ETH zürich

Institute of Cartography and Geoinformation

Bird Tracker

Mapping Bird Mobility with an Interactive 3D Web Tool

Dagmara Pasiak

29.05.2024

Bird tracks

- Frequency: seconds to hours
- Recorded data: GPS, Orientation, Magnetometer, Acceleration
- Years of data, ~ 40 birds

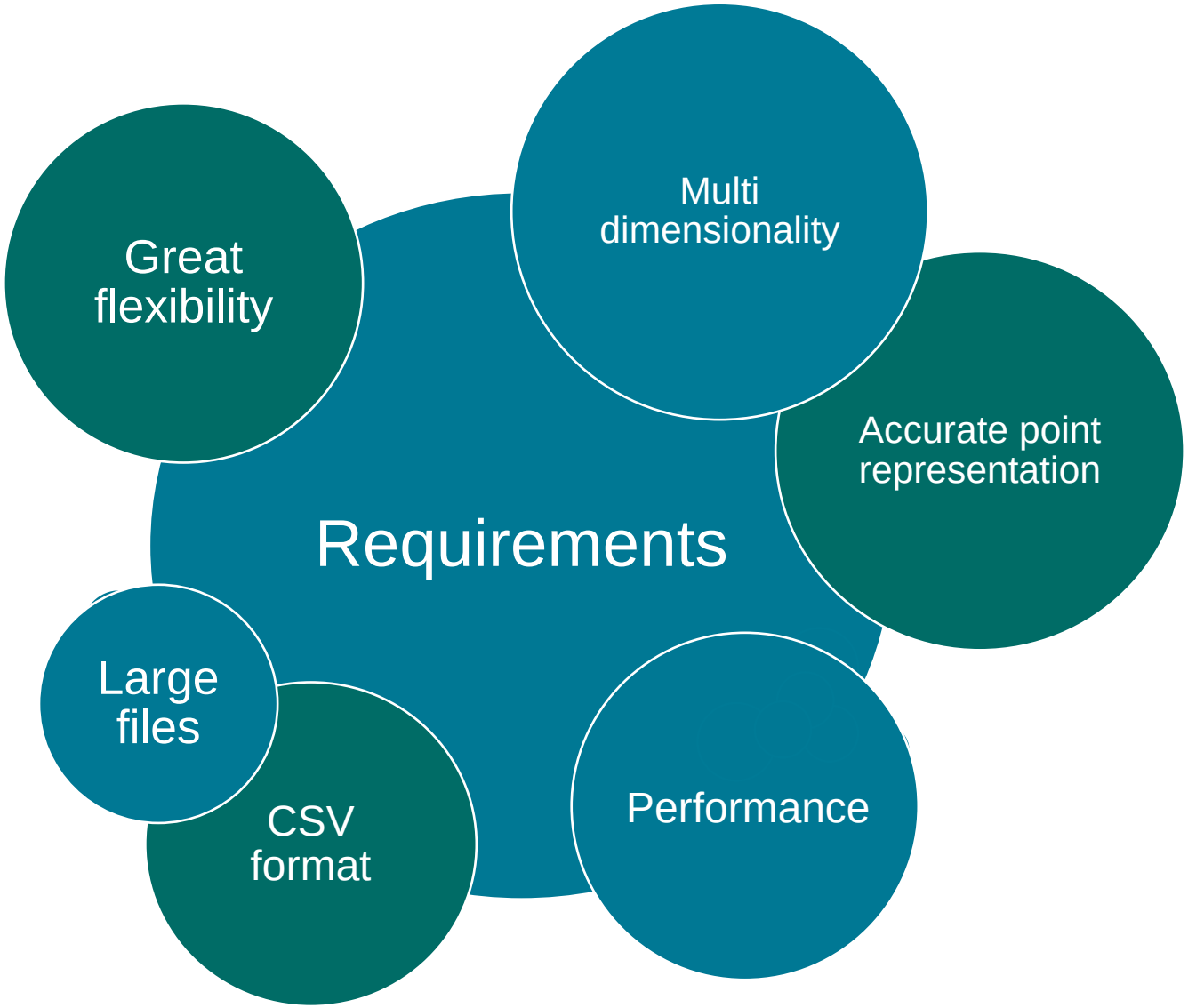
- Bird mobility with an interactive 3D web application
  - Scientists
  - Policy-makers
  - General public

Honey buzzard

Golden eagle

Image src: Vogelwarte and Movebank

Requirements



MAX PLANCK INSTITUTE
OF ANIMAL BEHAVIOR

File: Bird in focus:

Dashboard | Settings | Legend | Imprint

Upload CSV File

Please upload a CSV file downloaded from Movebank (either for an individual or some interval from the whole study)

Browse... No files selected.

CESIUM ion Upgrade for commercial use. Data attribution

UTC May 29 2024 04:00:00 UTC May 29 2024 08:00:00 UTC May 29 2024 12:00:00 UTC May 29 2024 16:00:00 UTC May 29 2024 20:00:00 UTC May 30 2024 00:00:00

Geomatics Semester Project 2024, 29.05.2024

Lead: Prof. Dr. Lorenz Hurni

Supervisors:
Katharina Henggeler (Institute of Cartography and Geoinformation, ETH Zurich),
Ph.D. Elham Nourani (Department of Migration from Max Planck Institute for Animal Behaviour)

Mapping Bird Mobility with an Interactive 3D Web Tool

Dagmara Pasiak
Institute of Cartography and Geoinformation, ETH Zurich;
Department of Migration, Max Planck Institute for Animal Behaviour (MPI)

1 Introduction

Understanding bird mobility is crucial for various sciences, but current tools like R have limited interactive 3D visualization capabilities. Interactive data exploration could simplify spatio-temporal movement analysis, making results more accessible to researchers, policymakers, and the public.

2 Methods

- The project began with requirement analysis including the interviews of four researchers from MPI to determine necessary functionalities revealing the need for essential features and flexible data exploration.
- The application used the Cesium library for 3D mapping integration, Vue for component-based structure, and was server-less with initial data upload capability.

Sketch of the application in the design phase

3 Data

- Track data used for testing was stored as a private repository on a Movebank[1] and shared as part of the collaboration.
- The application was tested using honey buzzard and golden eagle data recorded over several years at varying frequencies from seconds to hour.
- It was stored in CSV format with time, location and other movement and GPS device properties.

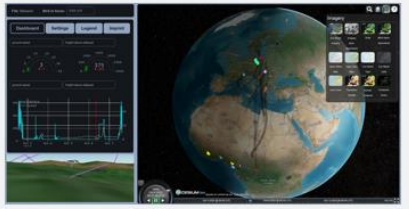
Honey Buzzard tracks

Golden Eagle tracks

4 Results

The application allows a global and detailed inspection after the user has uploaded the file, which can contain several individuals. The map allows interaction with the route and all the points recorded, while the changing dashboard allows further investigation.

Part of the route in the Swiss Alps, showing the complexity of bird movements. The map shows each recorded point, where the colours of the points and the generated line correspond to the selected attributes.



In order to display the entire path, a generalised path was created together with a 24-hour moving path. This combination allows both the entire uploaded track to be displayed, as well as detailed examination and rendering for multiple individuals on a global scale.

5 Conclusion and Discussion

The test results were very promising, confirming some assumptions and revealing new insights when the data was integrated with terrain and 3D visualisation. The complexity and size of the data presented many challenges and required several workarounds. While the application is functional, there is still potential for further improvement in terms of data rendering and implementation of additional features.

References

1. Globally used online database of animal tracking data hosted by the Max Planck Institute of Animal Behavior