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hroot:
Hamburg registration and
organization online tool

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Abstract

hroot (Hamburg Registration and Organization Online Tool) is a web-based software designed for managing participants of economic experiments. This package provides important features to assure a randomized invitation process based on a filtered, pre-specified subject pool, and a complete documentation of the selection procedure for potential participants of an experiment. It offers detailed statistics, subject pool filtering, and an internal calendar.

1.   Introduction

The success of the experimental method in economics in recent years is astonishing. The number of articles related to economic experiments has been increasing exponentially: Comparing the number of articles reporting experimental results in nine leading economics journals, a 75% increase in the years 2006-2010 compared to 2001-2005 has been reported (Noussair, 2011). Important components for the progress of the experimental method are advances in computerization (e.g., the software package z-Tree, see Fischbacher, 2007). With the current software package hroot, we facilitate the organization and administration of experiments in economics. hroot was developed in 2011 and 2012 at the University of Hamburg. Its development was based on the experience of administrating laboratory experiments in the field of economics with the first generation software (e.g., ORSEE, see Greiner, 2004), and detailed comments and suggestions by several experimental groups from economic laboratories across Europe and the United States of America.[1]

During the last decade, the requirements for registration- and administration- software have become more demanding. One crucial reason are social networks which facilitate the spread of information on experiments constantly and at any given time (e.g., via web-enabled mobile phones). hroot responds to the challenge by introducing new precautions regarding the recruiting and *randomization* of participants. On the

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[1] We are grateful for comments and wish lists from the laboratories in Bonn, East Anglia/Warwick, Frankfurt, Konstanz, Magdeburg, New York/Abu Dhabi, Oldenburg/Bremen, and Zurich.

other hand, laboratories need efficient and transparent procedures concerning the organization of experiments in large numbers to meet the scientific standards[2] of highly ranked (economic) journals. Again, hroot reflects these requirements by introducing special features for the *documentation* of the experimental process. Moreover, hroot allows the replacement of previous solutions in a well-documented migration process offering all below-described improvements.

hroot (except customized solutions) can be licensed free of charge. However, when reporting results of experiments organized with hroot, the license requires citing hroot's use in the publication. The license is available upon request at the University of Hamburg.

The remainder of this note is organized as follows: first, we briefly describe the core user features along some technical details. Second, a short documentation of hroot is provided.[3] Third, we conclude the article with a brief summary.

2. Core features

2.1 Collaboration

Although the project has been initiated by the experimental laboratory at the University of Hamburg, it has been developed in a collaborative structure: several laboratories with long-standing experience collaborated to guarantee a program that is both innovative and easily applicable to existing structures. hroot allows the administration of all kinds of social science experiments ranging from the small self-administered lab to big lab-corporations.

2.2 Technical details

hroot is implemented in Ruby using the web framework Ruby on Rails. To improve user experience and browser interoperability, many front end features are implemented using jQuery and Ajax components. Both Postgres or MySQL databases can be used for data storage. To ensure software quality, the project was organized as an agile software development process, borrowing elements from the Scrum development method, such as focus on user stories with estimation, short development cycles and testdriven development as well as test coverage measurement. We use git for source code man-

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[2] Most of our standards are initially described and derived from the seminal work of Sir Ronald A. Fisher (1935).

[3] An in-depth description of the program, all technical details, and the migration process are provided in the documentation of hroot which is available online.

agement, and we established a ticket system for bug tracking and future improvements. The laboratory at the University of Hamburg will provide software support and updates for hroot.

2.3 Settings

hroot provides a set of default preferences based on the demands of an administered lab as in Hamburg. However, most settings can be modified by the administrators and the default messages and items can be adapted according to lab's specific demands. Administrators can determine email formats, add new lab rooms, insert diverse templates for emails (invitation text, registration confirmation, session reminder, etc.), for the privacy policy, for legal notices, and for changes in subject's possible input data like field of study, profession, degree and so on.

2.4 Sampling

hroot supports a thoroughly randomized selection process of participants for experiments. To avoid the formation of cliques and quick-response-groups (e.g., via internet connected cellphones) the invitation mailing process is designed in a multi-stage randomized way. No public calendar is provided, so that participants cannot form groups in advance for experimental sessions.

2.5 Documentation

For the maximum of flexibility of selection criteria, hroot provides an adaptive tagging system. To allow full *replication* of experiments, all selection criteria and processes concerning the actual sampling of potential participants for an experiment are made fully available to the experimenter. hroot stores all filter and selection procedures of the invitation process. This documentation is easily available and can be integrated – if requested – by the experimenter into publications.

3. Short documentation

3.1 User hierarchy

The hroot system works with three groups of users: administrator, experimenter, and participant. All are listed in the Menu "User". By filtering for "role", hroot provides member-lists of each of these groups separately. User-rights are continually manageable: administrators can access and edit every bit of data in the system; participants are restricted in their access to the system and can manage bits of their own data only, while experimenters are endowed with rights that might be appropriate for a specific

experimental and laboratory environment. All users enter the system via personalized secure login. The design of the login page can be adapted via templates to seamlessly integrate visually with other websites, as most labs already have a web infrastructure (see Figure 1).
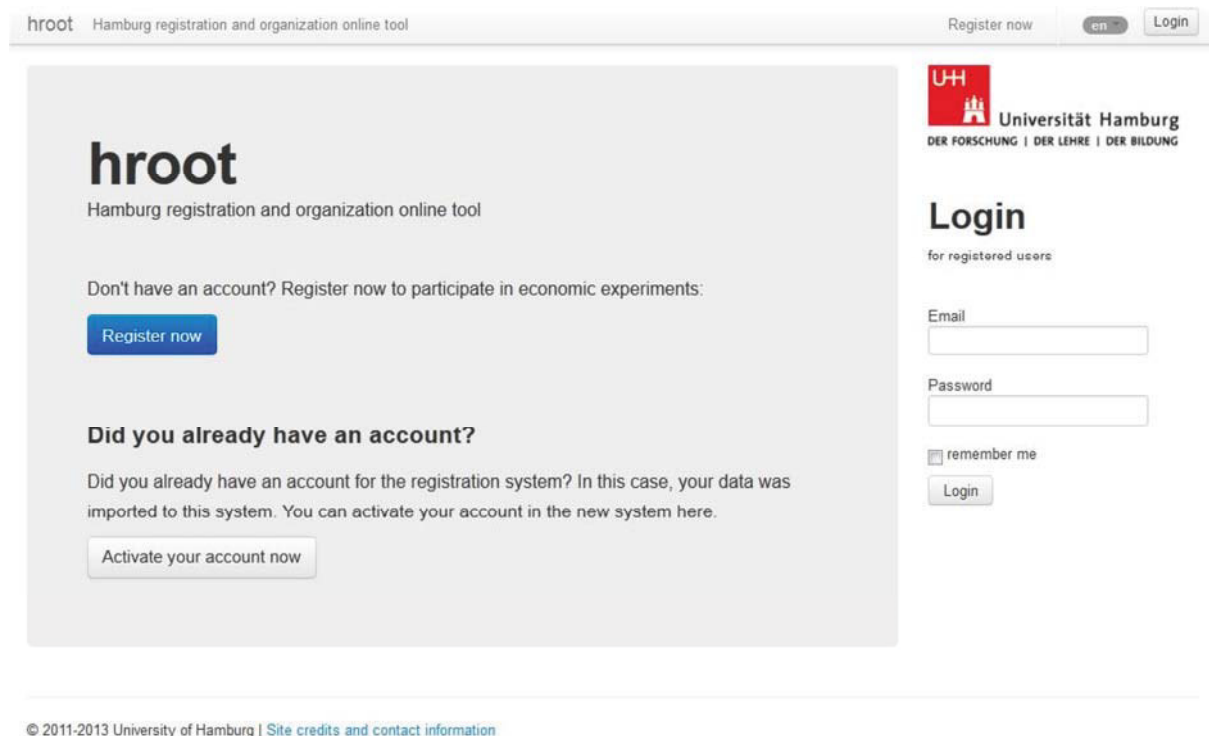

Fig. 1: Login page

3.2   Interface: administrator

An administrator has full access to all the features provided by hroot (that is, administrators can edit all features which are described subsequently for other user groups, too). They can set up and edit experiments, send invitations and reminders, edit users and manage the laboratory calendar. Furthermore they are able to change the default settings of hroot and add new settings, including email templates or experiment parameters. The administrator's dashboard provides a customized quick and easy accesspoint to various features of the system (see Figure 2).
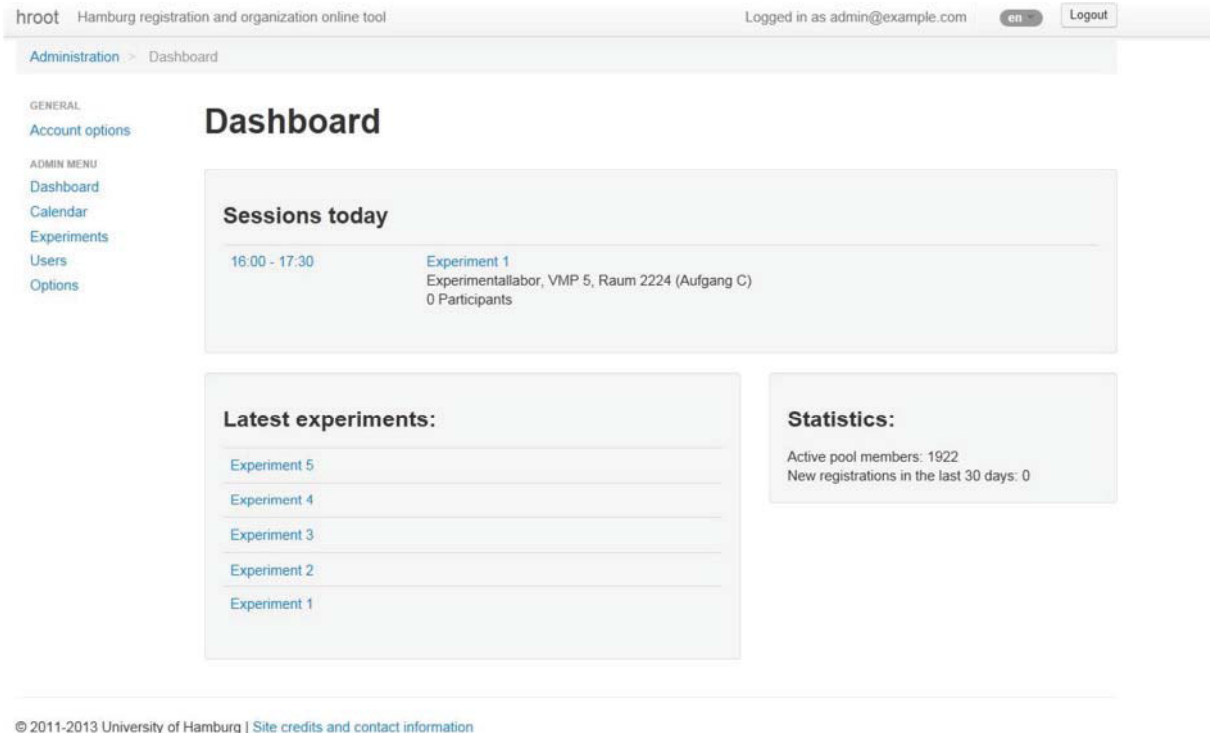
Fig. 2: Administrator's dashboard

3.2.1 Setting up an experiment

For registering a new experiment, administrators have to provide some basic details of the experiment, such as name, category-Tags (e.g. "Public Good"), short description, and contact information regarding the experimenter (which will all not be shown publicly). In addition, hroot provides the option of email addressors: Emails from the system will set this address as the sender of all correspondence with participants for this experiment.

3.2.2 Session editing

The system allows splitting the time window into preparation time, approximate duration of the session and follow-up time, the sum of which will be booked in the laboratory calendar. Automatic email dispatch can be activated, which schedules sending a reminder to registered participants before the beginning of each session. hroot also allows for follow-up sessions, so that an experimenter can work with the same participants over a couple of sessions. Likewise, it allows the duplication of sessions when editing an experiment, a very efficient tool when there is more than one session with the same parameters to be set up.

Fig. 3: Selection of subjects

3.2.3 Assigning pool members

In the next step, potential participants are assigned to an experiment or even specific sessions. Here, one can select all pool members or filter the pool by a set of criteria, which is provided by the generic tag system (see Figure 3).

To ensure the *replicability of experiments*, hroot documents the entire filtering procedure of potential participants. For this purpose, a detailed overview (see Figure 4) of all filters used is provided under the option "history of participant assignment". The option reports for each experiment how participants were selected by using the filters. Every step of filtering can thus be analyzed in detail at any time, especially after the experimental sessions have taken place.
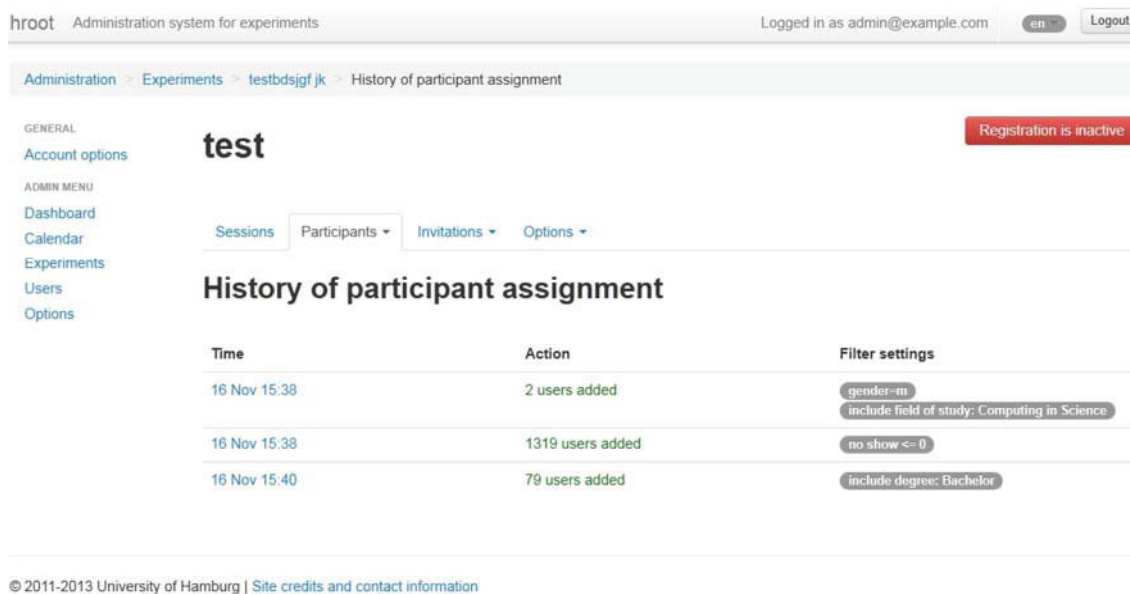
Fig. 4: Filter documentation

3.2.4 Invitation

To protect against the formation of 'quick-response' groups, hroot offers a *multi-stage randomization* of the invitations sent out to the subject pool. As contemporary mailing systems send out emails in packages, hroot allows for the active control of this packaging. That is, the assignment of an email address to a certain package is random (by default – however, the program allows to specify alternative packaging to invite specific subgroups first), while the size of the packages and length of the dispatch period can be controlled in hroot (see Figure 5). The delivery of invitations can be stopped at any time by the lab-administrators, and in addition, hroot stops inviting pool members via email as soon as the sessions of an experiment are filled. This feature improves the randomness of participation at any given experiment, while, in the meantime, it keeps close control over who actually registers for experimental sessions. Text templates and default text blocks facilitate the invitation process. The registration for an experiment has to be actively initiated by an administrator or an experimenter with appropriate rights. Accordingly, the registration for any experiment can be closed at any time.

3.3   Interface: experimenter

The access rights that can be granted to an experimenter range from all the features provided to administrators and only essential ones necessary to run a single experimental session (the administrators assign the rights). Again, a dashboard provides a customized quick and easy access-point to various features of the system. Past, current and future experiments are listed in chronological order.

Fig. 5: Invitation interface

3.3.1 Calendar

hroot provides a strictly internal laboratory calendar only accessible for experimenters and administrators – this decreases the risk of clique formation since the least amount of information concerning the relation between experiments and sessions is made public. The calendar contains a detailed overview of all experiments and their sessions for a given experimenter and of all experiments for the administrator (see Figure 6). It can be integrated into other calendars via *ICS-link*.
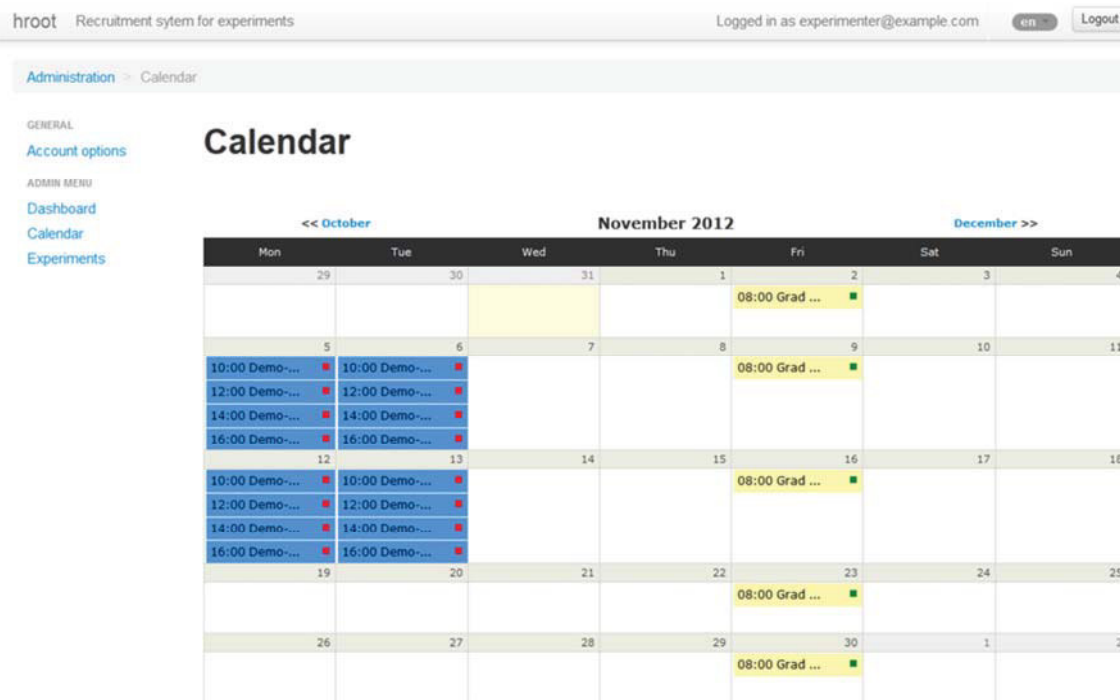
Fig. 6: Laboratory calendar

3.3.2 Documentation

To allow full *replication* of experiments, all selection criteria and processes concerning the actual sampling of potential participants are fully documented. Particularly, hroot stores all filter and selection settings of the invitation process. The documentation facilitates substantially the replicability of experiments.

3.4   Interface: participant

Each participant has to use a personal password to access his or her account. If sessions are open for registration for a particular pool member at the time of login, they are listed for registration via a "registernow"-button on the participant's dashboard. Sessions for which the subject has already registered are also shown providing a quick overview and reminder at any time to participants logging-in to their account (see Figure 7).
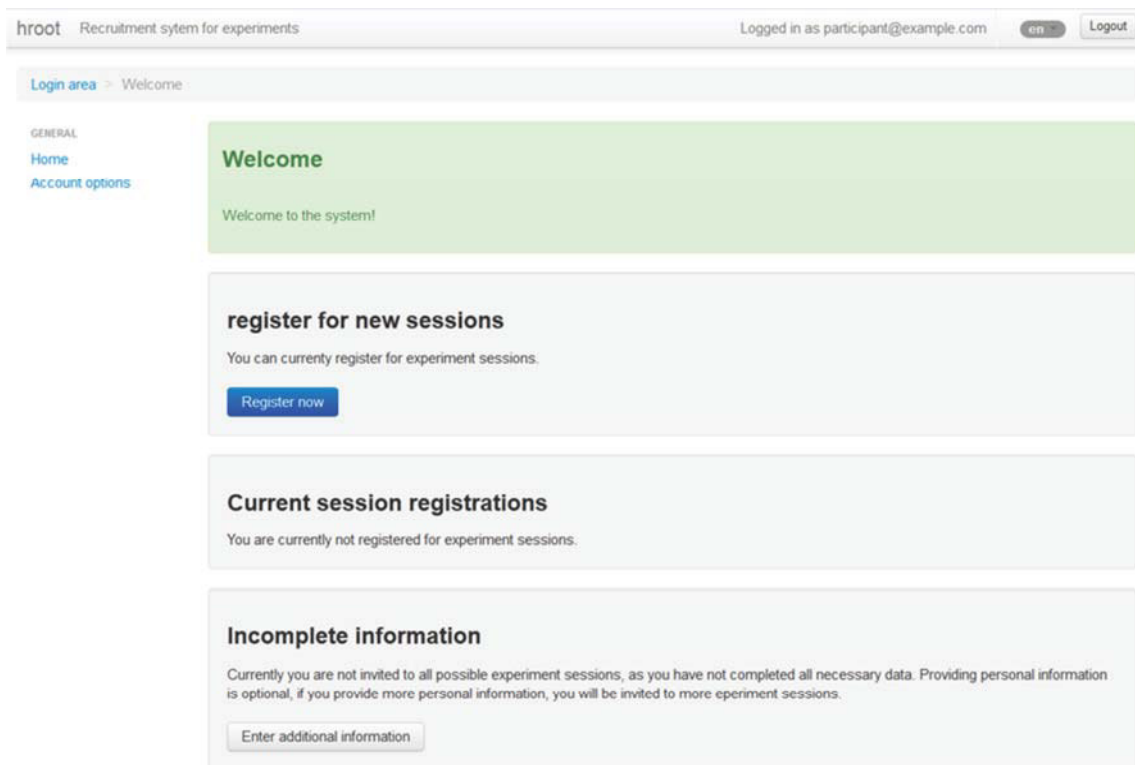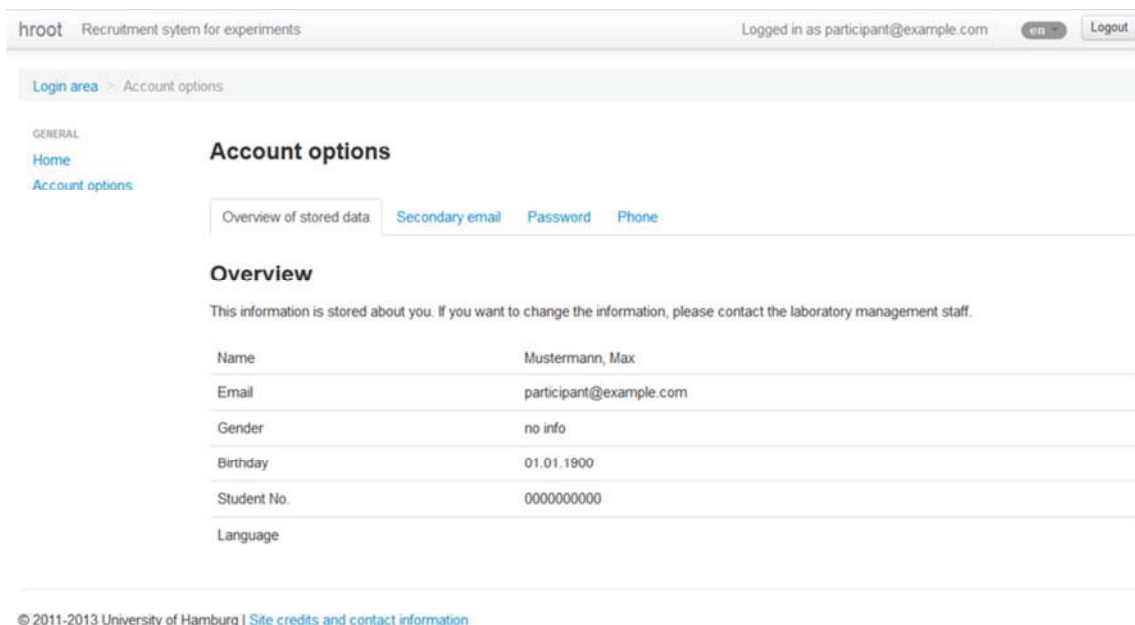
Fig. 7: Participants dashboard

Fig. 8: Personal data

3.5   Additional features

3.5.1 Statistics

hroot stores subjects' personal data and provides detailed statistics of their participation history in experiments. The default categories include name, birth date, student ID, gender, field of study, degree, phone number, and spoken languages (see Figure 8). Personal data – except fundamental information on the name, email address, gender and birthday – can be changed by the participant. Administrators (and, if access right is granted, experimenters) may change all data, and can search for a specific user by name, first name , or email address, or use one of the many filters.

3.5.2 Limited email format

To reduce the risk of multiple registrations of a single participant in the system, hroot offers the option to limit the self-registration of participants to certain e-mail domains (e.g., only email addresses with the ending "@uni-hamburg.de" are accepted). If those domains issue one unique email per user (as many universities do), this restriction reduces the risk of multiple participations of a single person considerably. Notice, administrators can create accounts without the email domain limitation nonetheless even when this restriction is activated. Therefore, participants who do not hold such an email account still can be registered manually in hroot.

3.5.3 Deactivation of accounts

Administrators can deactivate accounts. A deactivated account does not receive any emails and cannot be logged in to by participants. Thus, deactivated users cannot sign in for experiments, while for documentation purposes the data of the account is not deleted.

4.   Summary

We hope that hroot will be an important component enhancing substantially the quality of experimental research in the realm of social sciences and especially experimental economics. The system combines all the main tools to systematically manage subjectpools and to schedule experiments with a state-of-the-art documentation of the complete invitation and participation process. Importantly, hroot emphasizes a controlled process for the randomized selection of participants in order to retrieve valid experimental data. Additional features are introduced to decrease the risk of clique formation and double registration in the system. A constant support and update service for hroot will be ensured by the experimental laboratory at the University of Hamburg.

5.   References

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