of *seismic activities*. The corresponding reference frame for this scenario enables the user to determine the origin of *earthquakes* based on data collected from several stations. An example for the data can be seen in the figure below.

In the prepared example users will compete in finding the distance to the earthquake's origin by combining the results from various stations. The time lag between primary and secondary waves (see figure) indicates the 3-dimensional distance. With variation of the assumed depth of the center, the air-line distance is estimated. Using data from at least 3 different stations enables the user to find the center of the earthquake both in 3 dimensions (hypocenter) and in air-line distance (epicenter). The competition can

take place both without information exchange and with information exchange of previous calculations.

