The Open Key Editor: a tool for generating flexible digital identification keys for mobile devices

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Abstract

The Open Key Editor (OKE) is a tool for editing and enriching existing identification keys and to produce localized 'minikeys' that apply to local flora and fauna, such as in parks, nature reserves and school gardens or keys that apply to a particular season. The minikeys are easier to use than their originals, simply because of the fact that they deal with less species, their language can be adapted to a particular audience (e.g. pupils) and because they always point to species that are known to be present. Output of minikeys can be tailored for display on computers, smartphones or PDA's.

Keywords

Biodiversity informatics, field guides, identification software, iPhone, smartphones, PDA.

Introduction

Identification keys are often written by experts and aim at an 'academic' audience. Once they are published, they are more or less carved in stone and leave little room for adaptation to a specific audience, a particular region or season. In the case of plants, such a key can - for instance - encompass 1,900 species for the Netherlands or even 5,000 species for Spain and 6,000 species for Italy. Long keys are complicated and have redundant information when used in a region with fewer species, such as a park or nature reserve, or even a school garden. An increasing number of identification tools is published on the internet (Visser & Veldhuijzen van Zanten; Martellos & Nimis, 2008) offering an opportunity for tailoring them to particular audiences and situations. The Open Key Editor (Martellos *et al.*, 2010) allows users to 'crop' a master key and customize it for a given set of species. The 'cropped' key can then be edited for language and illustrations (e.g. to suit a particular user level, or platform such as a mobile phone).

The Open Key Editor

The KeyToNature *Open Key Editor* is a simple, easy-to-use Open-Source tool for editing and enriching a key with user-generated content. It was developed since June 2009 and is written in the PHP 5.2 language, and runs on a MySQL 5.0 database. The code is Open Source and available under the Creative Commons Attribution Non-Commercial (CC-BY-NC) licence. The programme can import dichotomous and polytomous keys with a compatible structure. It is downloadable since December 2009 from the Web Portal of project KeyToNature (http://www.keytonature.eu), together with sample keys. The current version is 1.1.

With the Open Key Editor the user can browse existing master keys and edit them. The first step in making a customized 'mini-key' is to create a filter: this is a list containing a subset of the species of the main key. Such a list can be made by selecting species from the original key, or by importing a text file with species names from an external source. The filters can be stored for later editing so many mini-keys can be tailored from the same basic dataset. In the Open Key Editor new couplets can be added to the key for identifying species that are absent in the original key.

The unprocessed mini-key will contain three kinds of questions from the original key:

1. valid questions that still separate (groups of) species.
2. questions that used to be like type 1, but now have only a single remaining branch.
3. questions that no longer lead to any species at all.

Questions of type 2 and 3 will have to be removed. Once a filter is defined, the programme starts with the species that were removed and traces them back in the key until it encounters a question that is still relevant. All questions downstream are 'dead wood' (type 3) and will be removed. The application repeats this process with the remaining species in order to find questions of type 2. When it encounters a question that no longer separates at least two species, the question is removed from the decision tree, but its parent and child questions are connected in a new branching pattern. Because there is a chance this new branching pattern will also contain questions of type 2, the whole process is reiterated until no more changes have to be made. The result is a key in which only questions of type 1 remain.

Special problems are reticulated keys. These are keys in which a question branches to another part of the key that is not 'downstream' of the present node. This problem is solved by controlling the creation of loops and unravelling them during the processing of the key.

The Open Key Editor can generate ex-novo a virtually unlimited number of 'filtered' keys from a single 'master' key. After filtering, the 'cropped' key becomes a separate entity, which can be edited independently from its master counterpart. All text from the key and the species descriptions can be edited or translated, while maintaining the structure of the key. A filtered key can be made available on the web, or given to a user for further editing. Any changes in texts or illustrations of a filtered key will not interfere with the original master key.

Identification keys can be used at home or in a laboratory, but they can be also used in the field, while exploring the biodiversity of an area. The Open Key Editor can export the master key, or any of the filtered keys, in the form of stand-alone packages. The stand-alone versions can be stored on CD- or DVD-ROMs, or used on mobile devices, such as PDA's and smartphones like the Apple iPhone or Google Android. These devices, when equipped with a camera, can be also used to enrich the key with original pictures.

Discussion

With the Open Key Editor, existing identification tools can be modified and their use can be made much easier by removing species that are absent from a particular region or season. Text of keys and species descriptions can be edited or translated so as to adapt them to user groups like pupils. Modified keys can be turned into stand-alone applications for computers, websites, smartphones or PDA's.

A key with 50 common species is much easier to use than a 'true' flora with thousands of species. This is enhanced by the fact that all the species in the key will be present in the field, park or school garden. As a result, motivation among pupils will be higher when they actually identify a species.

In the case of smartphones, exciting new possibilities emerge with the introduction of GPS receivers. Now it will become possible to use location data for identifying species within a certain area.

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Pupils using a customized identification key on a smartphone.