SEVENTH FRAMEWORK PROGRAMME

ICT PPP

Future Internet

ENVIROFI

The Environmental Observation Web and its Service Applications within the Future Internet

FP7-284898

Collaborative project

D1.4.1 Pilot applications for Biodiversity Scenarios I

Guidelines document

EAA

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Table of Contents

Index of Tables

Glossary

The glossary of terms used in this deliverable can be found in the public document "ENVIROFI_Glossary.pdf" available at: http://www.envirofi.eu/

Abbreviations and Acronyms

Abbreviation / Acronym	Description
GEO	Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GMES	Global Monitoring for Environment and Security
FI-PPP	Future Internet Public-Private Partnership
INSPIRE	Infrastructure for Spatial Information in Europe
OGC	Open Geospatial Consortium
OMG	Object Management Group
REST	Representational State Transfer
RM-ODP	Reference Model for Object Distributed Processing
SDI	Spatial Data Infrastructure
SOA	Service Oriented Architecture
SoS	System of Systems
SoSE	System of Systems Engineering
SWE	Sensor Web Enablement
UML	Unified Modelling Language
VGI	Volunteered Geographic Information
VP	Viewpoint
W3C	World Wide Web Consortium
XML	Extensible Mark-up Language

Table 1. Abbreviations and Acronyms

Executive Summary

Biodiversity is essential for human wellbeing; only by guaranteeing a well-balanced ecosystem can we assure a healthy and sustainable future for all life on this planet. The target of halting the loss to biodiversity by the year 2020, set both by the UN Convention on Biodiversity (CBD) and the EU, requires biodiversity observation data to provide a solid basis upon which to judge this progress as well as to assess the efficacy of measures for the protection of biodiversity. Observational data on biodiversity occurrences must be merged from all available sources while assuring high quality data and providing uncertainty measures where applicable. To do so we must leverage the potential of outreach groups for data survey, thus widening the base from which observational data may be gleaned. In order to utilize this new wealth of data we must also develop other forms of quality assurance in order to properly benefit from this additional contribution to biodiversity research. In addition, through a stronger engagement of non-scientists, we heighten the understanding of biodiversity related matters in the general populace.

The ENVIROFI-Bio app, created by ENVIROFI work package 1 (WP1: Bringing Biodiversity into the Future Internet), focuses on the use of Future Internet technology for survey, analysis, quality assurance, persistence and dissemination of biodiversity data. This enables users from a wide variety of backgrounds to:

- Obtain information on interesting biodiversity occurrences recorded directly at their current location

- Provide information on biodiversity occurrences they are currently observing

- Provide feedback on the correctness of existing biodiversity occurrence records in the system.

1   Introduction

Biodiversity is essential for human wellbeing; only by guaranteeing a well-balanced ecosystem can we assure a healthy and sustainable future for all life on this planet. However, to do this, we must understand the intricate interactions between the flora, fauna and fungi populating this world. As an initial step, we must perform exacting surveys on the current status of biodiversity in order to determine where which species currently still exist and in what abundance they occur.

Due to budget cuts entailed by the financial crisis, fewer resources are available for scientific and governmental surveys; it is just not possible to perform the necessary surveys to the required level of detail. Thus, the ENVIROFI-BIO app is working to fill this gap, providing means to leverage the interests of nature lovers and enabling them to support this important work.

In addition, users are provided with interesting information on biodiversity at their current location. This can be an interesting complement to more traditional field guides, as it allows for interactivity with the information provided. Also, in a world where peoples interest is progressively focused to the horizon of their smart phone, by bringing biodiversity into the smart phone, we hope to in turn bring the users back out into nature. Only through a thorough appreciation of the wonders of nature can the necessary enthusiasm be found to be willing to save this wonderful world around us.

2   Links to prototype

The ENVIROFI-BIO prototype App, which has been developed within the ENVIROFI project, can be accessed using an Android device. In addition, we have provided various types of documentation on the use of this app.

2.1   ENVIROFI-BIO App

The ENVIROFI-BIO application is currently designed to run only on the Android platform. Due to technical constraints, it currently only functions stably on Android version 4.1; in future releases this will be extended to cover other Android versions as well as other software platforms.

Please note: this is currently not a commercial application and thus requires additional steps to install compared to most phone applications; please follow the instructions carefully.

The ENVIROFI-BIO App can be downloaded from the following link:

http://envirofi.ait.ac.at/arml/prototype_releases/

2.2   Demonstration Webcast

This visual demonstration is intended to provide an overview of the ENVIROFI-BIO App to interested individuals. It may be used as a tutorial for the ENVIROFI-BIO App or also as a demonstrator for presentations or for situations where a live demonstration is not possible.

To make this webcast, we created a series of PowerPoint slides that addressed the various background requirements that led to the creation of the ENVIROFI-BIO App, which we then merged with a narrated voice over.

The online Webcast demonstrating the background to the application and a walkthrough of its functionality can be viewed here:

http://Dev0.nilu.no/users/mjk/envirofi/WP1/index.html

2.3   Paper Documentation - Guidelines document

Information on the prototype is provided by a guidelines document (this document) in PDF Format from the following location:

http://www.envirofi.eu/Portals/89/Docs/Project/Public_deliverables/D1.4.1_Pilot_applications_for_Biodiversity_Scenarios_I-Guidelines_document_v1.0.pdf

3 Guidelines to Users

3.1 Getting started

Read this guidelines document prior to using the online version of the ENVIROFI-BIO App, or installing it to your phone. This is useful in order to have a good understanding of what it can do, and how it works.

3.2 Installation

As a new user of the ENVIROFI-BIO App, you must first install the application. If you have already done this skip to the next section.

To install the application, please follow these steps:

- First of all, go to the android release folder and download the latest version to your PC (currently VTL 0.4.0). Please note that the ENVIROFI-BIO App is currently available in English, German and Italian. The language of the app is provided within the link; for example, VTL-0.4.0.it.apk is the Italian version of the version 0.4.0 app (contains it between the version and the ".apk" extension), while VTL-0.4.0.en.apk is the English version. All App versions are available   at: http://envirofi.ait.ac.at/arml/prototype_releases/

- Once you have downloaded the App, make sure the file extension is ".apk" as some browsers modify the extension to ".zip". Then connect your phone to your computer, activate the USB storage and copy the application to a folder of your choice (i.e. "Downloads").

- As a next step, you must download and install the Astro File Manager from Android Marketplace: https://play.google.com/store/apps/details?id=com.metago.astro&feature=search_result

- Once this app has been installed, start it and navigate to the folder where you have saved the previously downloaded application.
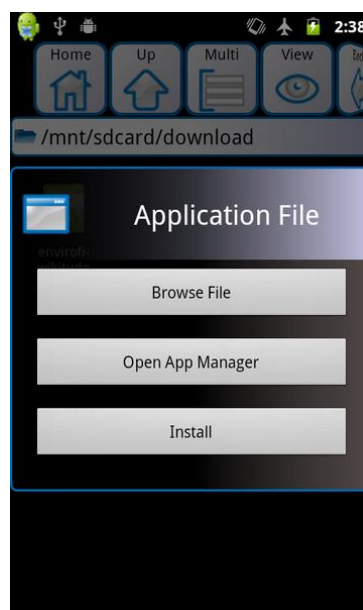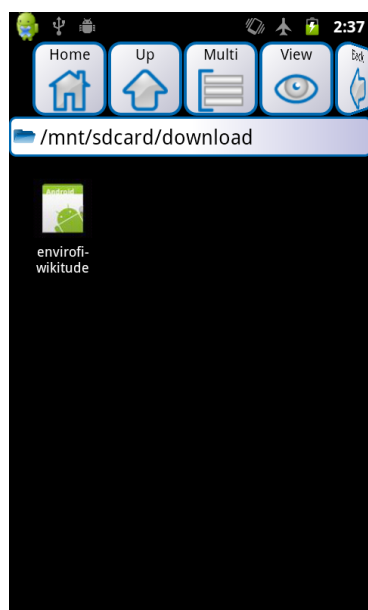
- Click on the "Install" button. It might be that the following message occurs:
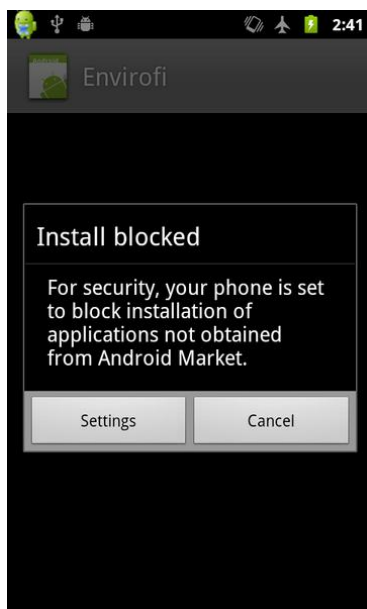
- Click on "Settings" and enable the "unknown sources" option as shown in the picture.

- Go back to the Astro File Manager and install the ENVIROFI-BIO application. After installing you can find "ENVIROFI-BIO App" in the program menu with all other installed applications.

Depending on your location, you may not see any biodiversity occurrences as they may not currently be available for your present location. The current hot spots for the ENVIROFI-BIO App are Firenze in Italy and Vienna in Austria. In addition, the "Citizens in Tuscany" scenario has been providing occurrence data in the more rural areas of southern Tuscany, providing information on monumental trees in the region. However, it is possible to virtually move the location of the mobile device using the Fake GPS App from Google Play (formerly Android Market):

https://play.google.com/store/apps/details?id=com.lexa.fakegps

As a further option, the user can manually enter GPS coordinates within the app itself as described under the app Settings.

3.3 App overview

When the user starts the ENVIROFI-BIO App, they are first presented with the following overview screen:
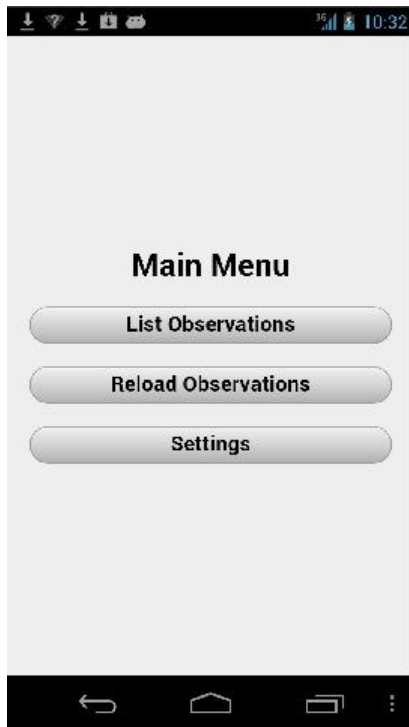

In this overview screen, the user may select the following functionality:

- List Observation: this option allows the user to see biodiversity observations in their vicinity. In addition, new observations may be provided

- Reload Observations: this option allows the user to pre-load maps and biodiversity occurrences for work in the field without data connectivity

- Settings: this option allows the user to change the settings of the ENVIROFI-BIO App.

3.4   Settings

Before starting to work with the ENVIROFI-BIO App, the user should properly configure their settings within the App. To do this, the user must click on Settings on the main app screen:
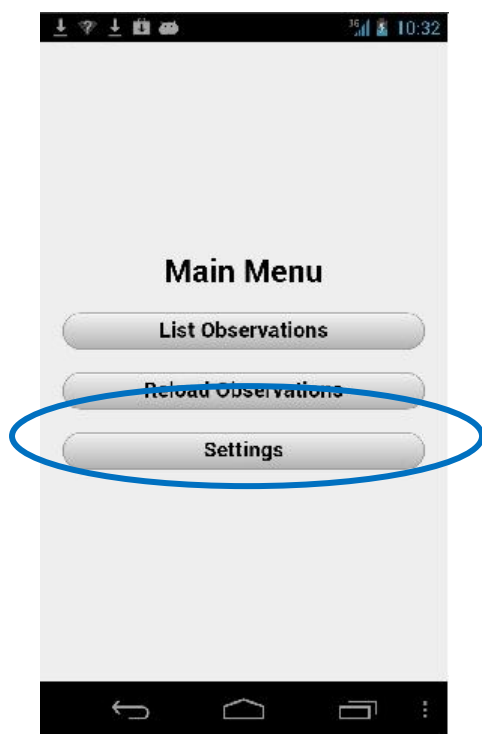
This will lead the user to the settings screen:
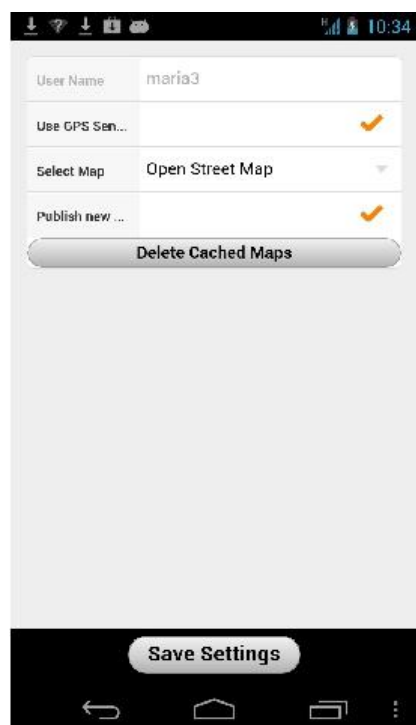
In the settings screen, the user may perform the following configurations:

- User Name: the user should provide their user name to the app. This must only be done once upon the first install and will be saved for later use. This allows the system to identify the user that has provide information to the system.

- Use GPS Settings: the default setting is for the App to access locational information from sources such as GPS. However, for certain purposes it can be useful to override this information with coordinates provided by the user. In this dialog, the user can provide such coordinates directly for use within the App.

- Select Map: The user may choose between Open Street Maps and the Tuscany Arial Map as a background for the map view.

- Publish New: By deactivating this setting, the user may suppress the provision of their information to the wider public.

3.5 List Observation

List Observation brings the user to the main part of the ENVIROFI-BIO App. To access this, the user must click on List Observation on the main app screen:
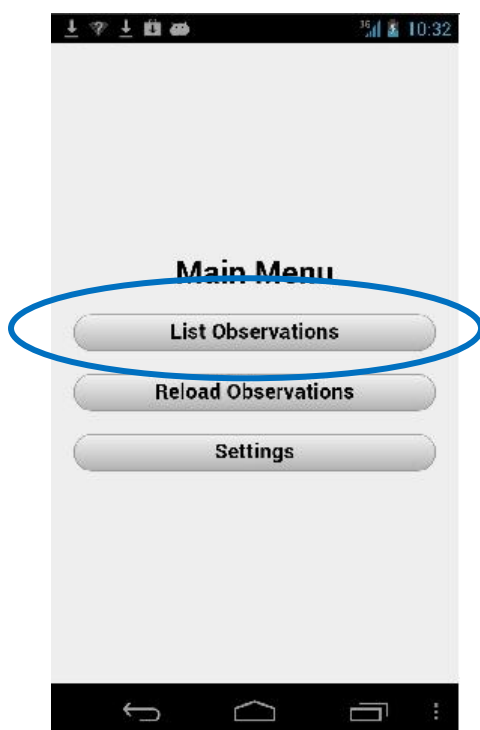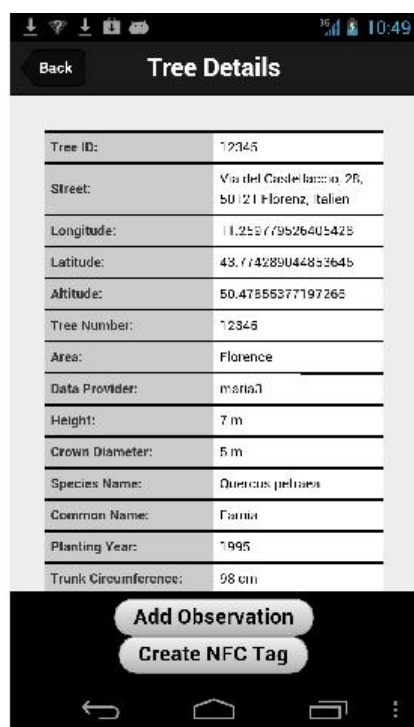

Within the List Observation section, the user my view individual biodiversity occurrence records, provide new information, or filter the information provided. These functionalities are described in the following sections.

3.5.1 View Observations

Initially, the user will be provided with entries for the individual biodiversity occurrence observations in list view as follows:

The same information can be provided in the form of a map detailing the individual biodiversity occurrence records. To toggle this view, the user must click on "Map View" at the bottom of the screen. Once this has been done, the user can view all occurrences close to their current location in map view as follows:

Individuals provided by the ENVIROFI-BIO system are displayed in green while individuals provided by the user are displayed in red.

The user may access detailed information on the individual biodiversity occurrence records by clicking on the entry in the list, or by clicking on an individual point on the map. The following details are provided to the user under details:
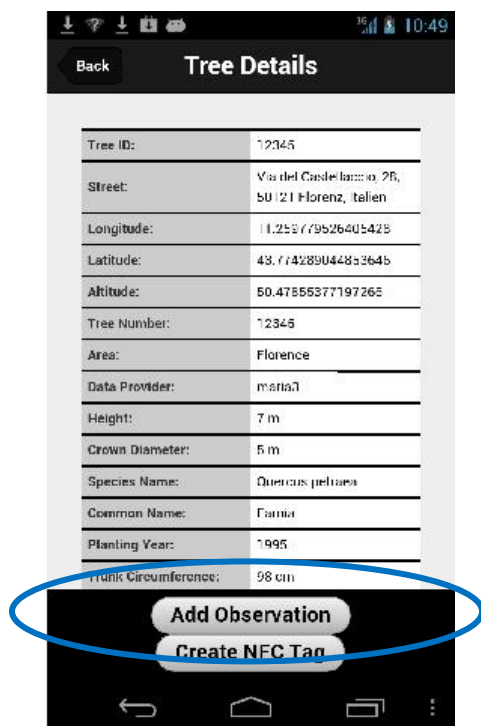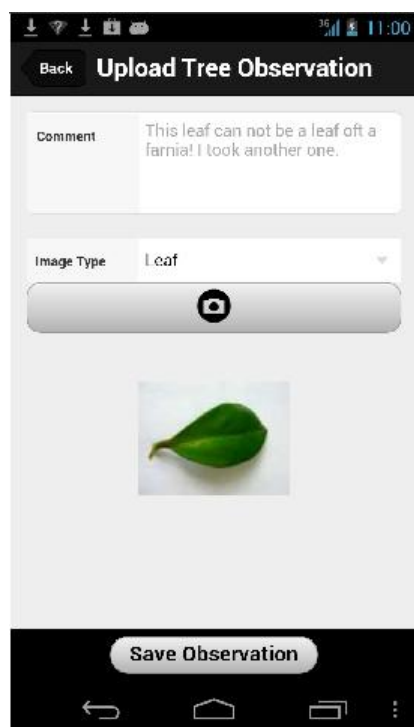
3.5.2 Provide Observations and Information

The user may provide additional information on existing occurrence records through the "Add Observation" dialog. To access this dialog, the user must click on "Add Observation" from the detailed view:

This will lead the user to a dialog allowing for the provision of additional information on an existing individual. At present, the user may only provide a comment and an image. In upcoming versions, it will be possible for users to provide all types of information fitting to the species being observed.

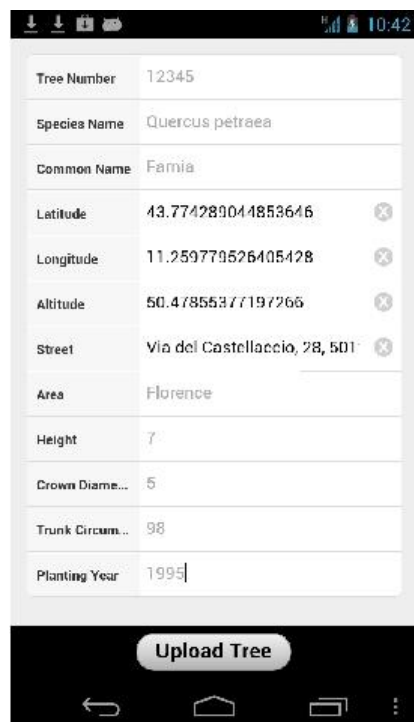Once the user has saved the observation, this information will be provided together with the existing in-formation on the individual:
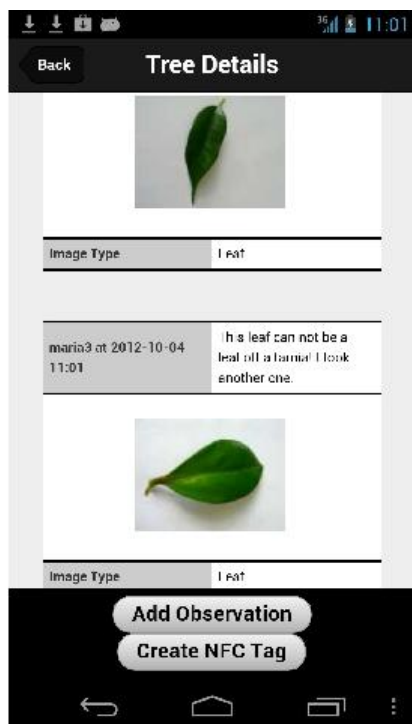
In addition to providing additional information on existing biodiversity occurrence records, the user may also provide new biodiversity occurrence records to the system. As a first step in this proved, the user must first provide the location for the new biodiversity occurrence record:

Once the location of the individual has been determined, the user is provided with a form to fill in further information on this individual:

Once this information has been provided and uploaded, it can be made available to other users of the ENVIROFI-BIO app.
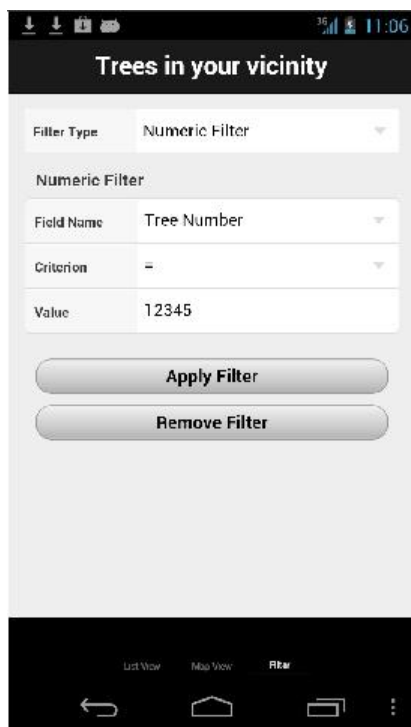
3.5.3 Filter Observations

In areas where many biodiversity occurrence records have been provided, it may become difficult to see the forest for all the trees in the way. Thus, the ENVIROFI-BIO App allows the user to filter the bio-diversity occurrence records provided by various criteria. Numeric and textual filters are available; depending on the filter type, the data fields pertaining to the biodiversity occurrences of the correct type are provided for the user to select.

For the numeric filter, only numeric fields are displayed. The user may select which field to filter on:
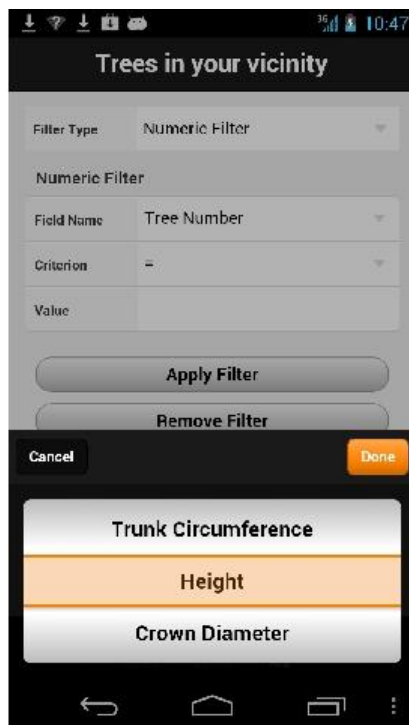
When using a numeric filter, the user may specify a criterion to filter on. For example, the user could choose to filter only those trees above a certain height or circumference. The user may also set the filter so that only a tree with a certain tree number is displayed.
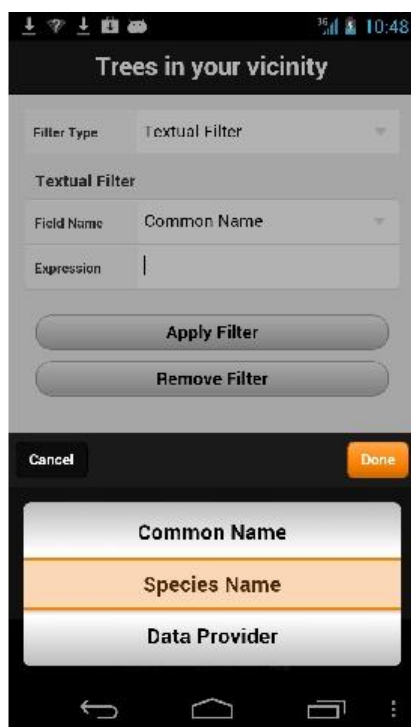
The textual filter is very similar to the numeric filter; however, only textual fields are provided for the user to select. The user must provide a textual expression for the system to filter on:

When the filter has been set, only those individuals corresponding to the filter criteria are displayed, resulting in a far smaller result set:

In order to return to the full view, the user must select "Remove Filter" from the filter page.

3.6   Reload Observations

In the Reload Observations section of the ENVIROFI-BIO App, the user can pre-load data for an area they plan to soon visit where they know that they will have poor data connectivity. This allows the user to use the App in remote areas, where normal mobile applications cannot be utilized.
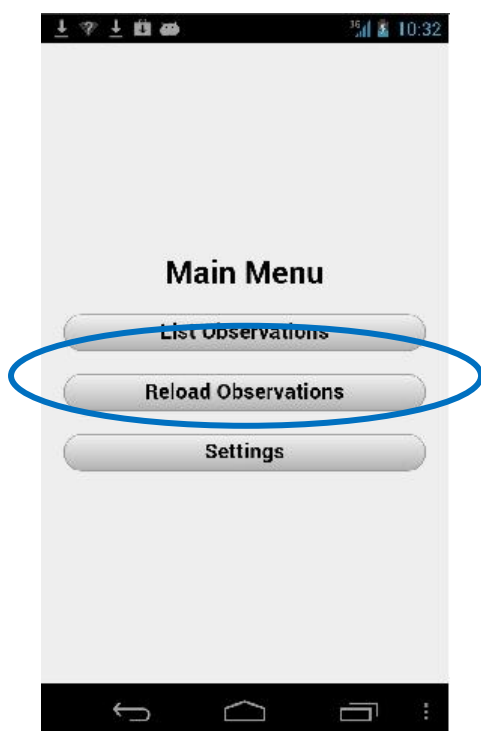
To do this, the user must select Reload Observations from the main screen. This will allow the user to select an area to be cached in their mobile device:

This data will then be available for the user despite lack of connectivity.

4   Feedback page

The feedback form is designed to capture responses from users and stakeholders with regards to the app's functionality, usability and usefulness. It also enables the user to provide input on suggestions for improvements as well as additional features. This data will be captured during the development and testing phases of the project with the results making up part of the final deliverable documentation. This data can then be used to improve the system in any future phases. This form will be available online from the ENVIROFI Products page.

Feedback Form for ENVIROFI-BIO

Installation

How would you rate the installation process for the App?

Very Good	Good	Bad	Very Bad

Basic Usability

How user friendly is the App?

Very Good	Good	Bad	Very Bad

How would you rate the configurability of the App?

Very Good	Good	Bad	Very Bad

How easy was it for you to find data of interest in your area?

Very Easy	Easy	Bad	Very Bad

Providing Observations

How important is it for you to provide your own observations to the App?

Very Important	Somewhat Important	Not very important	Not Important at all

How easy was it for you to provide your observations using the app?

Very easy	Easy	Difficult	Very Difficult

Your experience with the prototype

How long have you been using the ENVIROFI-BIO App prototype?

sporadically (less than one day per month)	regularly (at least one day per month)	a lot (more than one day per month)

Which features would you improve?

Free text 400 words

Additional Comments

Free text 400 words

Would you be interested in participating in other tests related to ENVIROFI?

E-mail for future contacts (with due privacy statement)

Please note that as our main test area is located in Tuscany, Italy, the feedback form is available in Italian.

5   Release Data

The following information details the development of the ENVIROFI-BIO App and includes basic functional updates for each version so far.

5.1   VTL 0.3.5

New features:

- Offline mode with map caching

- GUI for input of new occurrences with crosshair on map

- First draft of NFC tagging added

- Successfully tested on Android 2.3.5, 2.3.7, and 4.1.0

Known issues:

- Application not running on Android 4.0 and Android 2.3.1

- When application is started the first time after download and installation, occurrence list has to be updated once by "Reload Observations"

5.2   VTL 0.3.4

New features:

- New name: ENVIROFI-BIO

- User name required for tagging of occurrences with provider information

- Common database for all occurrences and observations

- Local database on phone, user database on server and central store on server are synchronized (up- and download)

- Settings stored in database and reloaded when application is started

- Settings: Field "publish" added to indicate that new occurrences can be published to other users

- New occurrences displayed immediately at user's own device; if "publish" is set to true, new occurrences are stored on central data store but visible on other user's device only when "Reload Observations" is pressed in main menu.

Known issues:

- Application not running on Android 4.0

- Application not yet working in offline mode

- When application is started the first time after download, occurrence list has to be updated once by "Reload Observations"

- Performance of synchronization download has to be improved

5.3   VTL 0.3.3

New features:

- Removed bug which caused that no trees could be seen when launching the app.

- Added functionality that trees uploaded by users are now displayed on the map view (red tree icons). Posting comments on these trees is possible.

- Note: local database has been added, but is currently not used. However, the APK file is now about 6 MB.

5.4   VTL 0.3.2

New features:

- Added Vienna aerial map view

5.5   VTL 0.3.1

New features:

- Removed bug which occurred when user often switched between Vienna and Florence tree library

- Added "recenter" button in map view: The behavior of the map view now tracks the current position of the user. If the user zooms in or out or scrolls to another area of the map, tracking is disabled and a recenter button is displayed. When pressed, the map recenters and continues following the user's current position (compare behavior of a common car navigation system).

- Filtering dialog has been added. It is now possible to specify multiple numeric and textual filters which are active as long as they are not removed by the user.

5.6   VTL 0.3.0

New features:

- Added multilanguage support: prototype is now available in English, German and Italian

- Added Florence tree database

- Added main menu

- Added settings menu: Settings for user name

- Possibility to decide if you want to use a default location or defined coordinates

- Possibility to switch between Vienna and Florence tree database

- Possibility to switch between open street map and tuscany aerial map view (only available for Florence tree data base)

- Added possibility to upload new trees (currently no view mode implemented)

- Added possibility to stop application (bring it to background)

- GPS sensor is now disabled in background mode

- Size of bounding box is now calculated dynamically such that number of loaded trees is limited to 50.

5.7   VTL 0.2.0

New features:

- Added first version of splashscreen (press start button to launch application)
- Added support for upload of pictures (currently only camera).
- Changed title in list and map view to "Trees in Your Vicinity".
- Changed list view such that tree number and street name are displayed (instead of tree id).
- Removed sever rendering bug which did you not allow to scroll in tree details view.

5.8   VTL 0.1.2

New features:

- Added new tree icons for map view.
- Added new current location marker for map view.
- Added new buttons for map view.
- Used newest release of OpenLayers library: double tapping zooms in, single tapping with two fingers zooms out.
- Storage update is done after location change of about 100 meters.
- Added warning message if you are outside of Vienna (to prevent an empty list view).

5.9   VTL 0.1.1

New features:

- Supported versions now include Android 2.1+ (was 2.3.3+).
- Location is automatically set to Vienna if no valid GPS signal can be retrieved (this is a workaround for devices where FakeGPS does not work correctly).

5.10 VTL 0.1.0

New features:

- List and map view of saved trees.
- Uploading of observations to selected trees.

6   Suggestions

Bugreports and suggestions shall be placed at: https://service.ait.ac.at/mantis/main_page.php

7 Conclusions

The ENVIROFI-BIO mobile phone application is a working prototype that is under continual development using an agile development process. At the current development stage, end October 2012, we have made significant progress in the provision of biodiversity occurrence data based on the user's location as well as allowing the user to provide further information and observations to the system.

In the present development stage we have been focusing on trees as they are easy to identify, and can usually be depended upon to be at the same location at a later point in time, making it easier to illustrate the functionality of the ENVIROFI-BIO App. However, this is purely due to such illustrative purposes, there is no reason that any other form of biodiversity occurrence data, be it pertaining to other species of plants or be it data and information on animals or fungi.

Now that we have the basic ENVIROFI-BIO App operational, we shall continue to extend the functionality in various directions. These extensions include:

- **Dynamic Provision of Properties:** in upcoming versions, the properties that can be provided will be dependent on the species identification of the individual biodiversity occurrence, with properties appropriate to that species type identified being provided to the user. For example, while a user providing information on trees will be provided with properties such as height and breast height diameter, a user providing information on an insect will be provided with properties such as the developmental stage of the insect.

- **Dynamic Selection of Properties:** at present, a preconfigured set of properties pertaining to trees is presented for the user to provide information on. In the future, the user will be able to select appropriate properties they wish to provide information on from a list. Multiple entries of the same property will be possible to allow tracking of changes over time.

- **Identification Referencing:** in the current version of the ENVIROFI-BIO App species identification is provided by the user as a text string; however, this has long caused difficulties in the use of biodiversity occurrence data due to inconsistencies between species names across Europe. This problem will be remedied through the use of the TaxMeOn species ontology as the definitive source of species names.

- **Identification Quality Assurance:** in addition to the referencing of the TaxMeOn species ontology for species identification, we will explore mechanisms for providing plausibility on individual identifications. This will also allow users to question the identification of occurrence records available within the system, and provide alternative identifications.

- **Automatic Identification:** we are working on automatic recognition of tree species based on images of the leaves of the trees. This service is currently running in a stand-alone test harness; it will soon be integrated into the ENVIROFI-BIO App.