Setting up integrated farm animal databases with RapidAPIIS

Zhivko Duchev and Eildert Groeneveld

Department of Breeding and Genetic Resources
Institute for Animal Breeding
Federal Agricultural Research Centre (FAL)
31535 Neustadt am Ruebenberge
duchev@tzv.fal.de
eg@tzv.fal.de

Abstract: RapidAPIIS is free software developed in the APIIS framework for setting up integrated databases of individual animal records. It is intended for scientists, students and breeders in the animal agriculture with no programming experience. The user can choose from variety of templates for various species and customize them by including the traits recorded within her/his their organization. Thus, the user builds a model file for the system, on which basis a database with full operational GUI for business rules data entry is automatically created.

1 Introduction

Modern animal breeding relies heavily on extensive data collection, storage and utilisation. Pedigree records, numerous morphological and performance traits and breeding values are collected from various primary and secondary data sources, e.g. farms, test stations, breeding organisations, slaughter houses, veterinarians. With the increasing amount and complexity of the information to be processed, the creation of consistent integrated data inventories becomes a major prerequisite for successful data management.

As most of the organisations posses already their data in a electronic form, the main cost item in the development of an information system is the price of the software. In many scientific institutions there are no persons with programming experience, which require hiring of external programmers and starting the development from scratch.

To address this problem, the Adaptable Platform Independent Information System (APIIS) [Gr04] was developed as a generally applicable framework of open source software tools and methodologies for setting information systems which are based on individual animal records.

As part of APIIS, a software for creation of integrated databases with a fully operational graphical user interface (GUI) for business rules based data entry was developed. This software package (RapidAPIIS) allows the users without programming expertise to set up within hours an operational system ready for data entry. Moreover, with RapidAPIIS the user can create also decentralized databases, which exchange data via synchronization protocol developed in APIIS [DG06].

2 Computing environment and system requirements

RapidAPIIS is written in Perl and Perl/Tk and uses PostgreSQL as a database backend. The current version runs under Linux OS. RapidAPIIS is released as Open Source Software under the General Public License (GPL). It is distributed as .tar.gz archive and can be downloaded from ftp://forssa.tzv.fal.de/pub/apiis/rapidapiis/current or obtained from the authors by request.

Prior to usage of the RapidAPIIS, the user has to have a running Linux distribution with graphical interface, installed PostgreSQL, Perl, Tk and several Perl modules, which are listed in the 'needed_modules' file. These modules are available from the Common Perl Archive Network (CPAN) and some of them are even in the standard Linux distributions. However, in the RapidAPIIS distribution there is a Perl script, which installs automatically from CPAN all needed modules.

3 Using RapidAPIIS

All the input, required from the user can be done via the graphical Tk interface of RapidAPIIS. As shown on Figure 1, the user starts with choosing appropriate template for the species he/she is interested in. This template can be customized by adding and removing traits and choosing business rules for the various traits. In the same time the user can add description for the traits (which is used later for a context help), type and label of the responding field on the GUI form which will be used for data entry and modifications. Thus, the user creates a “model” file for the database and the GUI, which is internally stored in XML format. This file can be checked from RapidAPIIS for consistency – e.g. validation of the columns and tables names, duplicated names, foreign keys integrity and redundant indices.

Using the customized model file or the ones offered by the ready-made templates, the user can go to the next step – installation of the software for the new system. This step is completely automated and all the required settings are performed by the system.

Once the software is installed, the database structure can be created and populated with some initial data. This is also automated via a special script, which produces on the basis of the XML model, a batch file with SQL statements and executes them. If the model file is modified, this step can be executed again to initialize an empty database with the new structure. However, there is also an option for modification on a live database, without losing the data, which are described in the next section.

The last step – the creation of the default GUI interface for the new database is also automated and the generated forms are stored directly in the place, where software is installed. These forms can be used with the APIIS graphical Tk shell “apiish”.

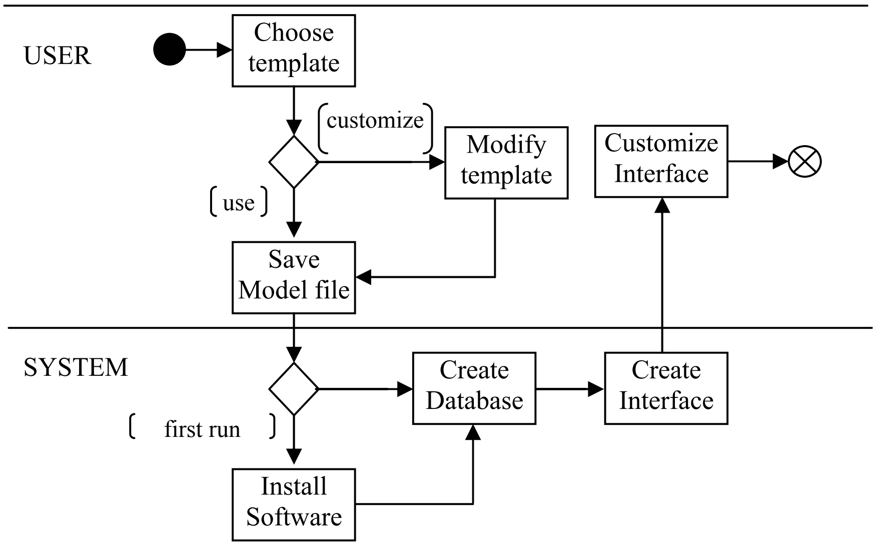


Figure 1: Activity diagram of standard RapidAPIIS usage

4 System components

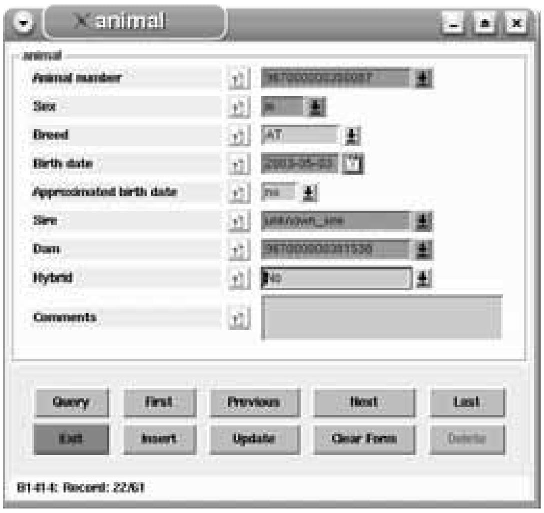
The description and settings of the database structure and the interface are stored in the same model file, but the modifications in the interface do not require recreation of the database. In this section we give more details about the internal handling of these components and the extent to which they could be customised.

4.1 Database structure

The database structure consists of two parts – fixed and customised. The fixed part comprises the tables for storing animal identifications, pedigree data, codes and units used in the system, address and personal information, together with the system tables required by APIIS. The customisable part consists of tables which are in “one-to-one” or “one-to-many” relationship with table “animal”, i.e. for storing single or multiple measurements per animal. It is also possible to have tables not linked with “animal”, e.g. a table for storing environmental daily data.

4.2 Definition and customization of the interface

The GUI forms produced from RapidAPIIS are hardcoded for the fixed part and for the custom part one form is created for each table. The forms are in the XML format developed in APIIS. When a form is called in “apiish” a responding Tk form is created in real-time as the one shown in Figure 2. With such a form the user can insert and update data, query the database and navigate through the results of this query. The XML forms can be customised via ordinary text or XML editor, changing the colour scheme, position and size of the fields, etc. Experienced users with knowledge of SQL can create also complicated forms, like the ones in the fixed part.



animal

Animal number	3670000000250097
Sex	m
Breed	AT
Birth date	2003-05-03
Approximated birth date	no
Sire	unknown_sire
Dam	367000000391530
Hybrid	No
Comments	

81414: Record: 22/61

Figure 2: Tk form for basic animal herdbook data entry

4.3 Modifications on a production database

With RapidAPIIS the user can add or remove tables, columns and indices without the need to recreate the database. Thus, modifications can be done also on a production database. The user has to modify only the model file and the system automatically recognizes the changes, creating the appropriate SQL statements and executes them.

Literature

[DG06] Duchev, Z.; Groeneveld, E: Synchronization of APIIS based farm animal biodiversity systems. Bioinformation, 2006; S. 146-152.

[Gr04] Groenevel, E.: An Adaptable Platform Independent Information System in Animal Agriculture: Framework and Generic Database Structure, Livestock Prod. Sci., 2004; S. 1-12.