

Augmented Presentation of Animal and Environmental Data

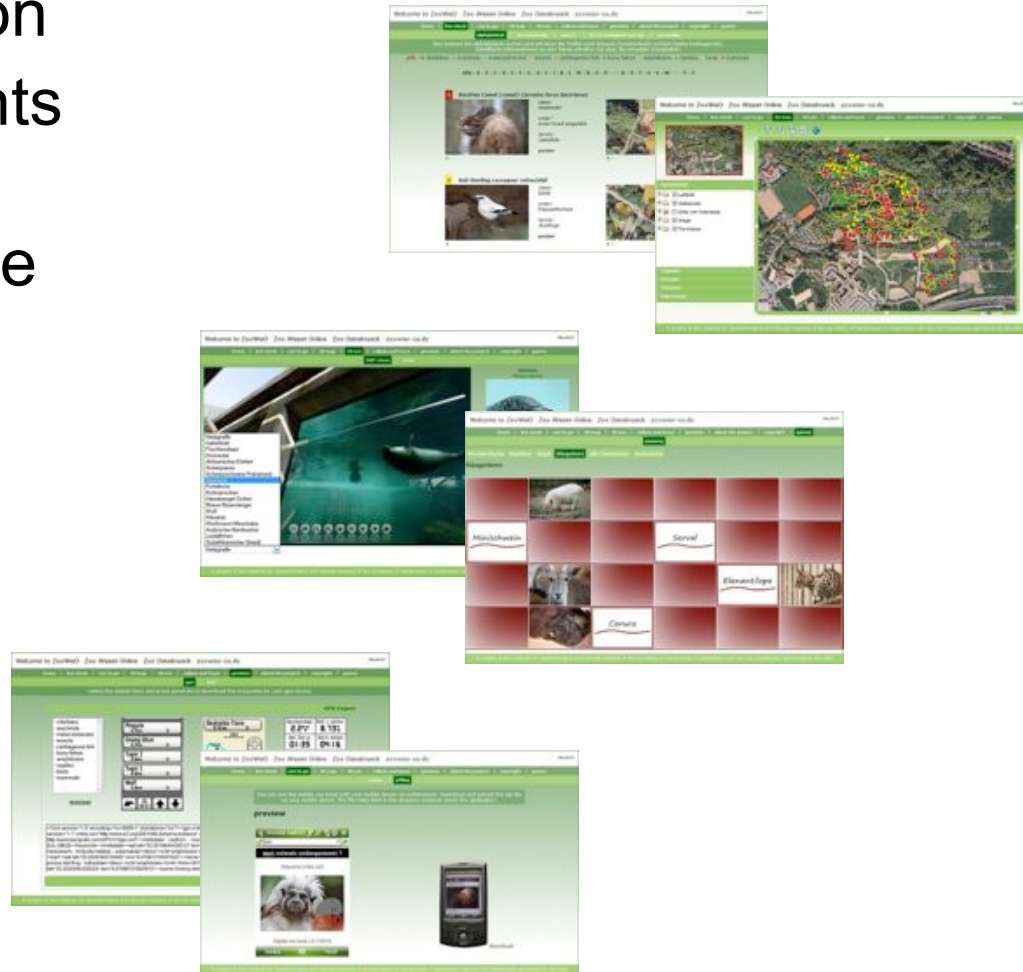
Using Augmented Reality to Locate Species in the Zoo of
Osnabrueck

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University of Osnabrueck, Germany

- The Project Zoowiso
- Where are the Tortoises?
- Augmented Reality
- Using Augmented Reality at the Osnabrueck Zoo
- Conclusion and Outlook

- General Information
- System components
- The project website
 - Livestock
 - 2D-maps
 - 3D-views
 - Games
 - Geodata
 - Zoo to go



The Project Zoowiso

General Information



- Funded by the DBU
- Start 2007 - “End” 2009
- Partners

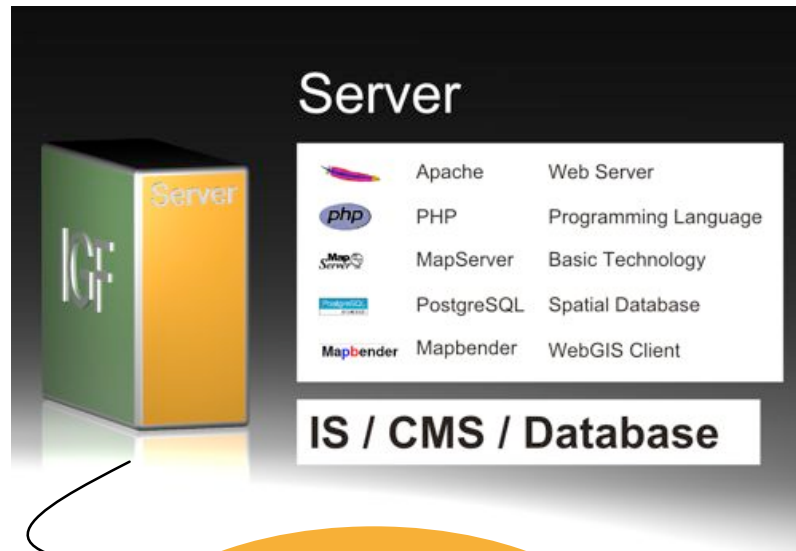


- Institute for Geoinformatics and Remote Sensing
- Osnabrueck Zoo



The Project Zoowiso

System Components



- All important data is stored in a spatial database
- Data maintenance via CMS















- Project homepage – www.zoowiso-os.de

Welcome to ZooWisO - Zoo Wissen Online - Zoo Osnabrueck - zoowiso-os.de deutsch

[home](#) | [live stock](#) | [zoo to go](#) | [3d map](#) | [3d zoo](#) | [rallies and tours](#) | [geodata](#) | [about the project](#) | [copyright](#) | [games](#)

Welcome to all animal lovers and enthusiasts of the zoo of Osnabrueck. On this website unique information about the animals of our zoo are available, plus maps and routes for a zoo-visit.

<ul style="list-style-type: none">  From Axolotl to Zebra: Here you can find any animal, you're interested in!  On safari: Use the zoo-tours created by our zoo-pedagogues.  Navigate through the zoo: Here you can find the locations of all animals as free geodata.  All around animalistic: 360-degree-panoramas delivering an amazing insight to the animals. 	<ul style="list-style-type: none">  Many paths leading through the zoo: Find your personal way through the zoo!  Rescue me! Which species from the zoo are endangered?  All animal-info in one hand: Download the animal-info for you mobile device.  Live stock accessible: Here you can find an accessible version of the live stock.
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A project of the Institute for Geoinformatics and Remote Sensing of the University of Osnabrueck in cooperation with the Zoo Osnabrueck sponsored by the DfG

- Alphabetical and taxonomic overviews

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[alphabetical](#) | [taxonomically](#) | [search](#) | [list of endangered species](#) | [accessible](#)

Hier können Sie alphabetisch suchen und erhalten die Treffer nach Klassen (Taxonomisch) sortiert (siehe Farblegende).
 Detaillierte Informationen zu den Tieren erhalten Sie über die virtuellen Schautafeln.

alle - • • • • • • • •

alle - A - B - C - D - E - F - G - H - I - J - K - L - M - N - O - P - Q - R - S - T - U - V - W - X - Y - Z

1 Bactrian Camel (camel) *Camelus ferus bactrianus*




class:
mammals

order:
even-toed ungulate

family:
camelids


poster

+



+ -

2 Bali Starling *Leucopsar rothschildi*




class:
birds

order:
Passeriformes

family:
starlings

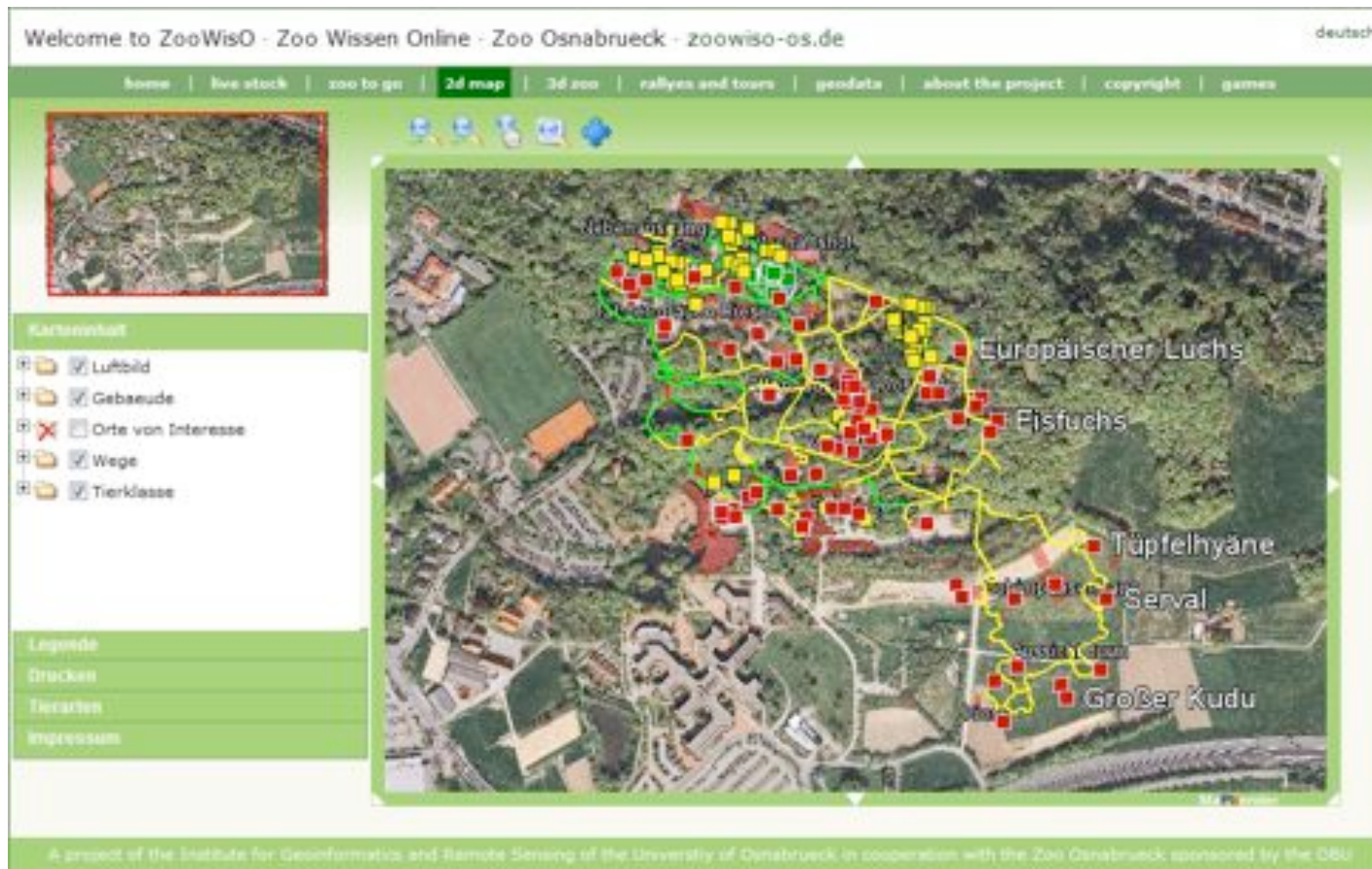
poster

+

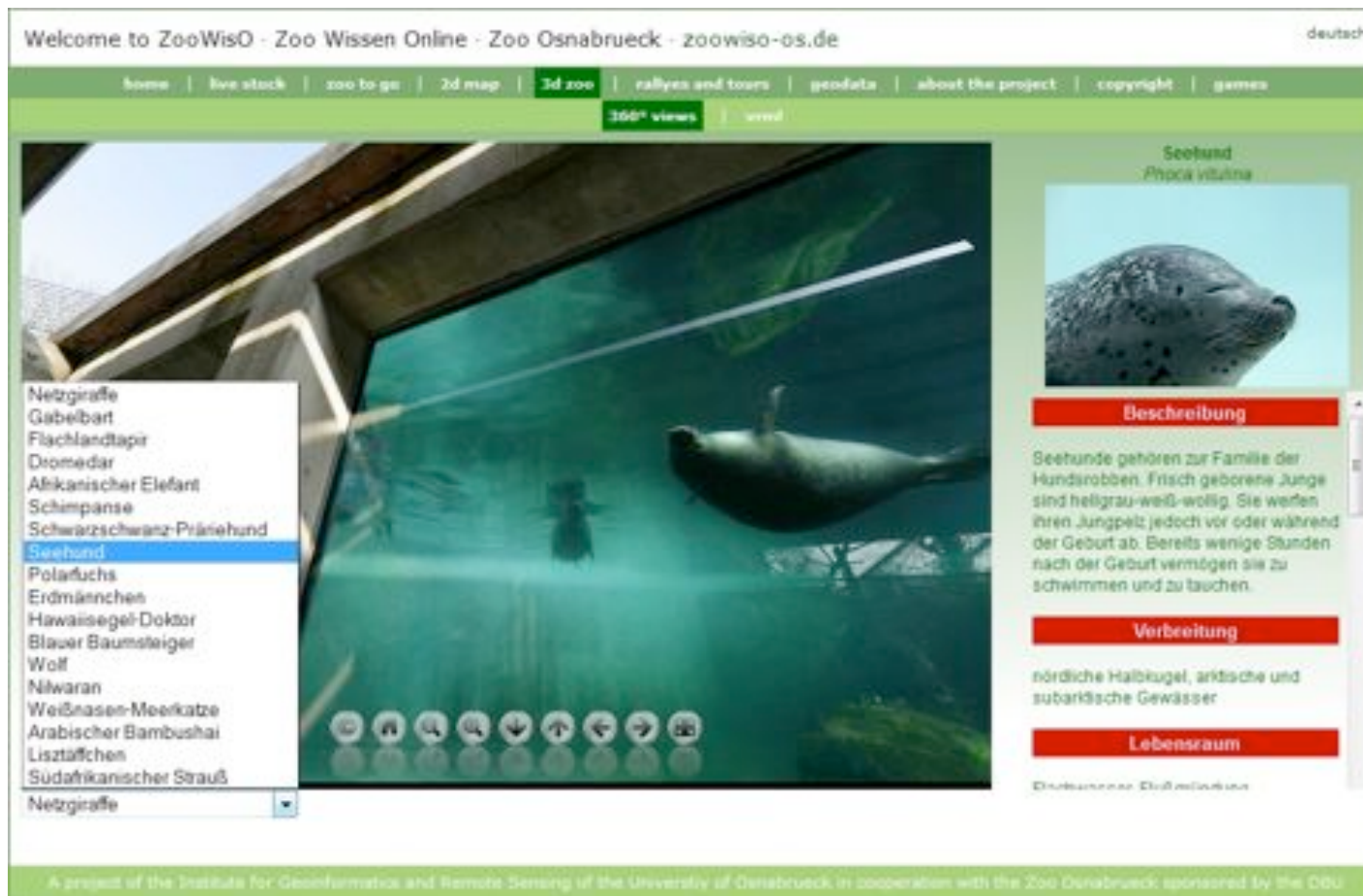


+ -

- Species by animal class on a high res. aerial photograph



- Interactive panoramas linked with the database



- Memory in a different way – you have to know the name!



- Free geodata for GPS devices (gpx)

Welcome to ZooWisO - Zoo Wissen Online - Zoo Osnabrueck - zoowiso-os.de deutsch

home | live stock | zoo to go | 2d map | 3d zoo | rallies and tours | **geodata** | about the project | copyright | games

gpx | list

Select the animal class and press generate to download the waypoints for your gps-device.

GPX Export

- ciliates
- arachnids
- malacostracans
- insects
- cartilageous fish
- bony fishes
- amphibians
- reptiles
- birds
- mammals

download

Pinguin
8.7km 0

Orang Utan
8.7km 0

Tapir 2
8.8km 0

Tapir 1
8.8km 0

Wolf
9.0km 0

← [A] [B] [C] ↑ ↓

Bedrohte Tiere
8.76km 0

1.2km

Map showing route with points: Pinguin, Orang Utan, Tapir 1, Tapir 2.

Los

tiere_afrikas.gpx

Geschwindigk.	Entf. z. nächst.
2.2%	8.73km
Ant. Ziel ca.	Zeit b. nächst.
01:35	04:16



generate

```

<?xml version="1.0" encoding="iso-8859-1" standalone="no"?><gpx xmlns="http://www.topografix.com/GPX/1/1" creator="Zoo-iS IGF"
version="1.1" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="http://www.topografix.com/GPX/1/1
http://www.topografix.com/GPX/1/1/gpx.xsd"><metadata> <author> <name>IGF - Christian Plass</name></author><keywords><![CDATA]IGF,
Zoo, DBU</keywords></metadata><wpt lat="52.2519840438313" lon="8.07091381210984"><name>Aeolol</name><desc>Ambystoma
meucanum - Ambystomatidae - salamander</desc><cbt>amphibians</cbt><time>2011-7-21T10:37:57Z</time><sym>animals</sym>
</wpt><wpt lat="52.2520380736093" lon="8.07081310697622"><name>Three striped Poison Frog</name><desc>Epidobates tricolor -
poison dart frog - batrachian</desc><cbt>amphibians</cbt><time>2011-7-21T10:37:57Z</time><sym>animals</sym></wpt><wpt
lat="52.2520294335224" lon="8.07085721820913"><name>Dyeing dart frog</name><desc>Dendrobates tinctorius - poison dart frog -
    
```

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- (Public) mobile zoobook (server side generated)



Orient Yourself in the Zoo

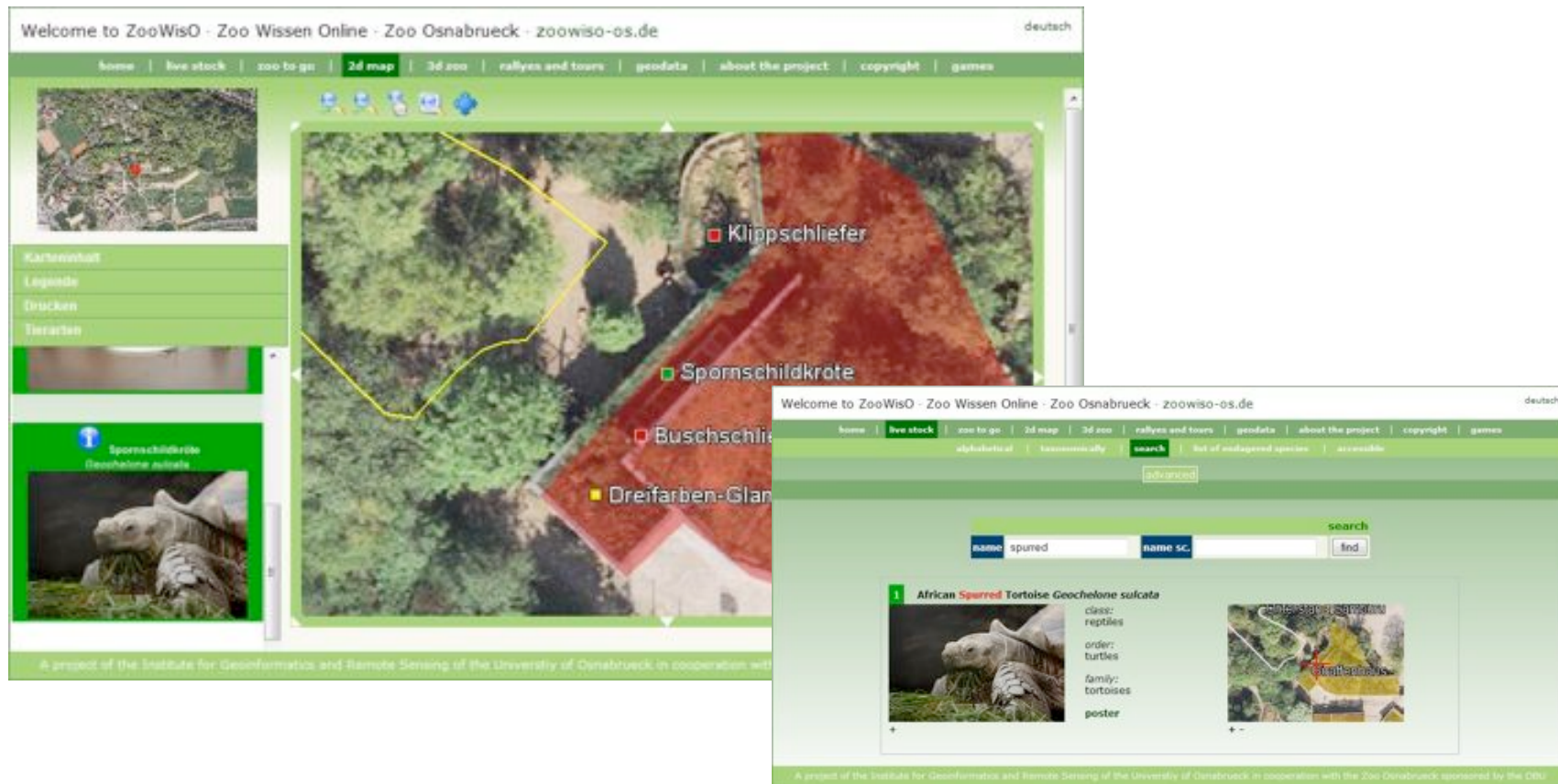
Common practice

Overview maps with

- generalized paths
- important buildings
- locations of the most well known species like elephant, lion, giraffe...



The Website allows to locate a species before a visit.



Digital Zoobook

The digital (offline) zoobook provides

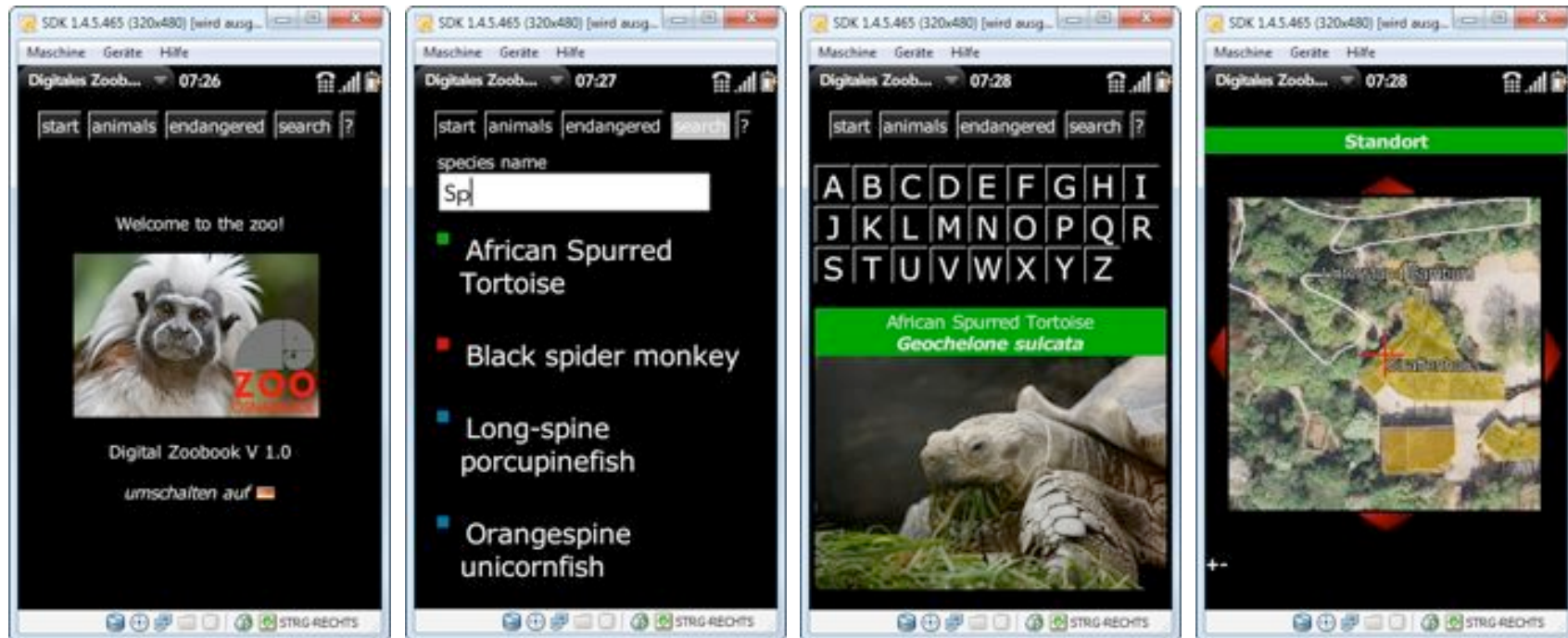
- animal data (digital photo, distribution, habitat...)
- shows the visitor's position only indirectly (when standing in front of a cage)



Digital Zoobook (WebOS)

The digital zoobook with WebOS (not yet completed)

- Ajax / Interactive Map / First attempts with GPS



Downloaded free GPS data and GPS tracks

Visitors with a GPS device can

- navigate to a species via line of sight
- walk along a track (i.e. track “animals of africa”)



What other possibilities exist???

Implemented¹, not yet finished², intended³

- Offline / online zoobook with aerial photographs¹
- WebOS zoobook with interactive map²
- Android application with GPS³
- **Augmented reality application²**

- Definition
- Applications
- Potential Applications
- Wikitude and layar
- Example University of Osnabrueck



Definition of Augmented Reality

- “Augmented reality is a technology which integrates the computer-generated scene to the real world.
- It provides a mixed scene of virtual information and real scene for users through the display devices such as head mounted display (HMD), glasses, projectors, general displays and even mobile phone screens.
- It can make users interact in a more natural way with the real and virtual objects in the environment.
- Augmented reality technology expands and supplements the real world rather than substitutes the real world completely.”

Yan, Yun, Liang, Yu and Zhang, 2011

Applications as of 2011

- **Advertising:** Usage of AR to promote products via interactive AR applications is becoming common now.
- **Task support:** Complex tasks such as assembly, maintenance, and surgery can be simplified by inserting additional information into the field of view.
- **Navigation:** AR can augment the effectiveness of navigation devices.
- **Industrial:** AR can be used to compare digital mock-ups with physical mock-ups for efficiently finding discrepancies between them.
- **Military and emergency services:** Wearable AR can provide information such as instructions, maps, enemy locations, and fire cells.
- **Art:** AR can help create art in real time integrating reality such as painting, drawing and modeling.
- **Architecture:** AR can simulate planned construction projects.
- **Sightseeing:** Guides can include labels or text related to the objects/places visited. With AR, users can rebuild ruins, buildings, or even landscapes as they previously existed.
- **Collaboration:** AR can help facilitate collaboration among distributed team members via conferences with real and virtual participants.
- **Entertainment and education:** AR can create virtual objects in museums and exhibitions, theme park attractions, games and books.
- **Performance:** AR can enhance concert and theater performances.
- **Translation:** AR systems can provide dynamic subtitles in the user's language.

Extract from Wikipedia, 2011

Potential applications

- **Devices:** Create new applications that are physically impossible in "real" hardware, such as 3D objects interactively changing their shape and appearance based on the current task or need.
- **Multi-screen simulation:** Display multiple application windows as virtual monitors in real space and switch among them with gestures and/or redirecting head and eyes. A single pair of glasses could "surround" a user with application windows.
- **Holodecks:** Enhanced media applications, like pseudo holographic virtual screens and virtual surround cinema.
- **Automotive:** eye-dialing, navigation arrows on roadways
- **"X-ray vision"**
- **Furnishings:** plants, wallpapers, panoramic views, artwork, decorations, posters, illumination etc. For example, a virtual window could show a live feed of a camera placed on the exterior of the building, thus allowing the user to toggle a wall's transparency.
- **Public displays:** Window dressings, traffic signs, Christmas decorations, advertisements.
- **Gadgets:** Clock, radio, PC, arrival/departure board at an airport, stock ticker, PDA, PMP, informational posters/fliers/billboards.
- **Group-specific feeds:** For example, a construction manager could display instructions including diagrams at specific locations. Patrons at a public event could subscribe to a feed of directions and/or program notes.
- **Speech synthesis:** Render location/context-specific information via spoken words.
- **Prospecting:** In hydrology, ecology, and geology, AR can be used to display an interactive analysis of terrain characteristics. Users can collaboratively modify and analyze, interactive three-dimensional maps.

Extract from Wikipedia, 2011

Wikitude and layar

Most known AR browsers are Wikitude and layar

These browsers interact with the hardware of the mobile device and overlay the camera view with virtual information

Augmented Reality Browsers

Wikitude

“... Wikitude World Browser is a fun, innovative and informative Augmented Reality (AR) platform allowing you to discover what’s around you in a completely new way...”

Wikitude will overlay the camera’s display and the objects you look at with additional interactive content and information – really cool!”



Extract from www.wikitude.com, 2011

Augmented Reality Browsers

layar

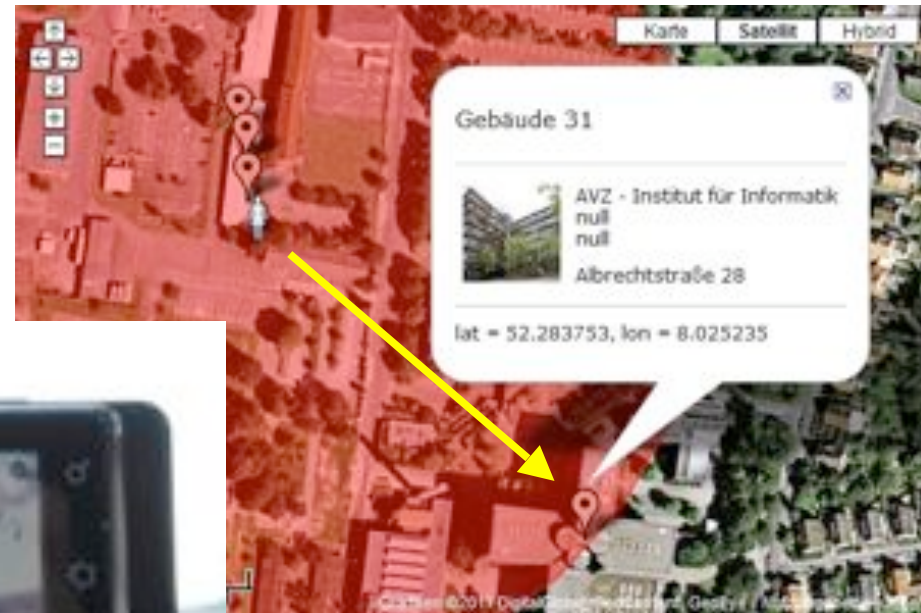
“A beautiful, fun augmented reality app that shows you things you can't see“



Extract from www.wikitude.com, 2011

Example University of Osnabrueck

- Testing on the doorstep (layar)



- Goals
- Technical background
- Testing a layer in layar
- Testing layar at the zoo



Logged in as Christian Plass [My Account](#) [My layers](#) [Log out](#)

Layers Download Development Blog Support Jobs

You are here: Home > My layers

cplass's layers and publishing info

Layers [My information](#)

[Create a new layer!](#)

My Layers

Layer name

Reptiles in the Zoo Osnabrück

Vogel im Zoo Osnabrück (vo)

Säugetiere im Zoo Osnabrück (säugetierarten)

Mammals in the Zoo (mammi)

Reptilien im Zoo Osnabrück (r)

Birds in the Zoo Osnabrück (b)


Test your layer

Layer name reptiles [Load layer!](#)

Before requesting publication, please test your layer against layer testing instructions at <http://layar.pbworks.com/Layer-testing-instructions>

Layer: reptiles

Leopard tortoise

 Geochelone pardalis
distance: 42.0653481497
order: turtles
family: tortoises

lat = 52.249779, lon = 8.070499

Karte Satellit Hybrid

Filter Settings:

Api version: 4.0

Range slider: Search range
(Current Value: 100)
100 m 10000 m

Accuracy: 100

Country code [Germany]: de - Germany

Language [en]: en - English

[Load POIs](#)

Current location: 52.24983859785881, 8.071110248565674

- Why using AR at the zoo?
 - Increasing use of such mobile hardware and software
 - Young people (mostly not very interested in environmental themes) use this technology
- AR is a modern way to present a company / zoo
- AR will bring more visitors to the zoo?
- AR to interest (the youth) in environmental themes?

■ Prerequisites

MySQL database

- The structure of a table containing the data for an AR Layer is predefined

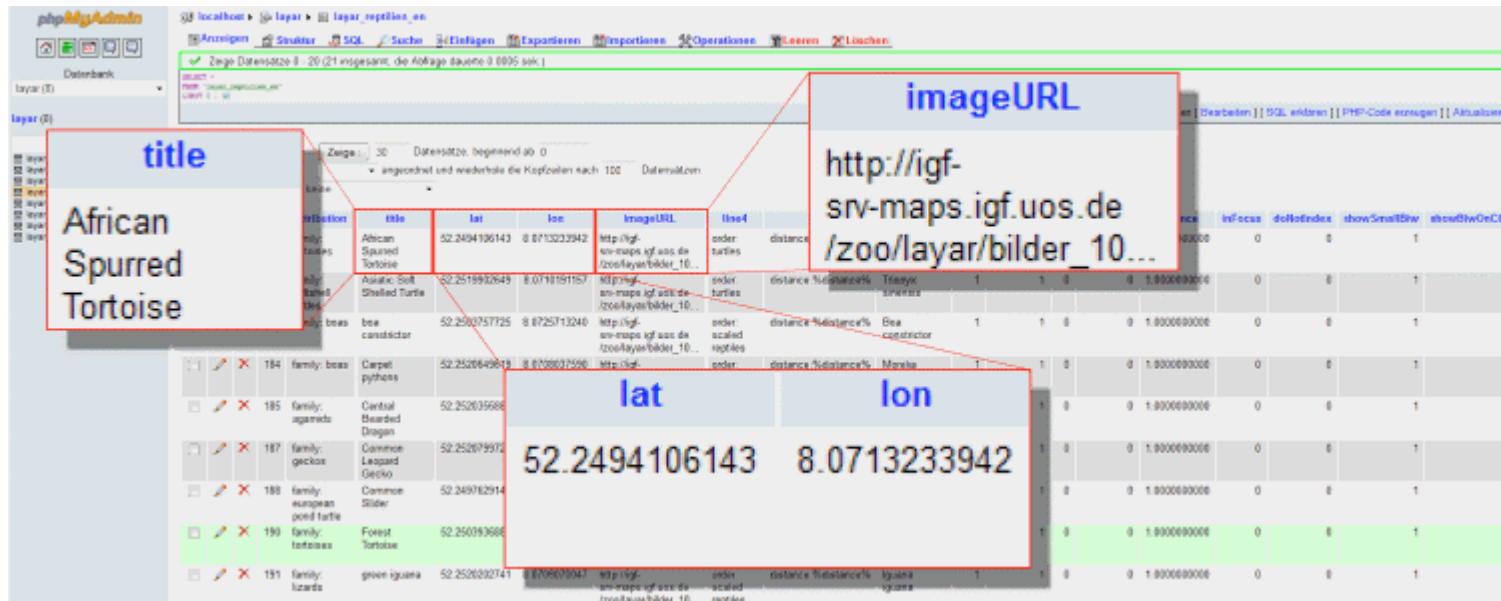
Webpace with PHP

- The access script is written in PHP and also predefined

→ User fills the table and configures the script

→ User creates layers in the (online) developer section

- Table in the **MySQL** database

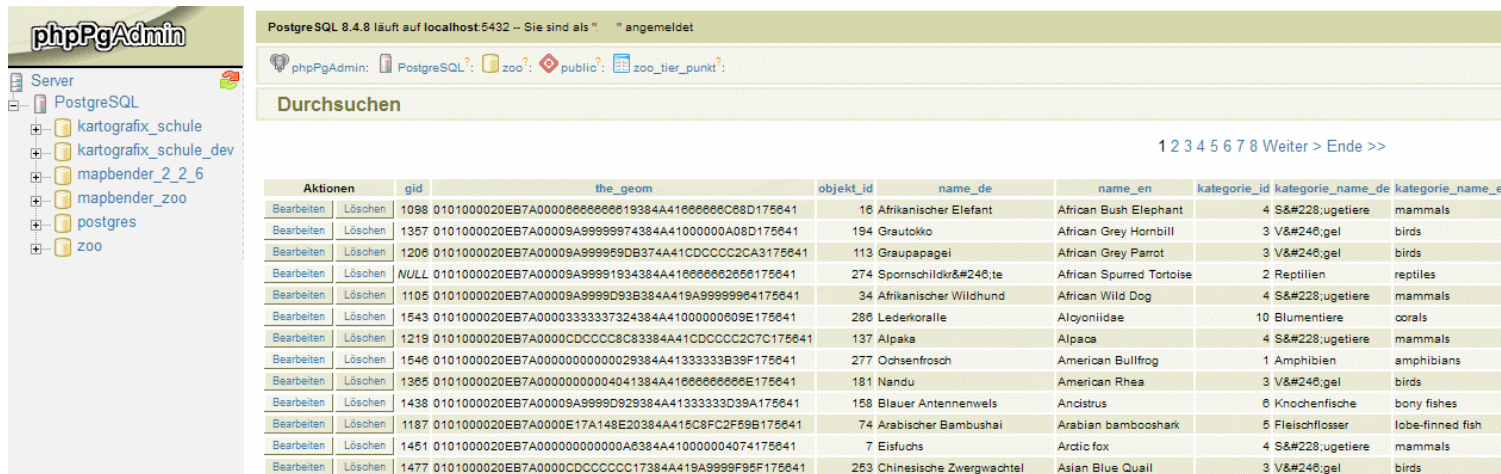


The screenshot shows a MySQL table with the following columns: title, lat, lon, imageURL, tier, order, distance, tolerance, showSmallBw, and showOnClick. The first row is highlighted in green and contains the following data:

title	lat	lon	imageURL
African Spurred Tortoise	52.2494106143	8.0713233942	http://igf-srv-maps.igf.uos.de/zoo/layar/bilder_10...

Some important fields are “title”, “lat”, “lon” and imageURL.

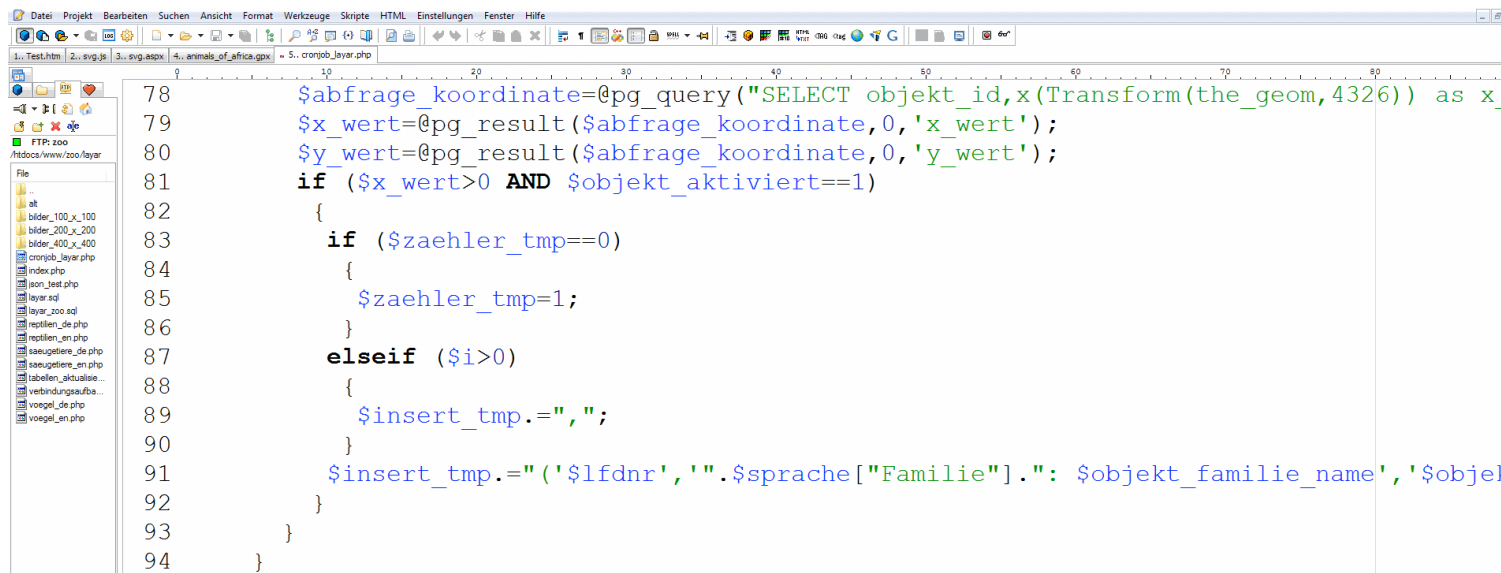
- But the zoo data is stored in a **PostgreSQL** database



Aktionen	gid	the_geom	objekt_id	name_de	name_en	kategorie_id	kategorie_name_de	kategorie_name_en
Bearbeiten Löschen	1098	0101000020EB7A00006666666619384A41666666C8D175641	16	Afrikanischer Elefant	African Bush Elephant	4	Säugetiere	mammals
Bearbeiten Löschen	1357	0101000020EB7A00009A99999974384A41000000A08D175641	194	Grautokko	African Grey Hornbill	3	Vögel	birds
Bearbeiten Löschen	1206	0101000020EB7A00009A999999DB374A41CDCCCC2CA3175641	113	Graupapagei	African Grey Parrot	3	Vögel	birds
Bearbeiten Löschen	NULL	0101000020EB7A00009A99991934384A416666662656175641	274	Spornschildkröte	African Spurred Tortoise	2	Reptilien	reptiles
Bearbeiten Löschen	1105	0101000020EB7A00009A9999D93B384A419A99999964175641	34	Afrikanischer Wildhund	African Wild Dog	4	Säugetiere	mammals
Bearbeiten Löschen	1543	0101000020EB7A00003333337324384A41000000E09E175641	286	Lederkoralle	Alcyoniidae	10	Blumentiere	corals
Bearbeiten Löschen	1219	0101000020EB7A0000CDCCCC8C83384A41CDCCCC2C7C175641	137	Alpaka	Alpaca	4	Säugetiere	mammals
Bearbeiten Löschen	1546	0101000020EB7A000000000029384A41333333B39F175641	277	Ochsenfrosch	American Bullfrog	1	Amphibien	amphibians
Bearbeiten Löschen	1365	0101000020EB7A00000000004041384A41666666E66E175641	181	Nandu	American Rhea	3	Vögel	birds
Bearbeiten Löschen	1438	0101000020EB7A00009A9999D929384A41333333D39A175641	156	Blauer Antennenwels	Ancistrus	6	Knochenfische	bony fishes
Bearbeiten Löschen	1187	0101000020EB7A0000E17A148E20384A415C8FC2F59B175641	74	Arabischer Bambushai	Arabian bambooshark	5	Fleischflosser	lobe-finned fish
Bearbeiten Löschen	1451	0101000020EB7A000000000000A6384A410000004074175641	7	Eisfuchs	Arctic fox	4	Säugetiere	mammals
Bearbeiten Löschen	1477	0101000020EB7A0000CDCCCC17384A419A9999F95F175641	253	Chinesische Zwergwachtel	Asian Blue Quail	3	Vögel	birds

Coordinates are stored in a different format and coordinate system

- Solution: cronjob (with coordinate transformation)

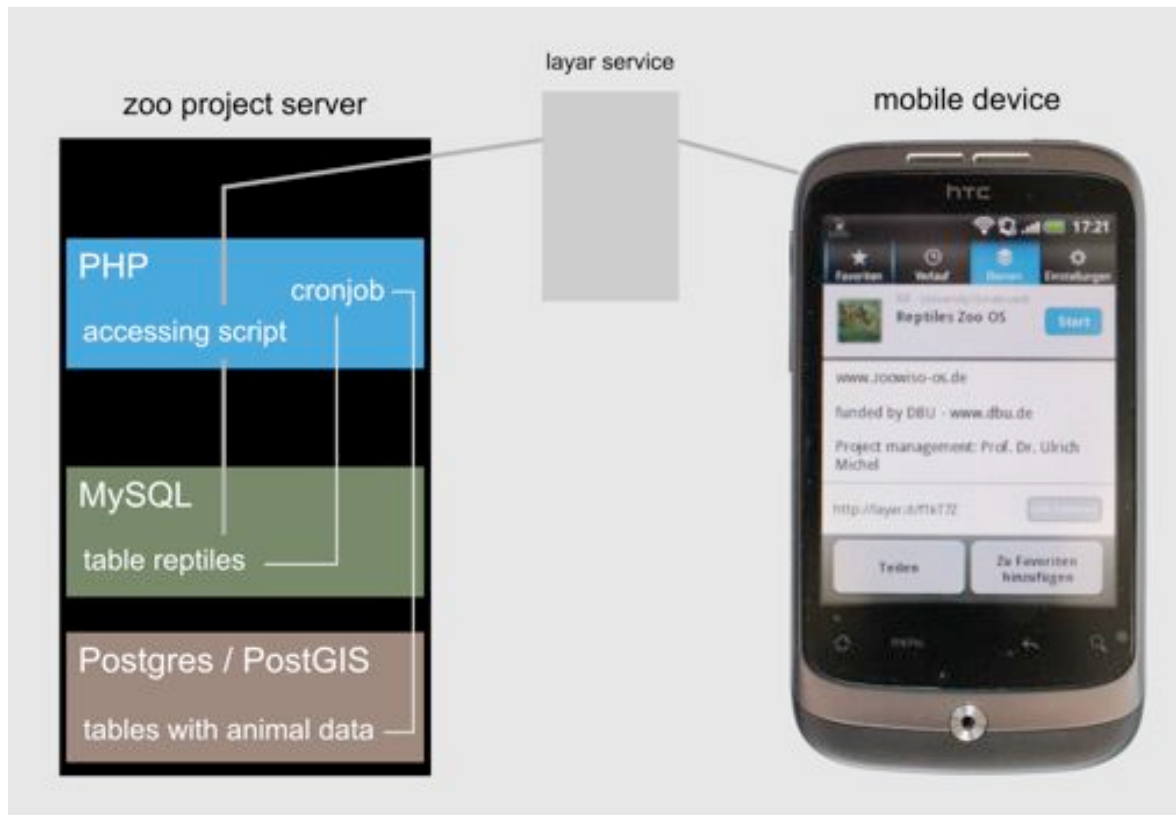


```

78  $abfrage_koordinate=@pg_query("SELECT objekt_id,x(Transform(the_geom,4326)) as x_
79  $x_wert=@pg_result($abfrage_koordinate,0,'x_wert');
80  $y_wert=@pg_result($abfrage_koordinate,0,'y_wert');
81  if ($x_wert>0 AND $objekt_aktiviert==1)
82  {
83      if ($zaehler_tmp==0)
84      {
85          $zaehler_tmp=1;
86      }
87      elseif ($i>0)
88      {
89          $insert_tmp.=",";
90      }
91      $insert_tmp.="('$lfdnr','" . $sprache["Familie"] . ": $objekt_familie_name','$objek
92  }
93  }
94  }
    
```

The cronjob script (PHP) is an update script and periodically executed

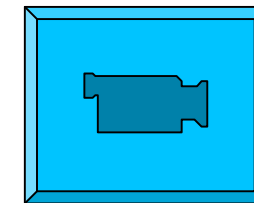
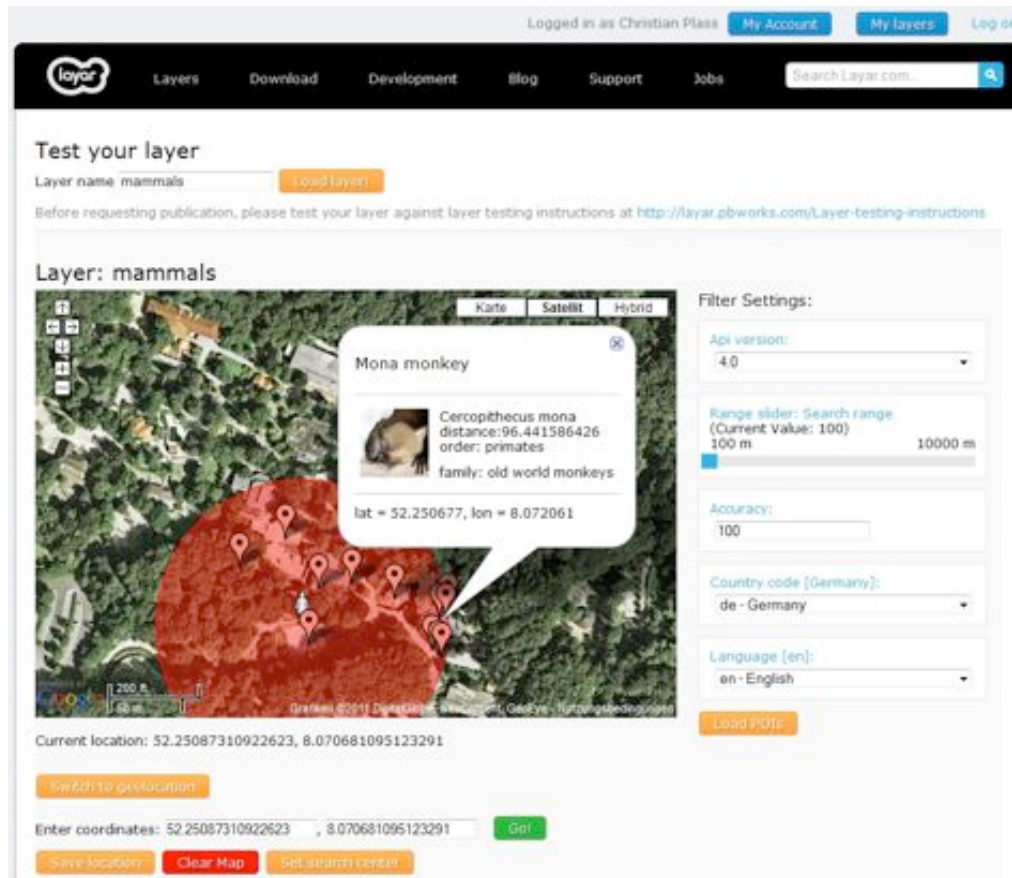
- Process sequence



The AR Browser can integrate current animal data now

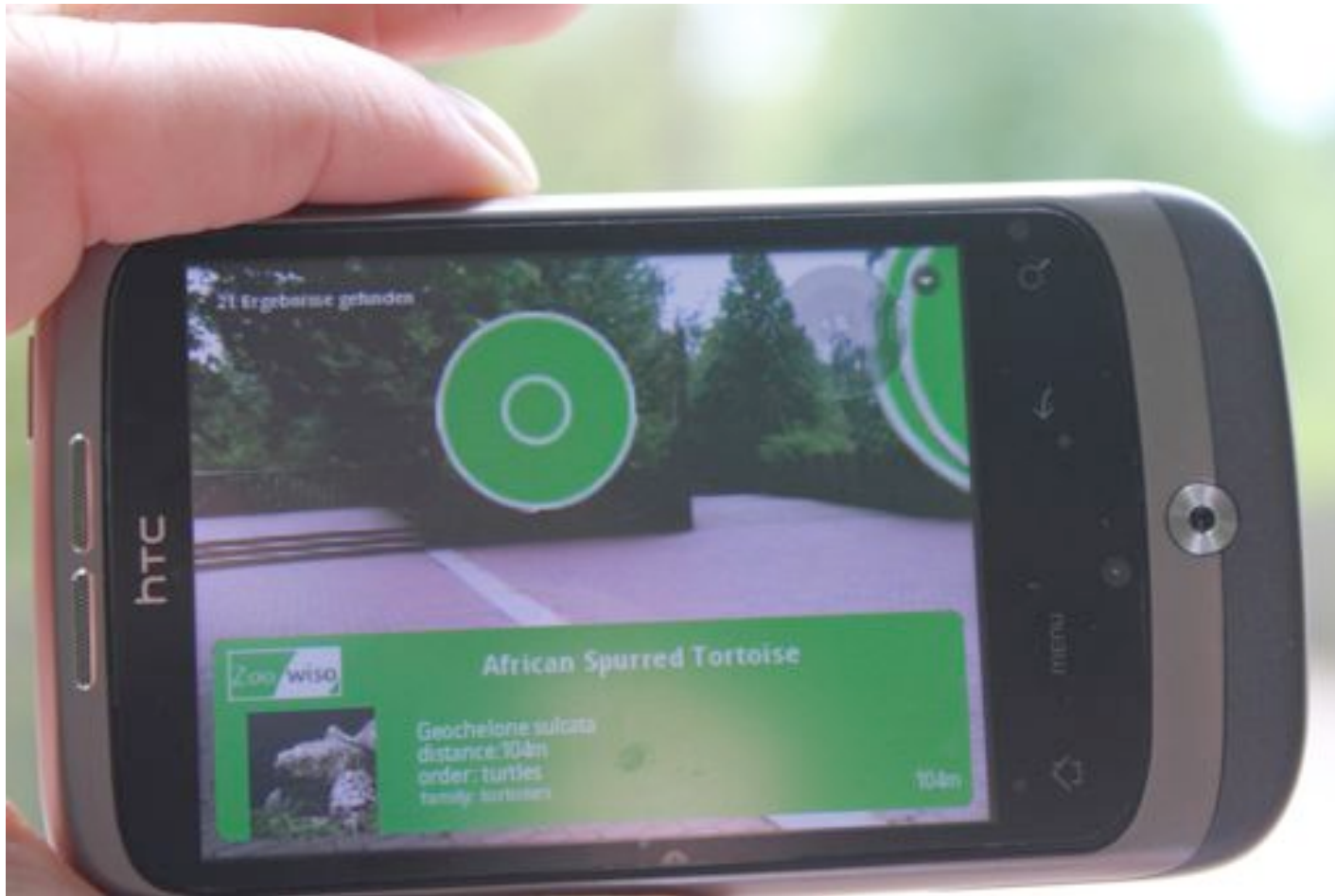
Testing a Layer in layar

- Video



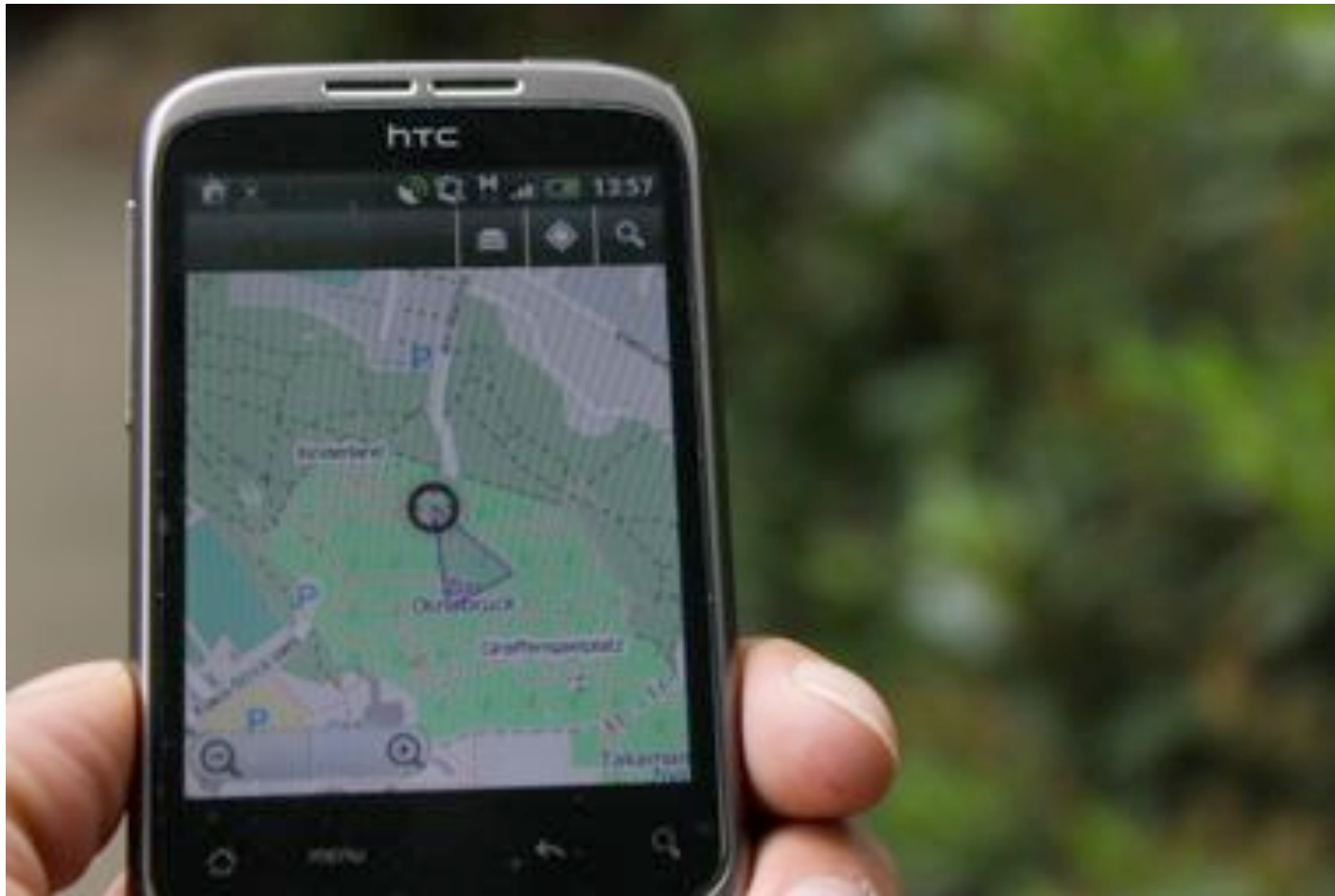
Testing Layar at the Zoo

- Layar on a (less powerful) device – here is the tortoise!



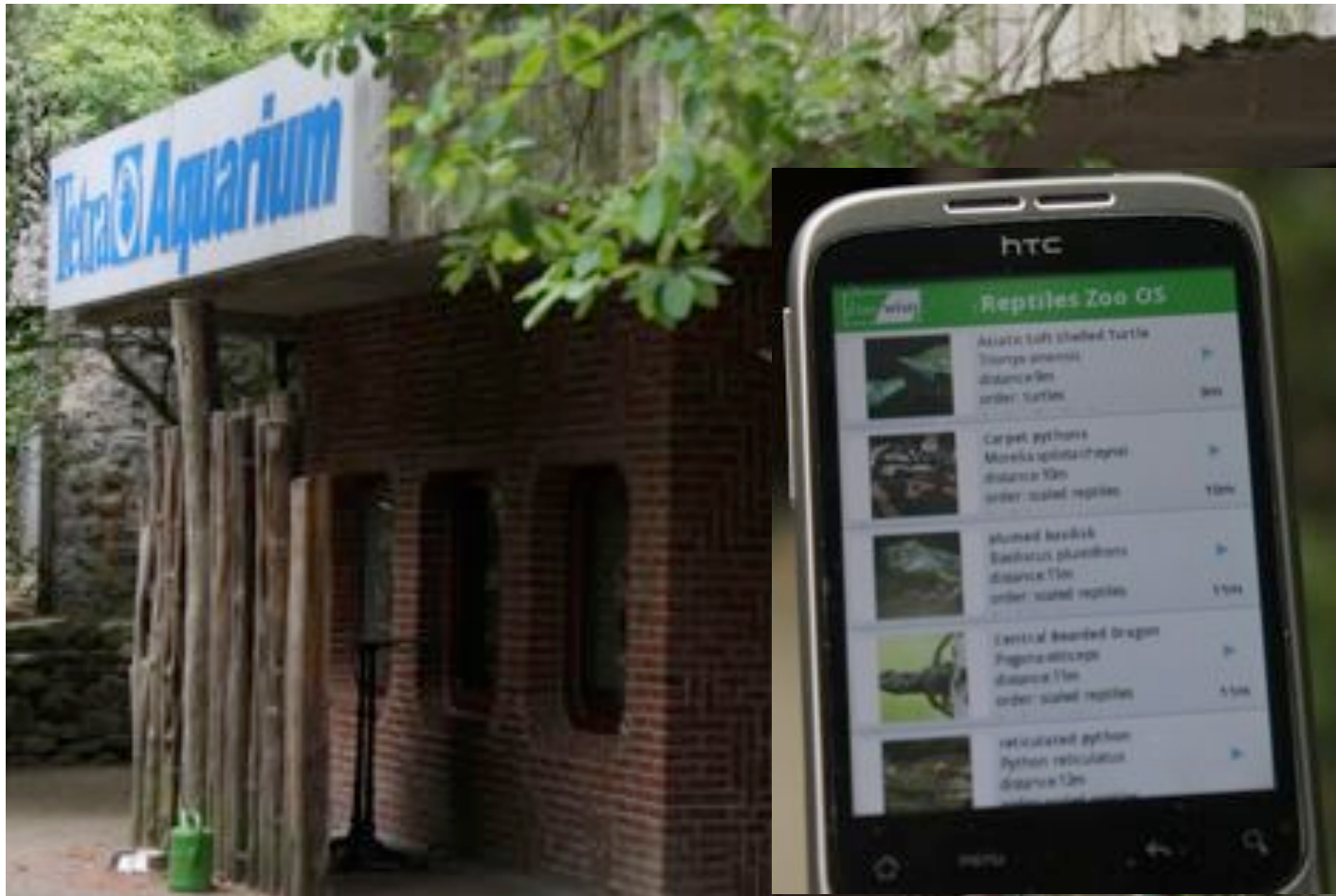
Testing layar at the Zoo

- Using layar for orientation during a zoo visit



Testing layar at the Zoo

- Seeing what's inside a building



Testing layar at the Zoo

- Seeing animals that are not there



- First attempts of using AR very promising
- AR is a modern way to present animal and environmental data
- AR seems to be suitable for the projects goals

Further Steps

- Publishing the layers
- Get a feedback
- Testing further functions of layar
- Testing Wikitude
- Integrating the results in the follow-up project “Expedition Moor”

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Thank You
for your attention!

