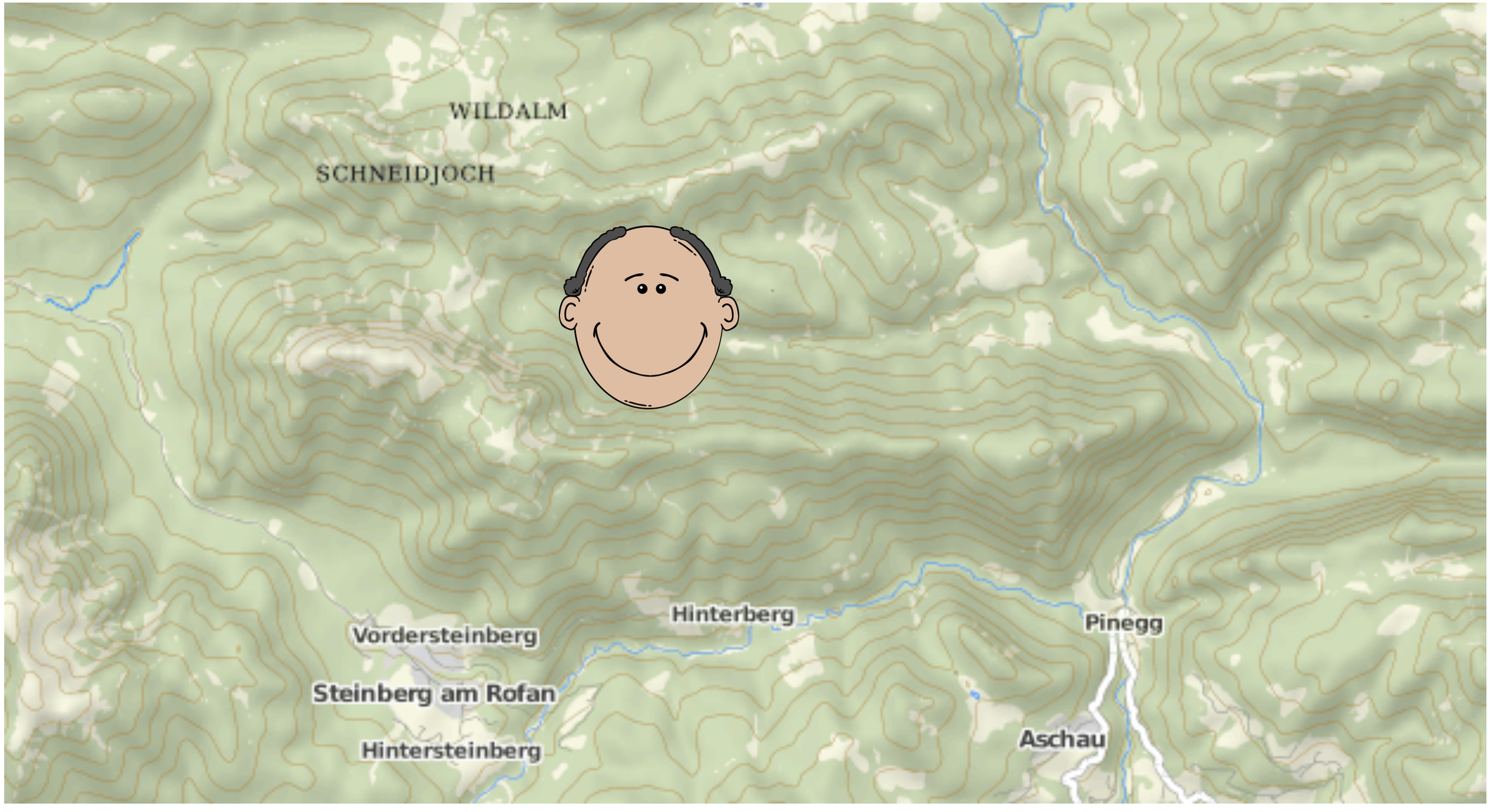
A Preference SQL Approach to Improve Context-Adaptive Location-Based Services for Outdoor Activities

F. Wenzel, M. Soutschek, W. Kießling

Vienna, 21st Nov. 2011

Running Example



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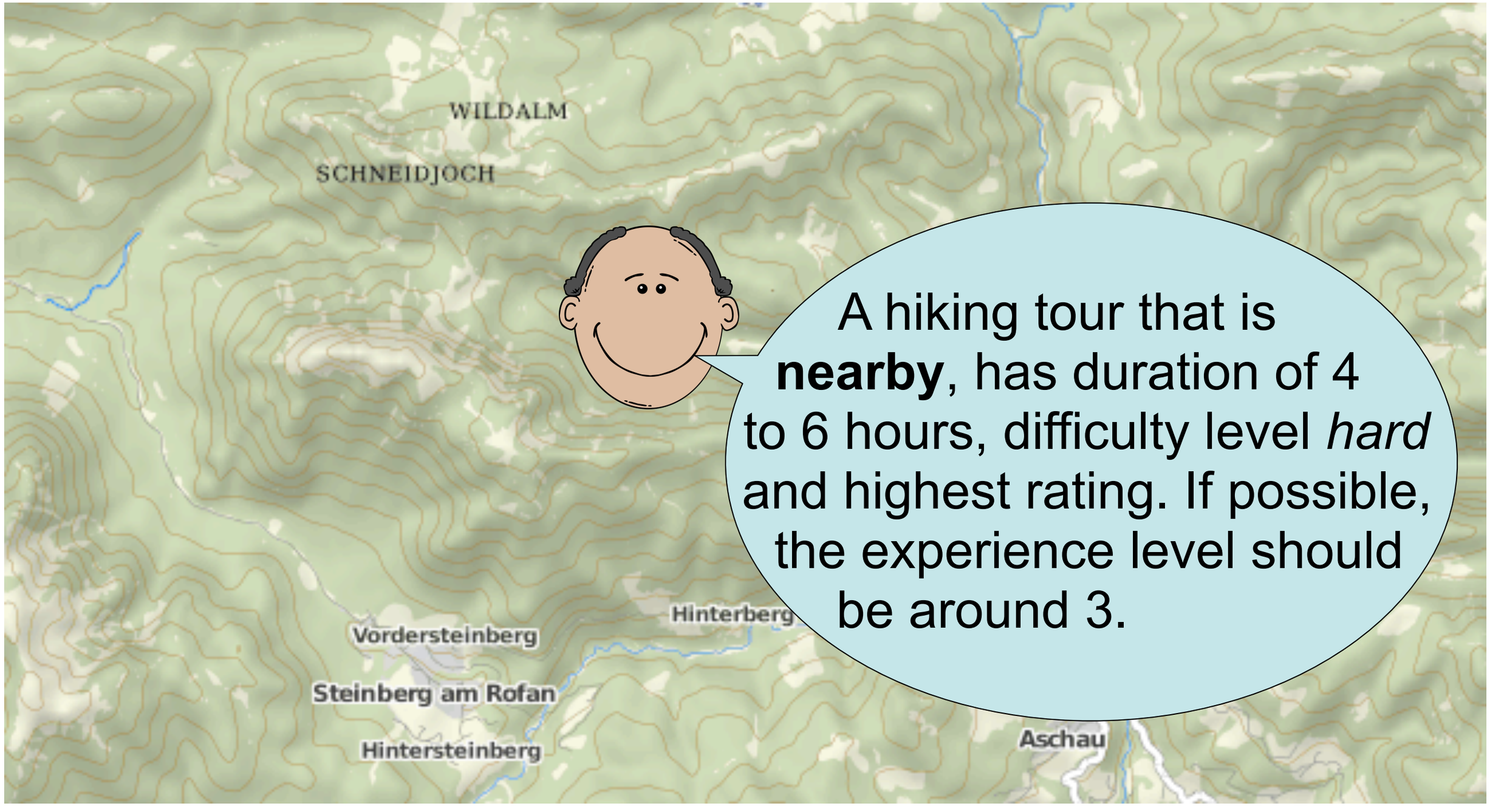

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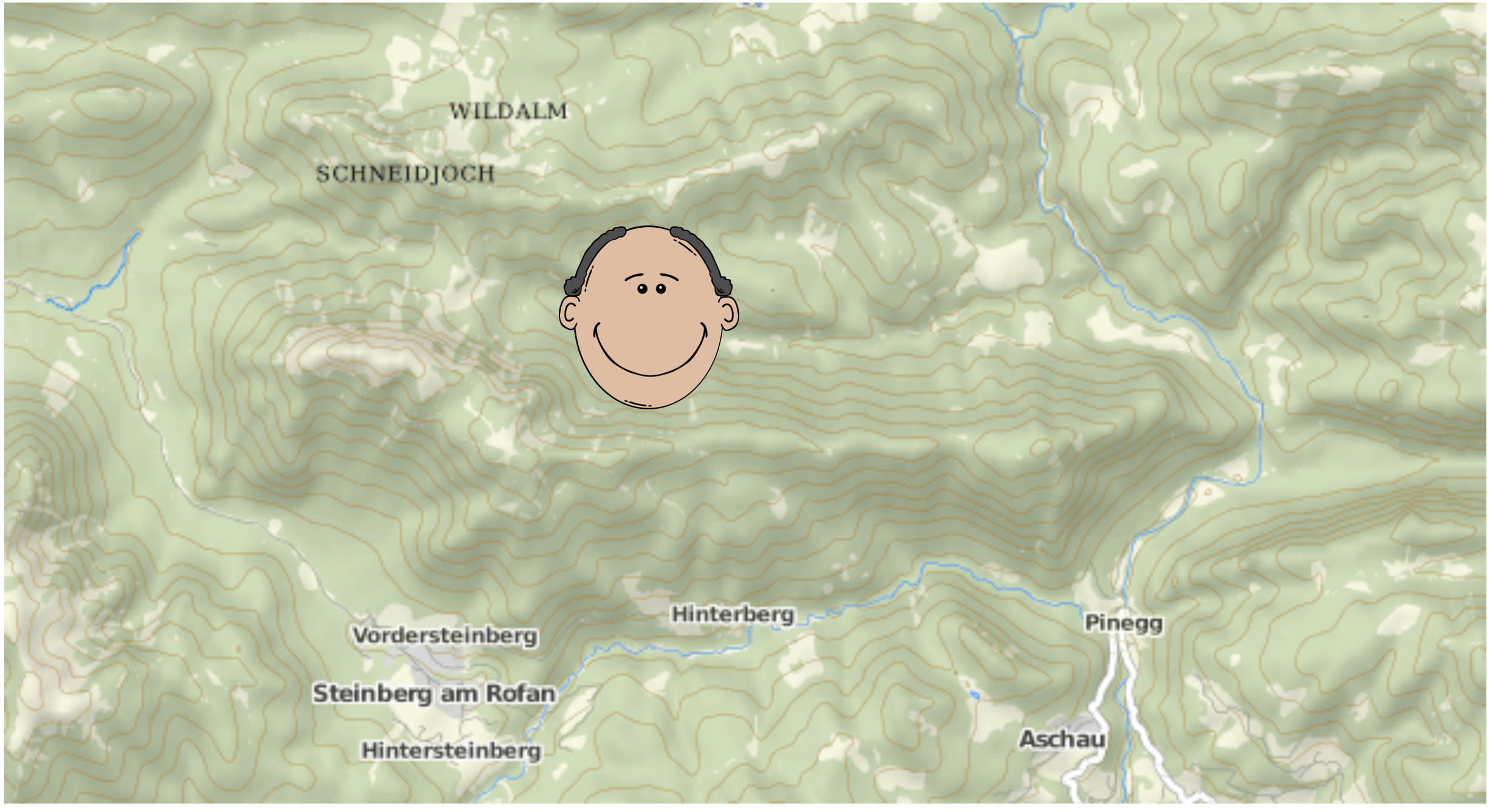

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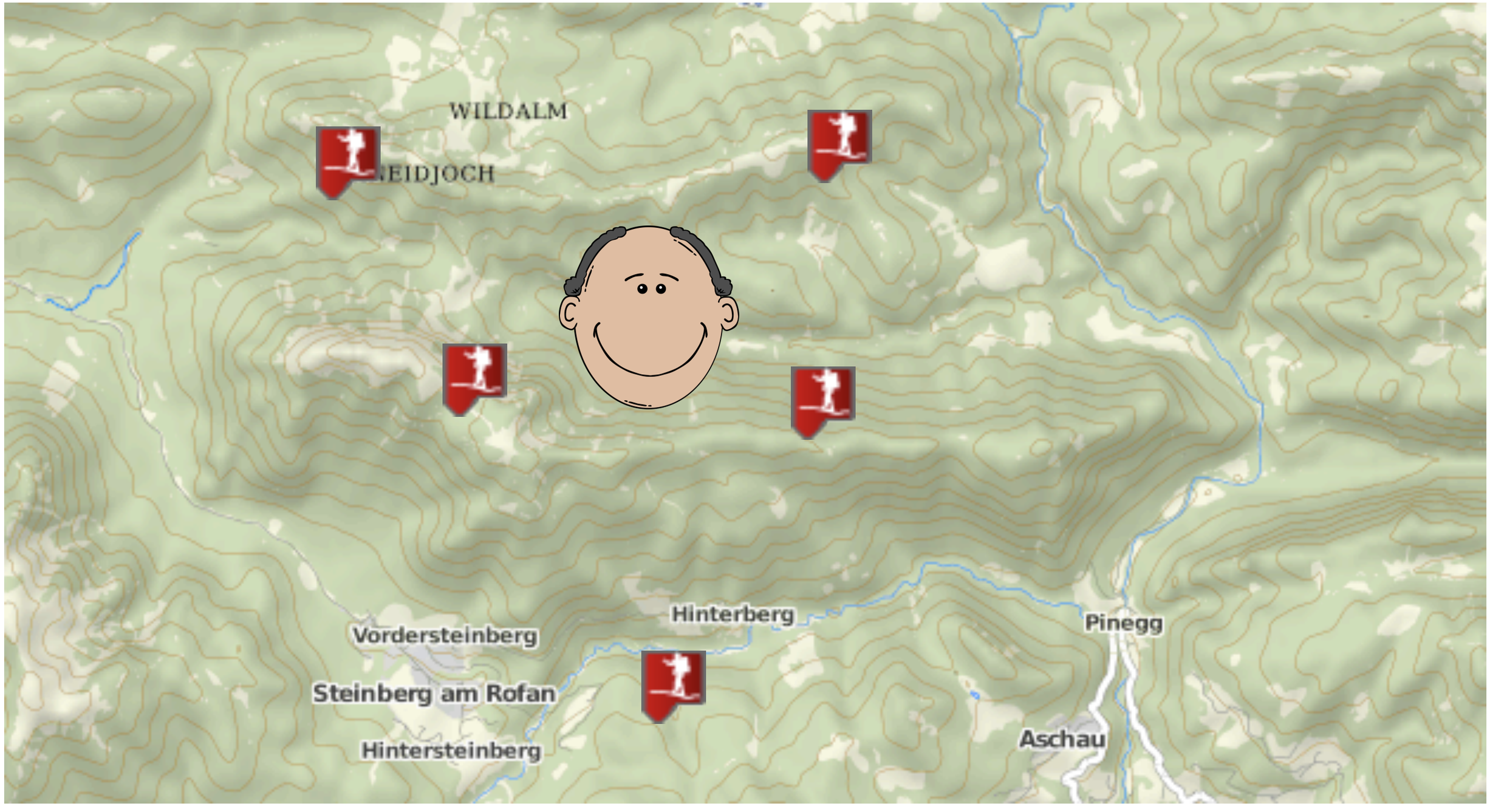

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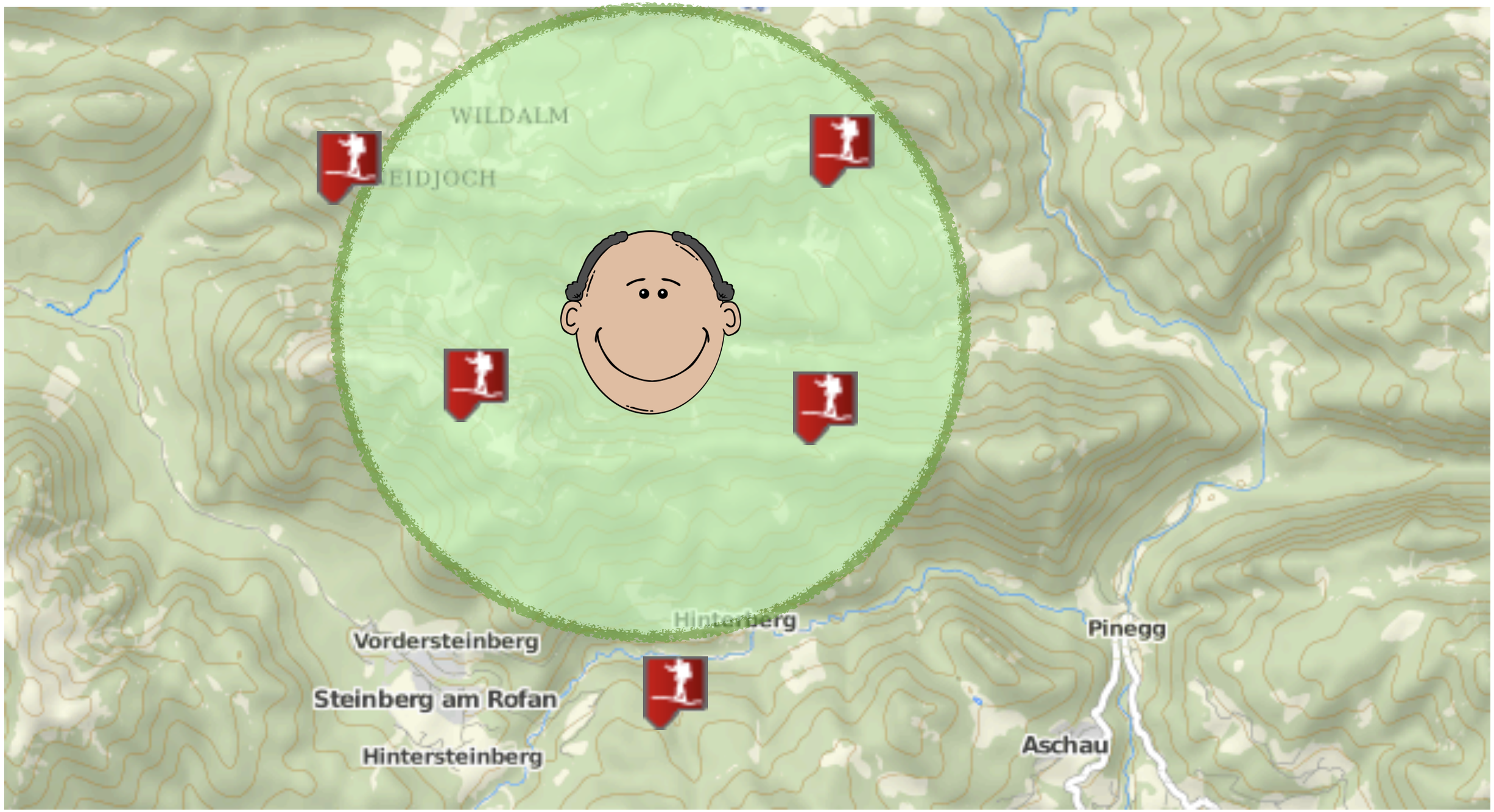

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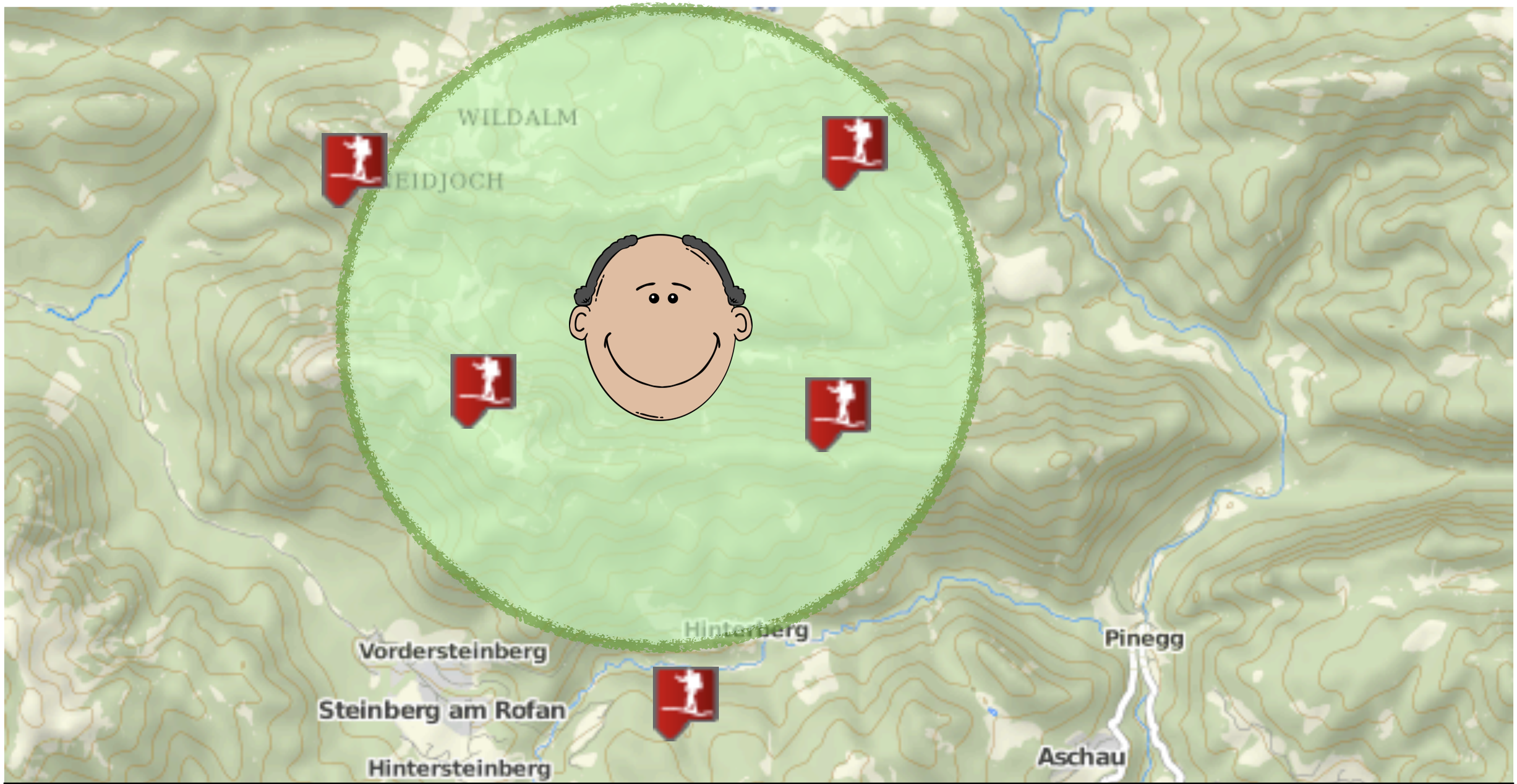

hiking tour: nearby, duration 4 to 6 hours, difficulty *hard*, highest rating, experience level around 3.

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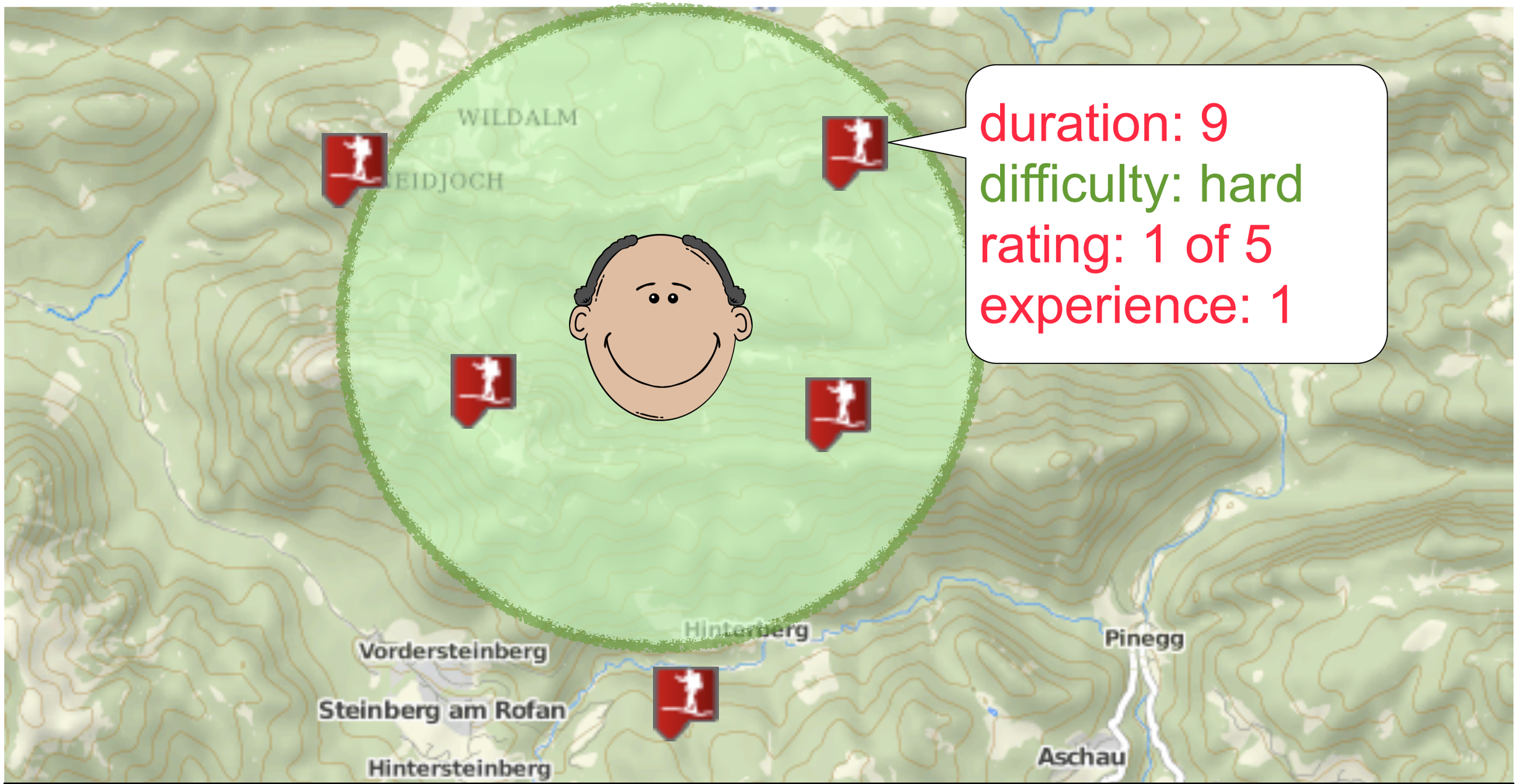

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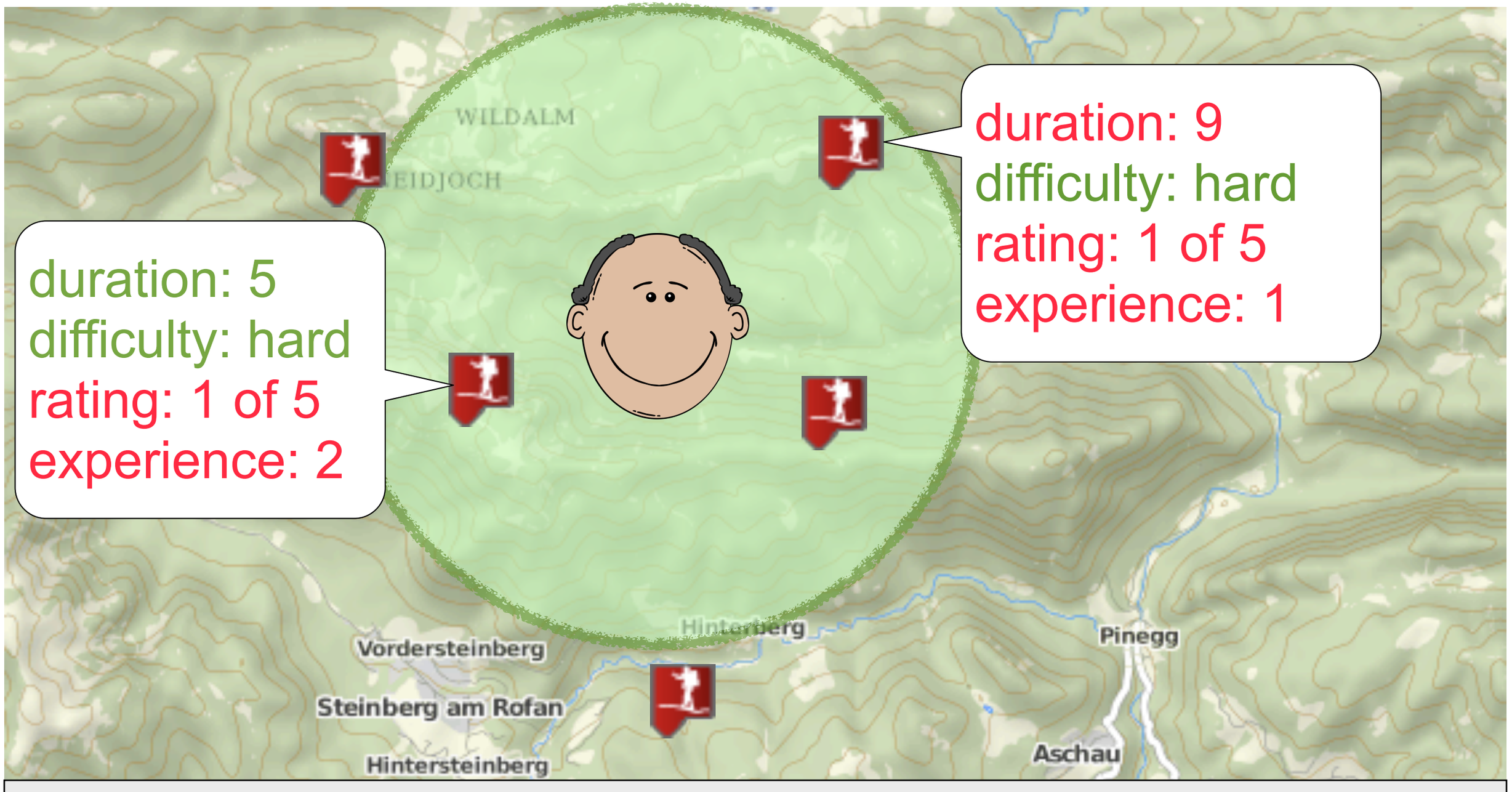

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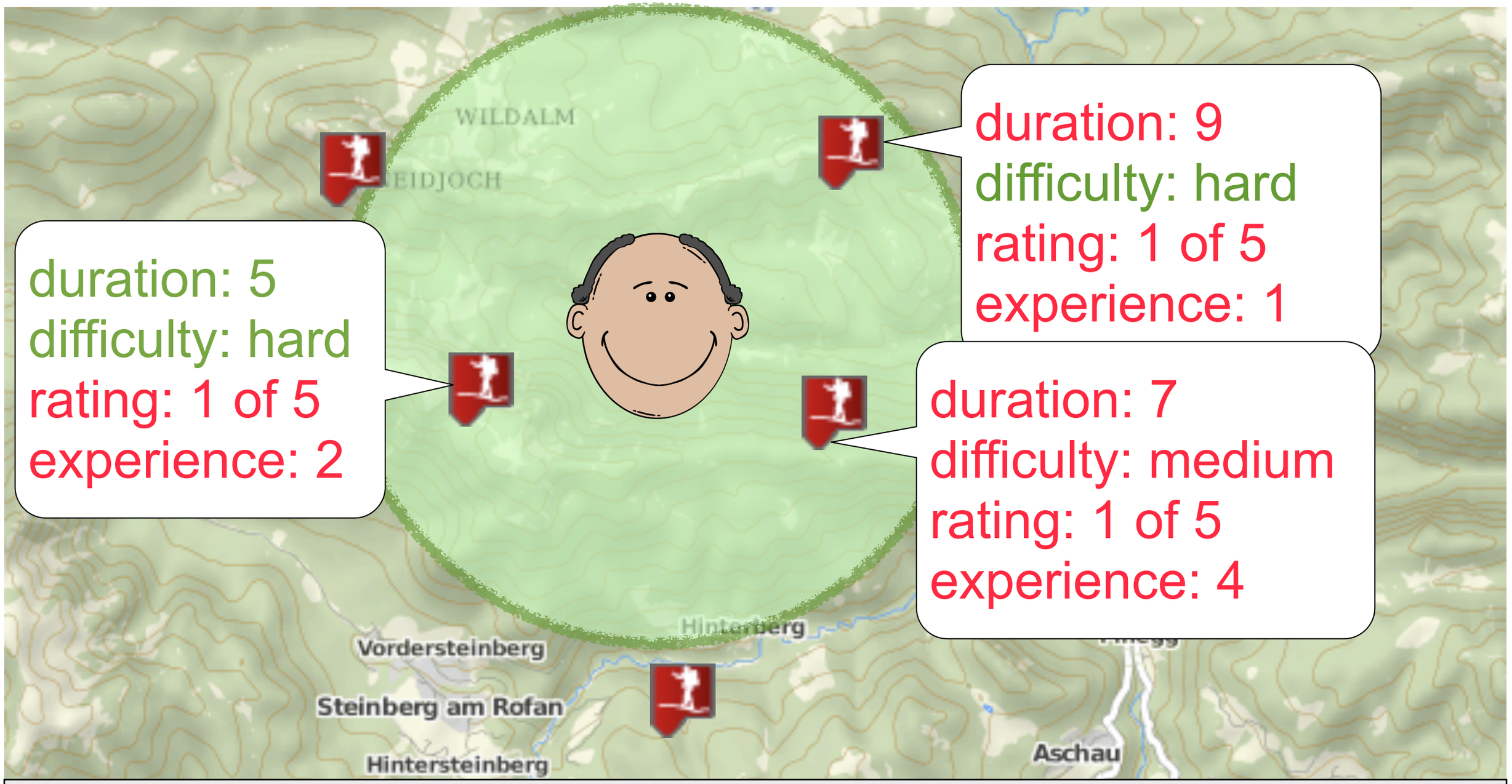

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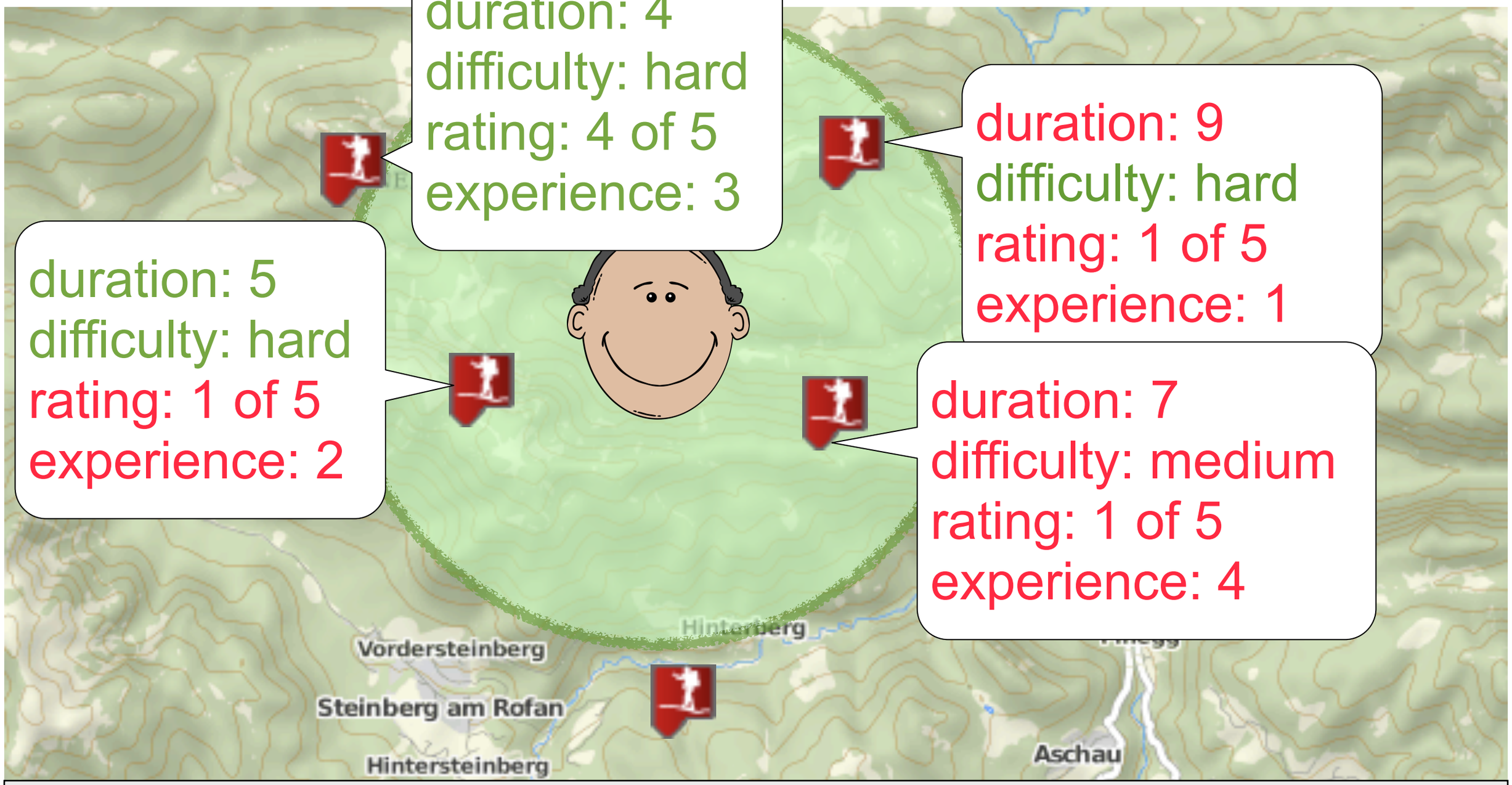

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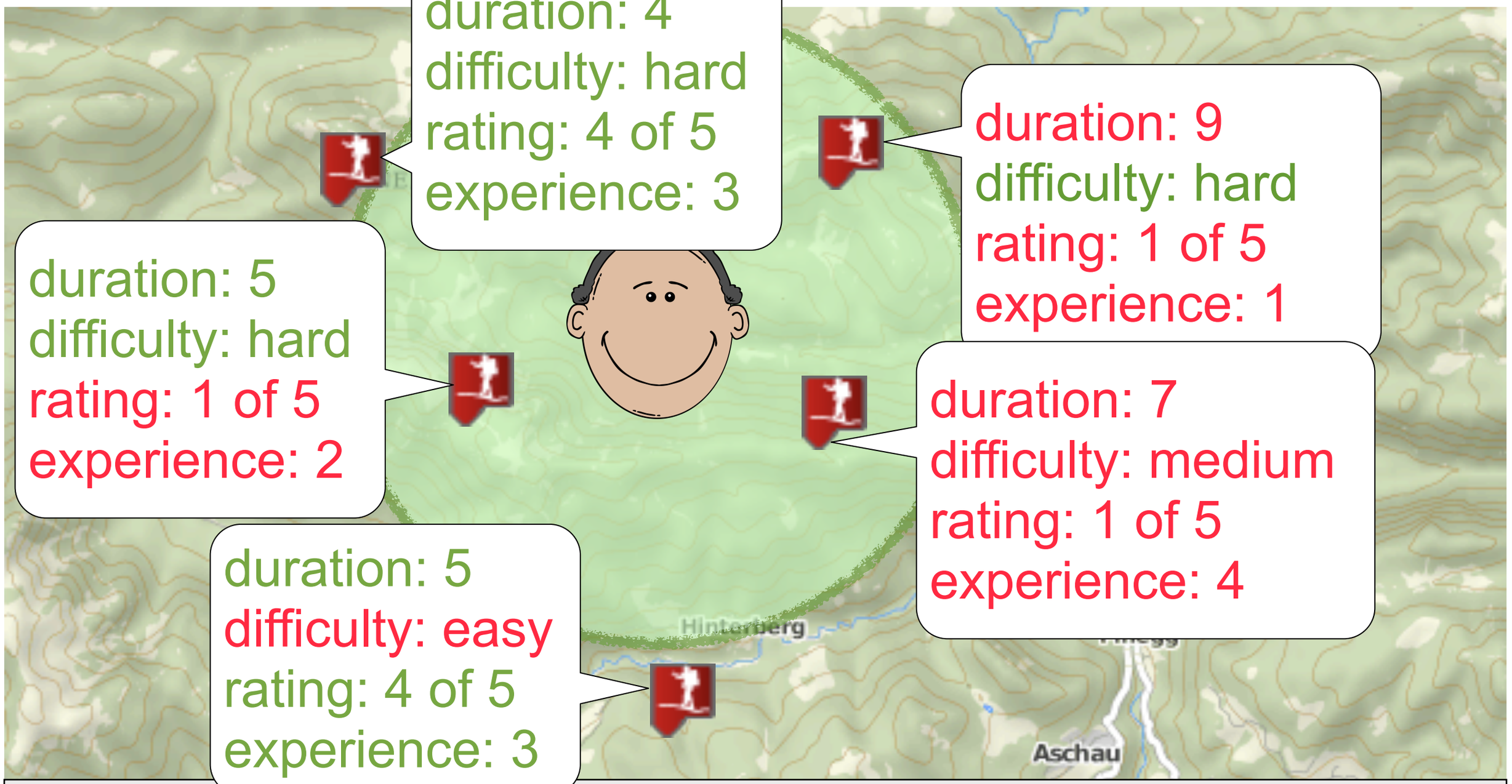

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Derived Requirements

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- The example shows that conventional search
  - often generates too many (flooding) or no results (empty result effect),
  - forces users to iteratively change search parameters,
  - creates long session times from first click to final result.

- What is needed is a query language that
  - avoids empty results and flooding,
  - lets users express wishes concerning basic attributes,
  - lets users state priorities between those basic wishes,
  - delivers results in **one single step**.

Preference SQL

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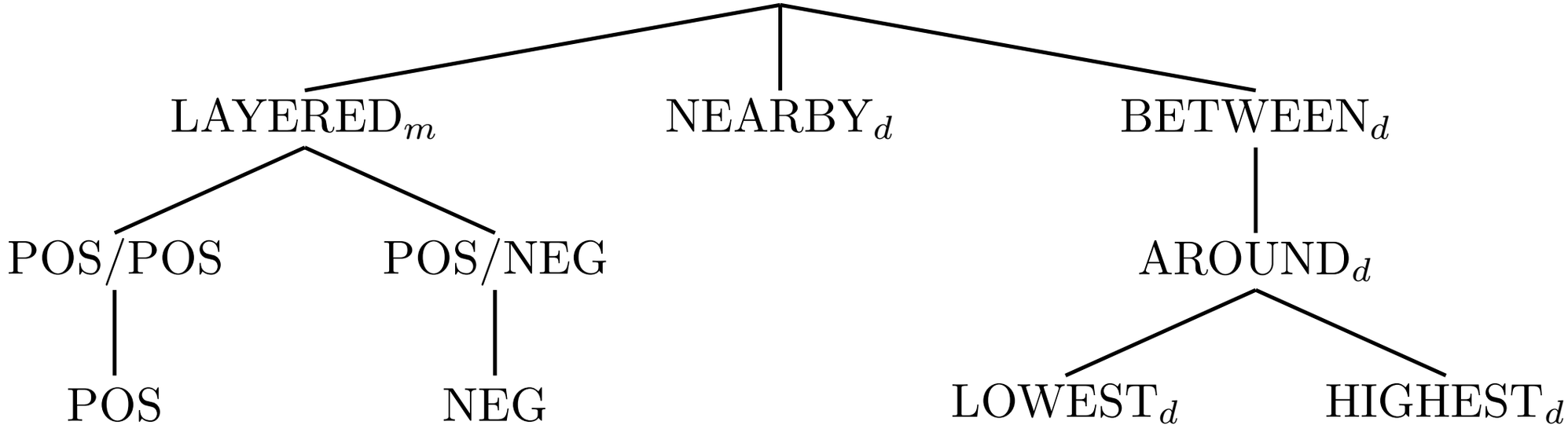
- Preference SQL defines a *Preference Algebra* with base and complex preference constructors.
- Based on that algebra, a query language for soft and hard constraints is implemented extending the SQL standard.
- The *Best Matches Only* (BMO) query model returns perfect matches if such matches exist.
- The Query model mitigates flooding and the empty result effect.
- Preference SQL is implemented as Java-middleware that connects to any conventional relational database system.
- The middleware provides its own parser, optimizer and preference algorithms.

Base Preferences

A hiking tour that is **nearby**, has duration of 4 to 6 hours, difficulty level *hard* and highest rating. If possible, the experience level should be around 3.



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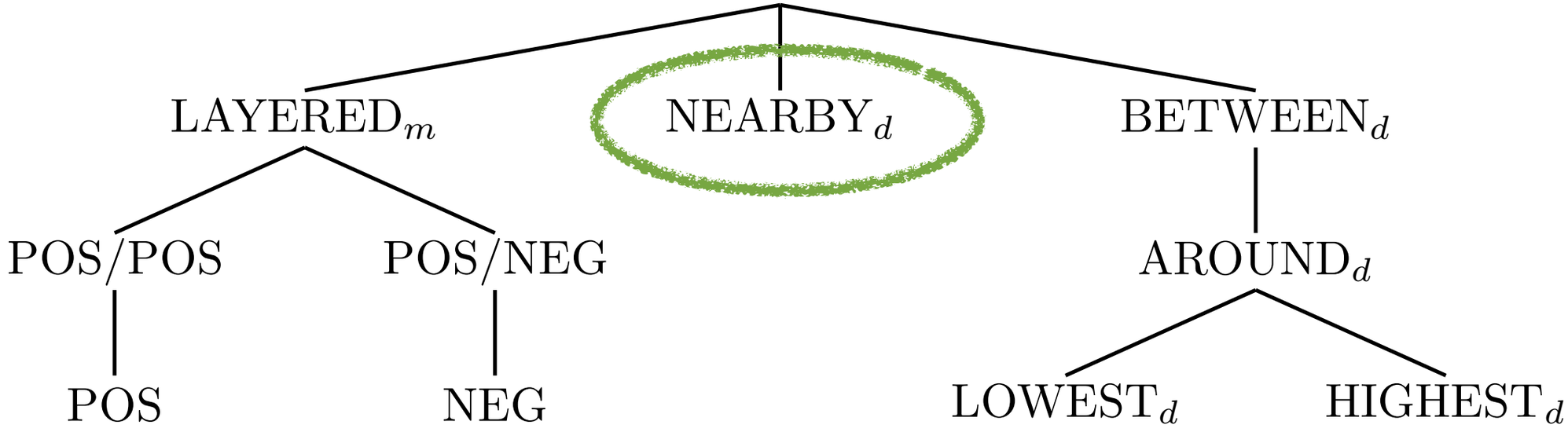

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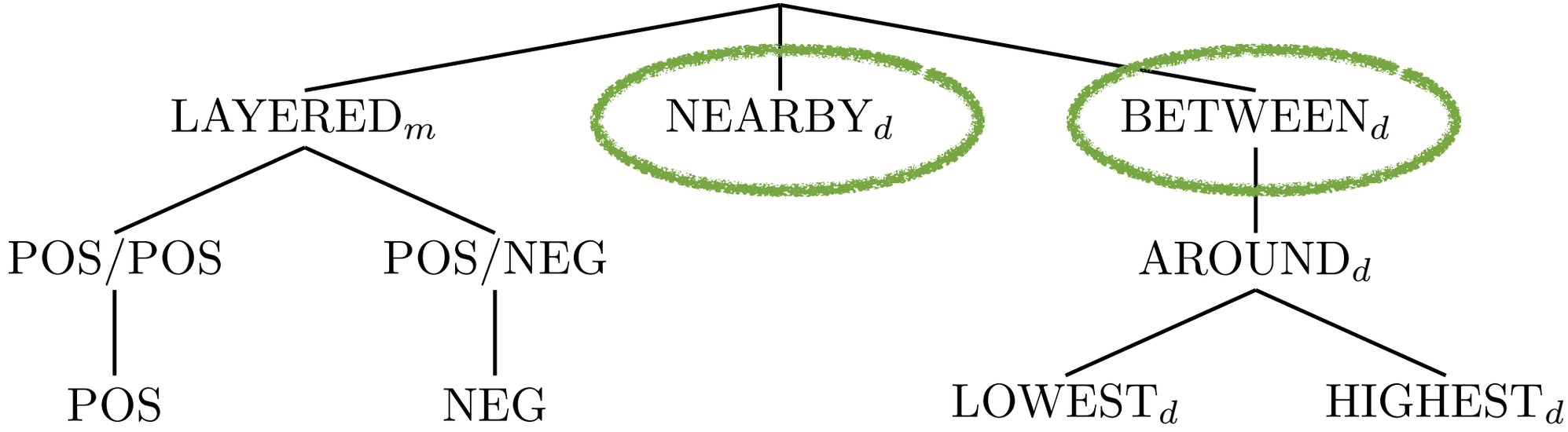

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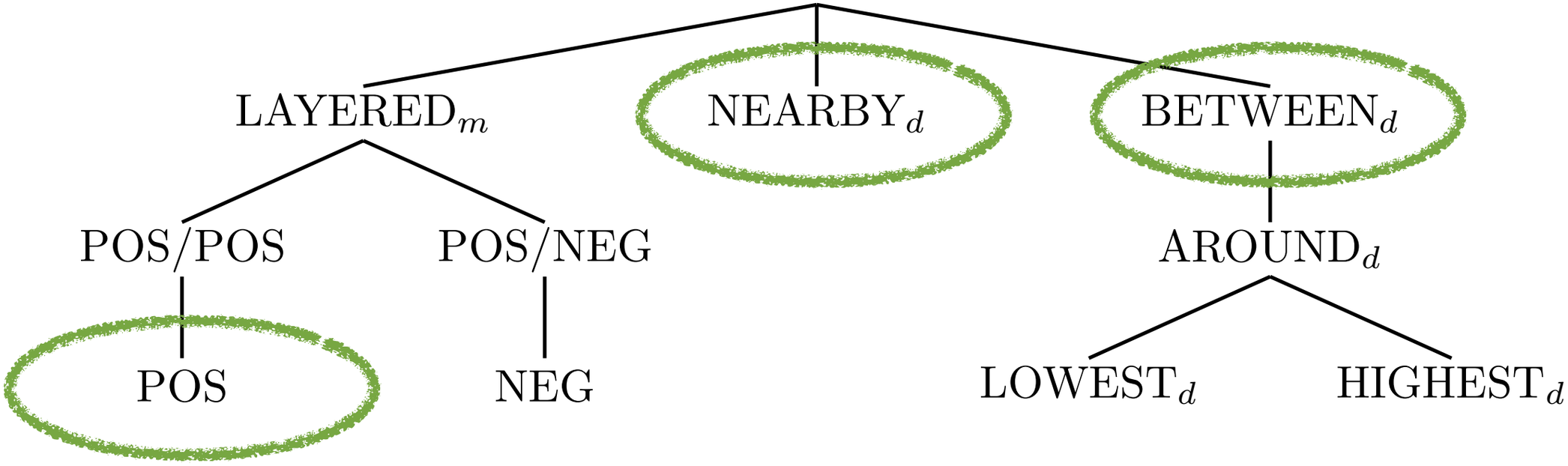

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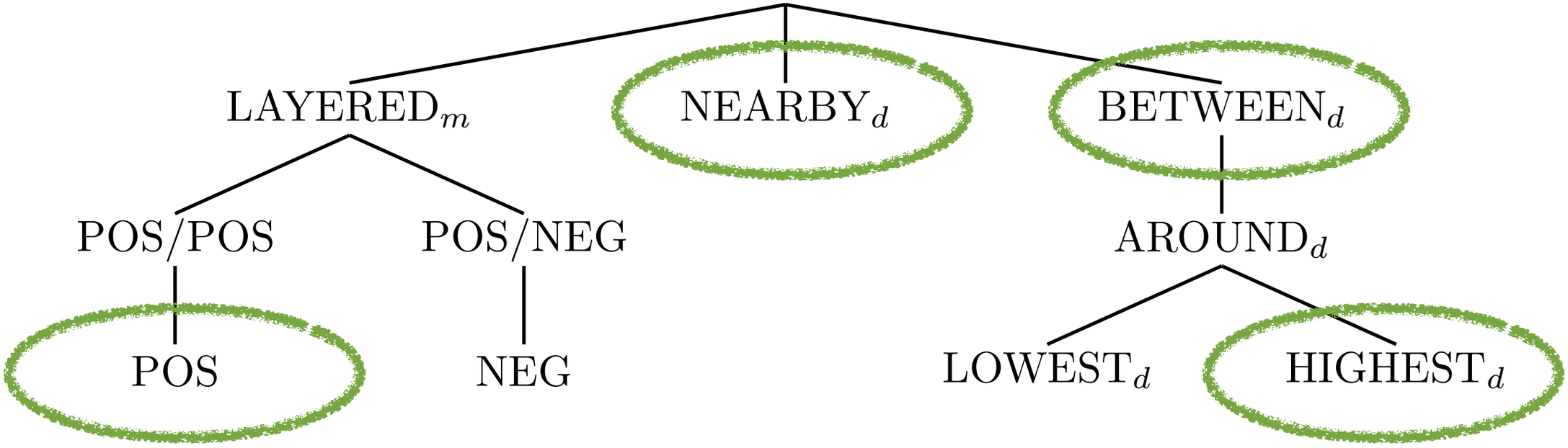

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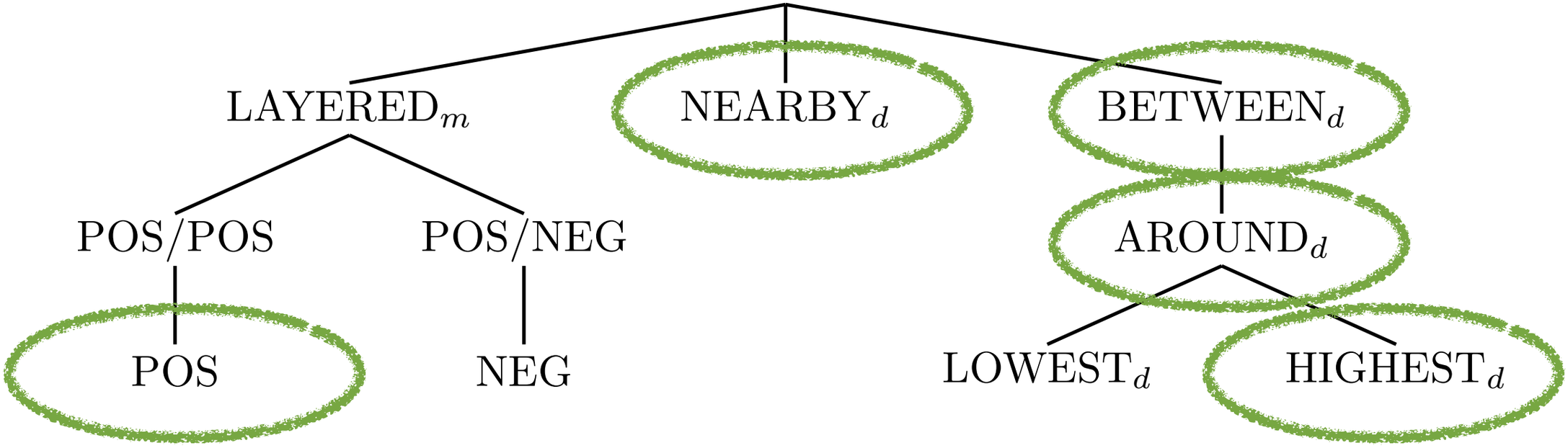
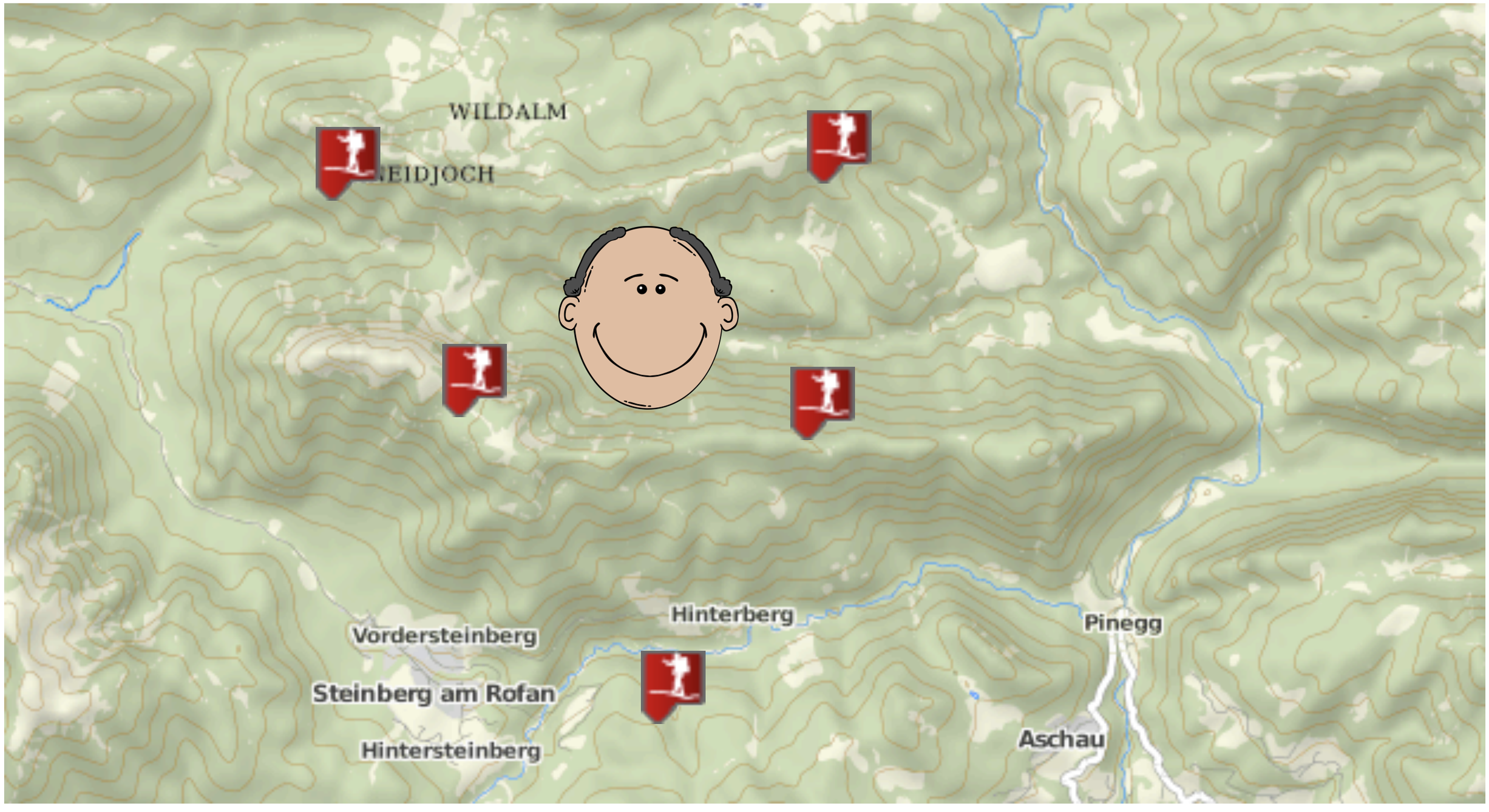


Complex Preferences

- **Pareto** constructor:
  - Involved preferences are of **equal** importance
  - example: Paul‘s wish for *hard* tours and highest rating

- **Prioritization** constructor:
  - involved preferences are of **ordered** importance
  - example: experience level as Paul‘s tiebreaker preference

NEARBY Preference



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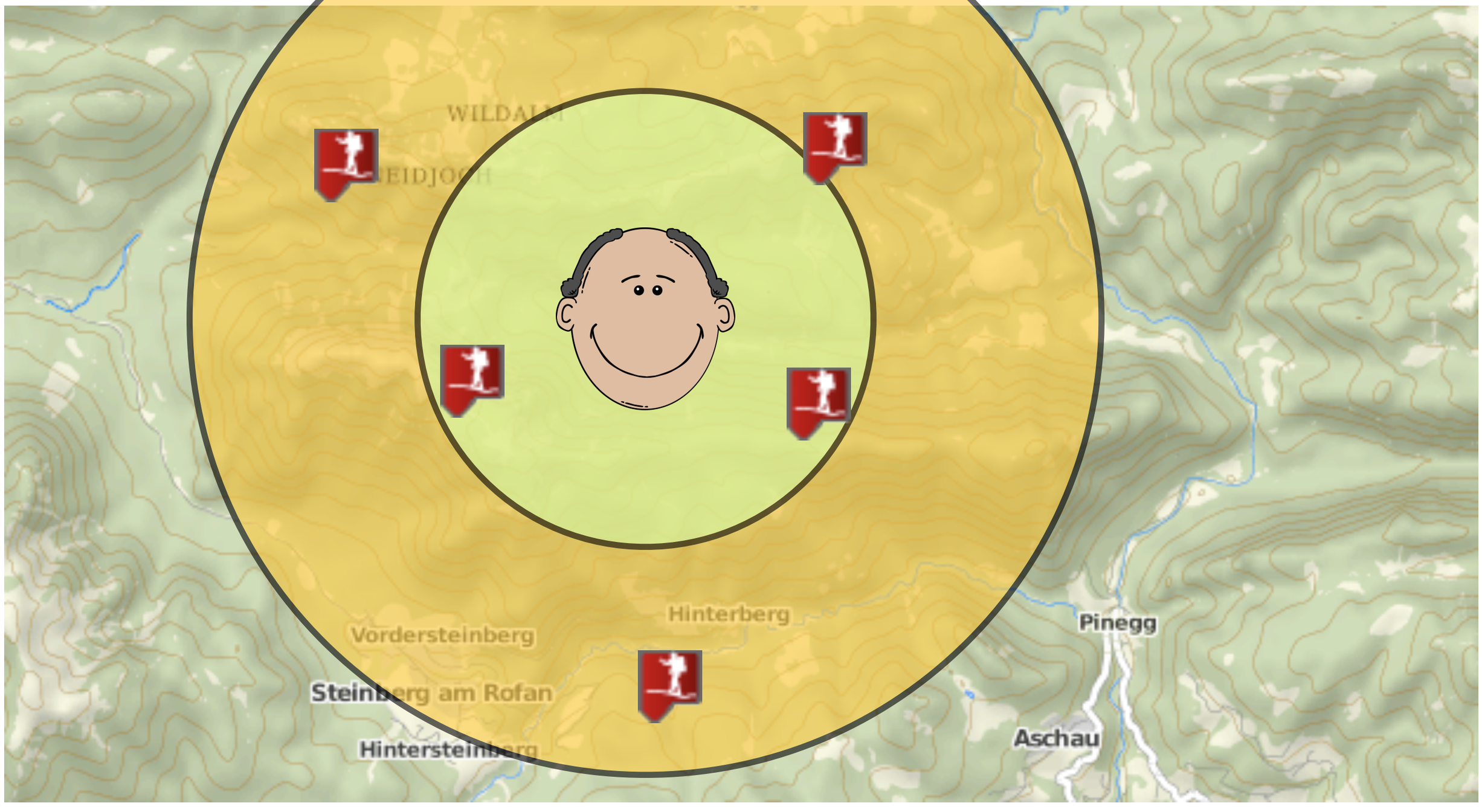

Spatial Preferences

- NEARBY is a first representative of *Spatial Preferences*.
- The implementation uses the basic functionality of the underlying PostgreSQL + PostGIS database.
- Several distance functions can be used: ST_Distance, ST_maxDistance

- Performance benchmark:
  - 24000 entries in about 5,5 sec
  - 1000 entries in less than 1 sec
  - largest touristic region in a commercial test case with 1300 entries

Preference SQL Queries

```
SELECT * FROM tours
WHERE region = 'Alpine'
 PREFERRING (
     route NEARBY 47.5494, 11.827211, 2000, ST_maxDistance
     AND duration BETWEEN 4, 6 , 1
     AND difficulty IN ('hard')
     AND rating HIGHEST 5, 1)
     PRIOR TO experience AROUND 3, 1
```

Preference SQL Queries

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base preferences

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SELECT * FROM tours
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Preference SQL Queries

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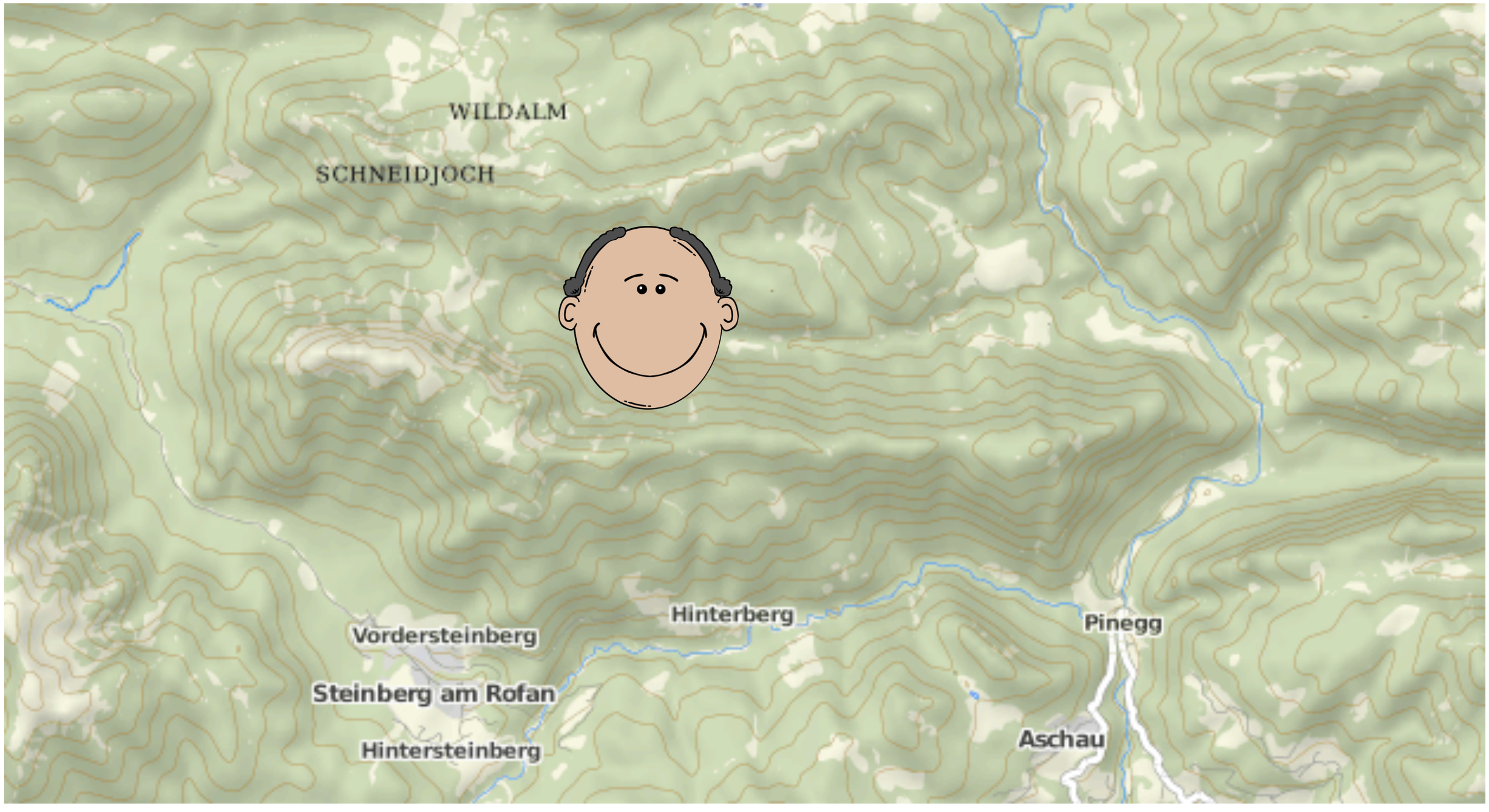
Query Evaluation



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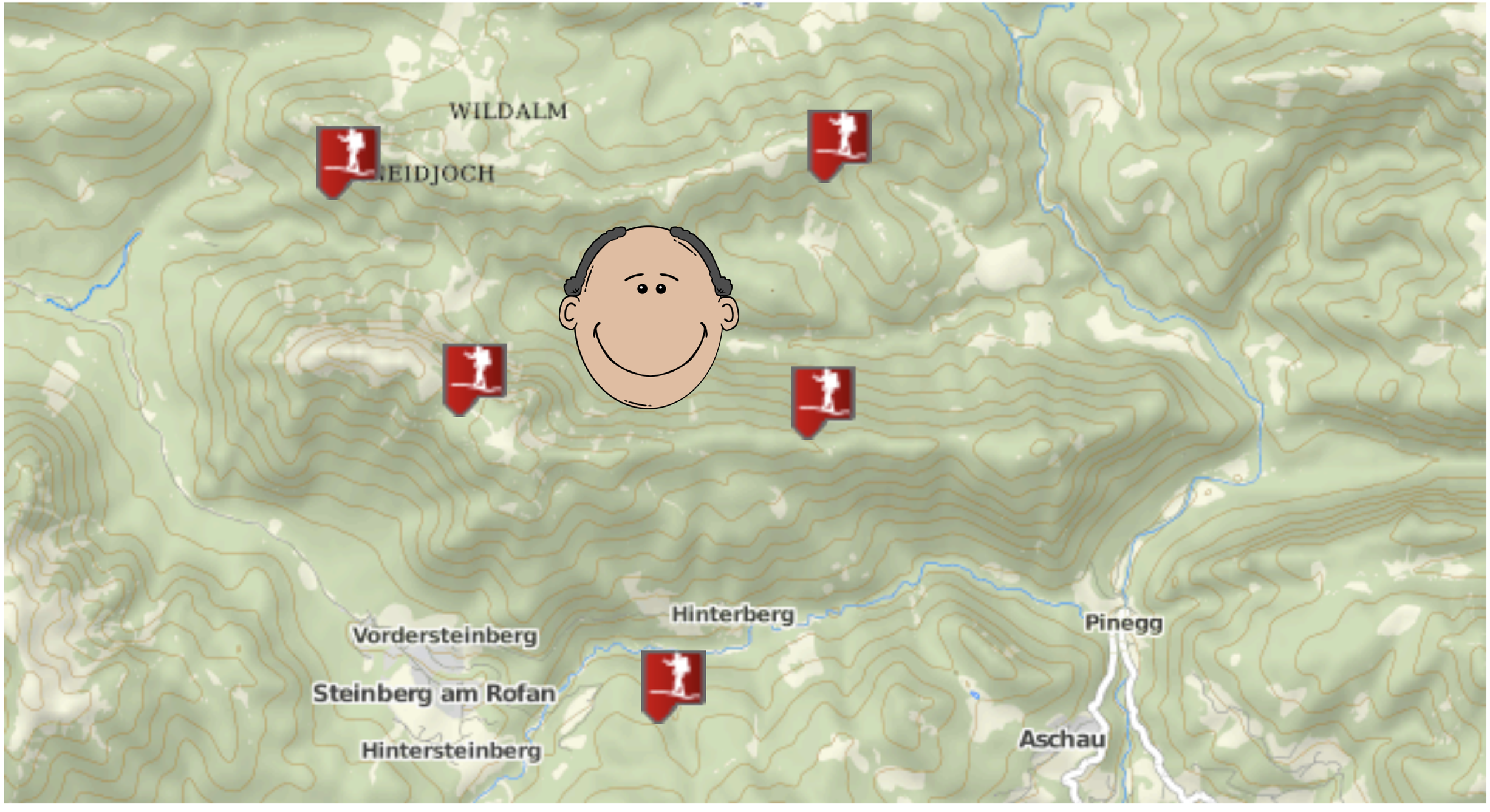

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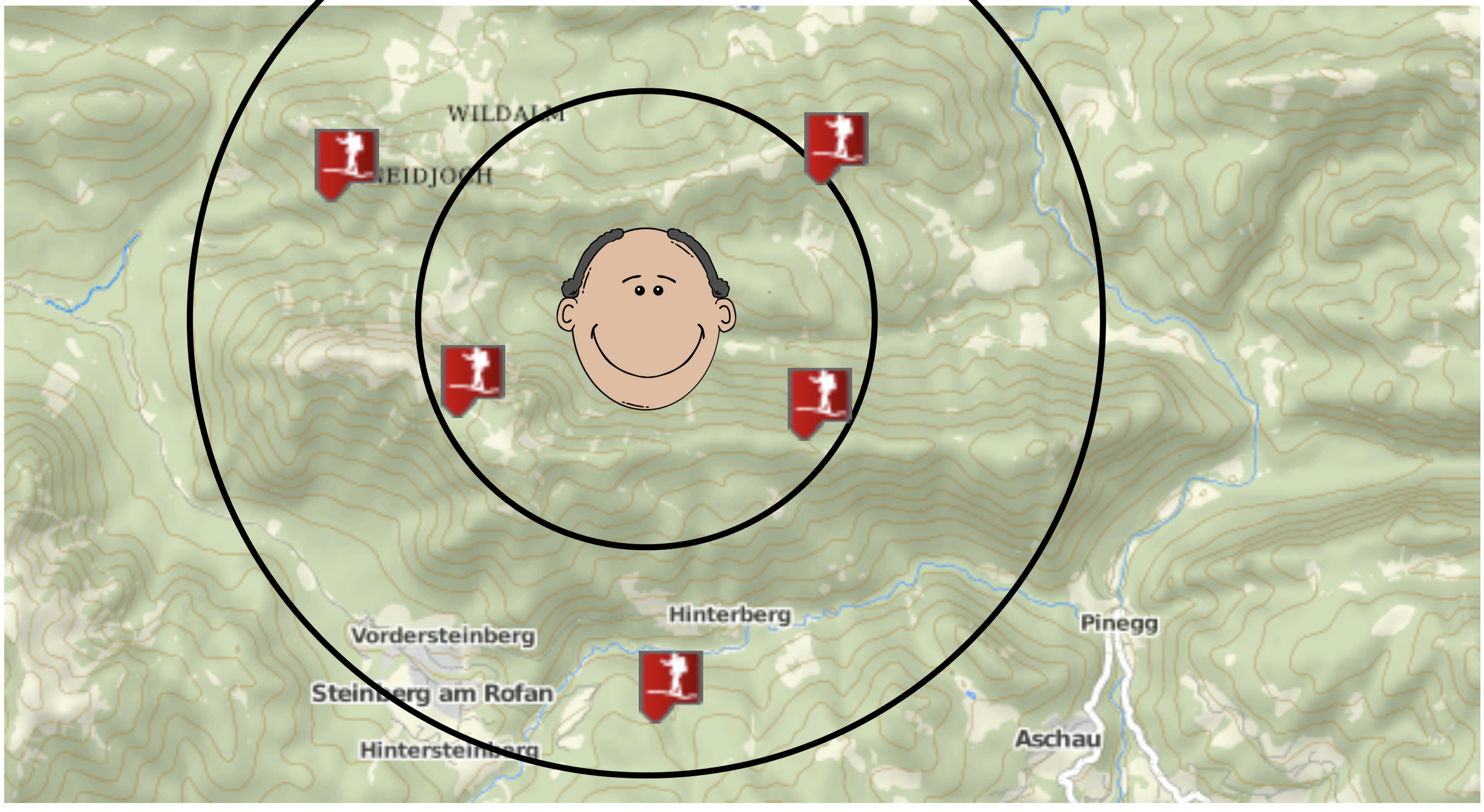

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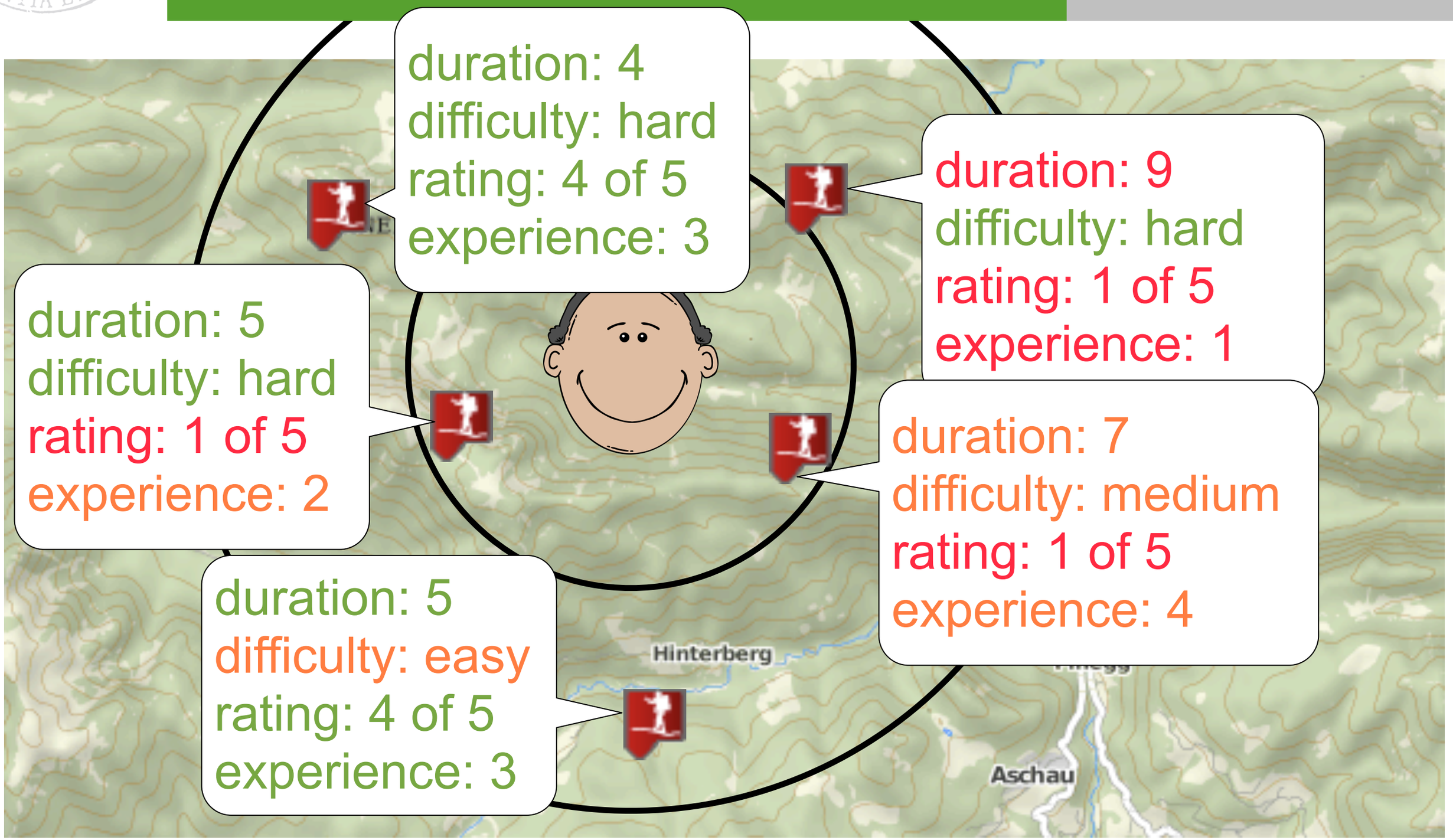

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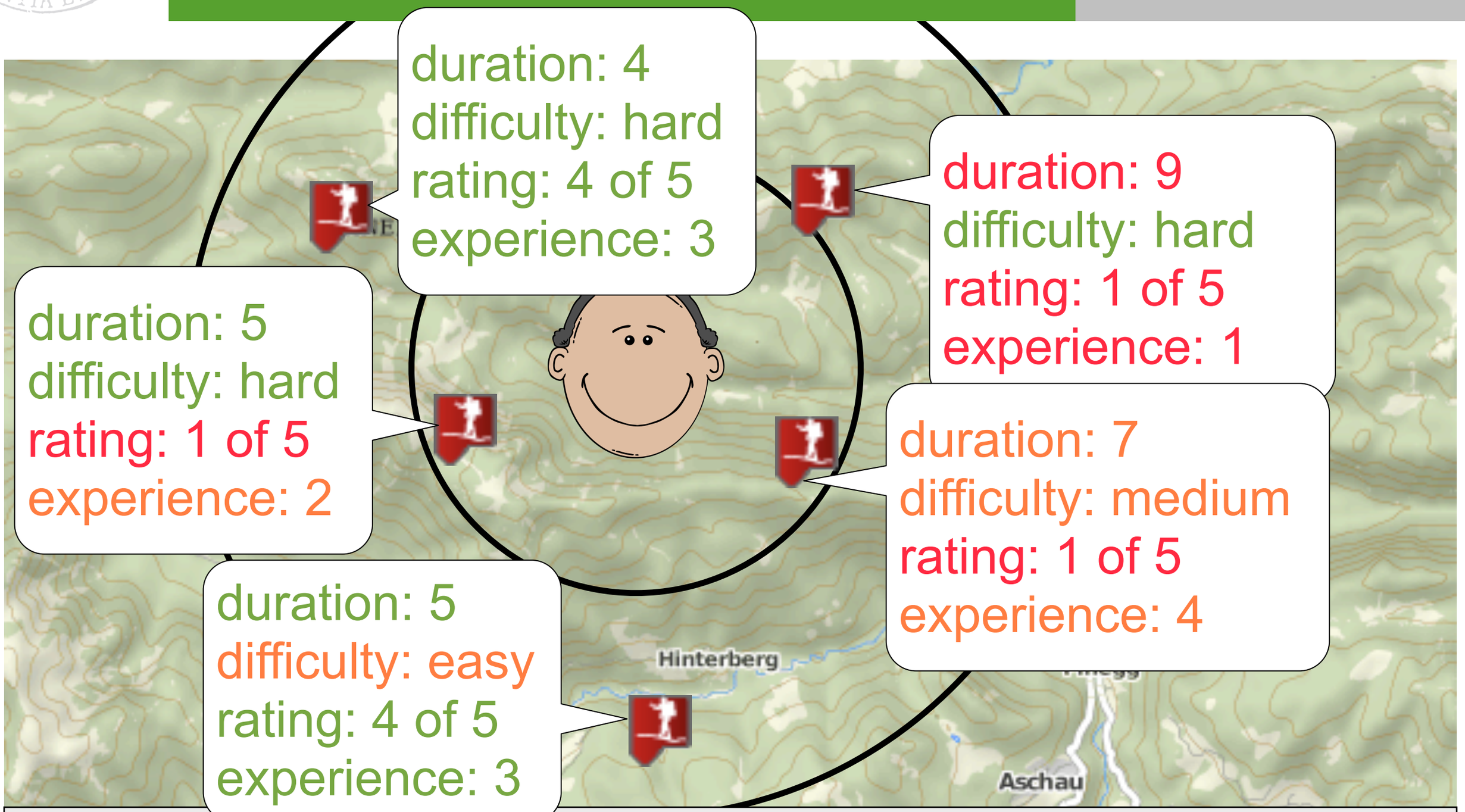

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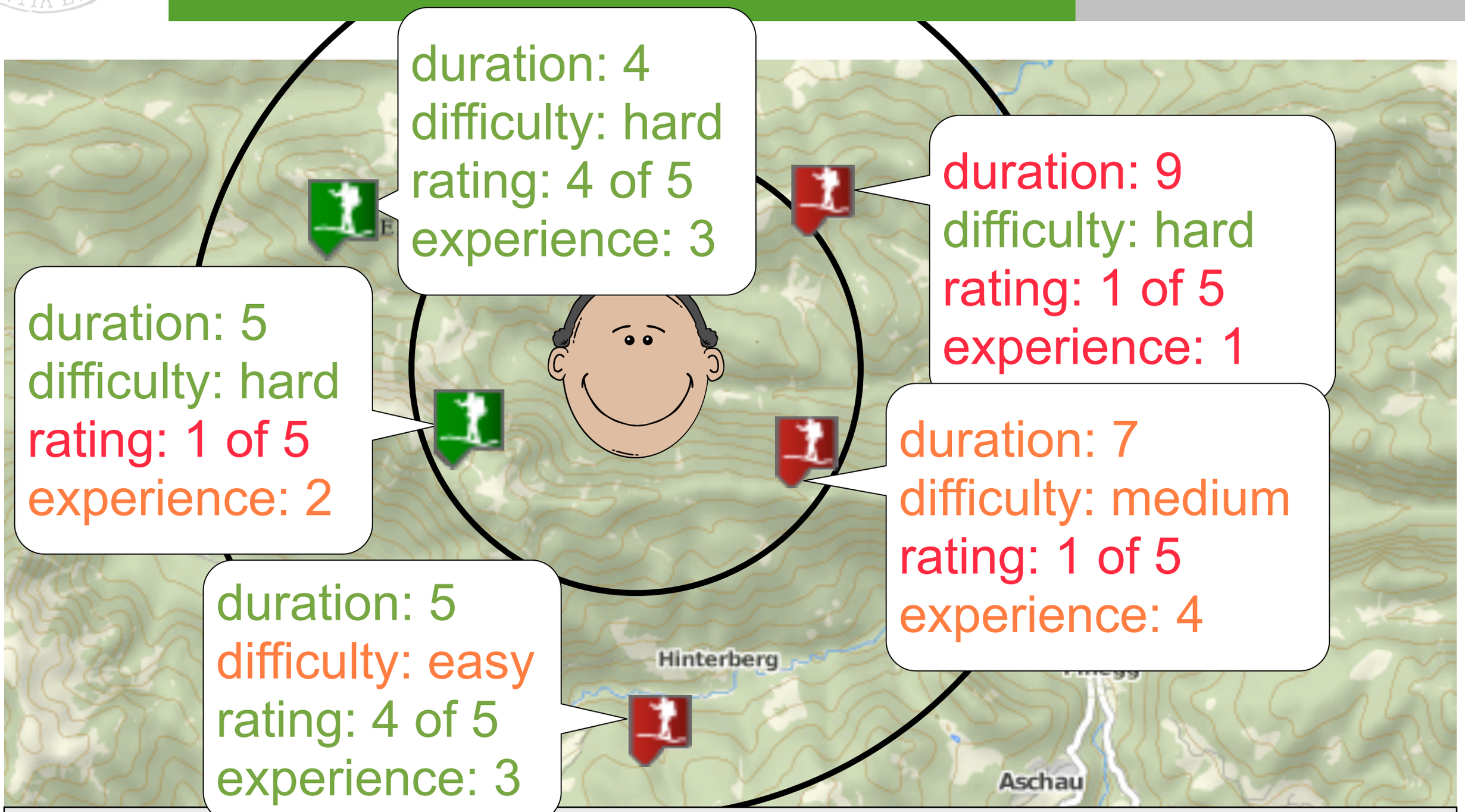

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Conclusion & Future Work

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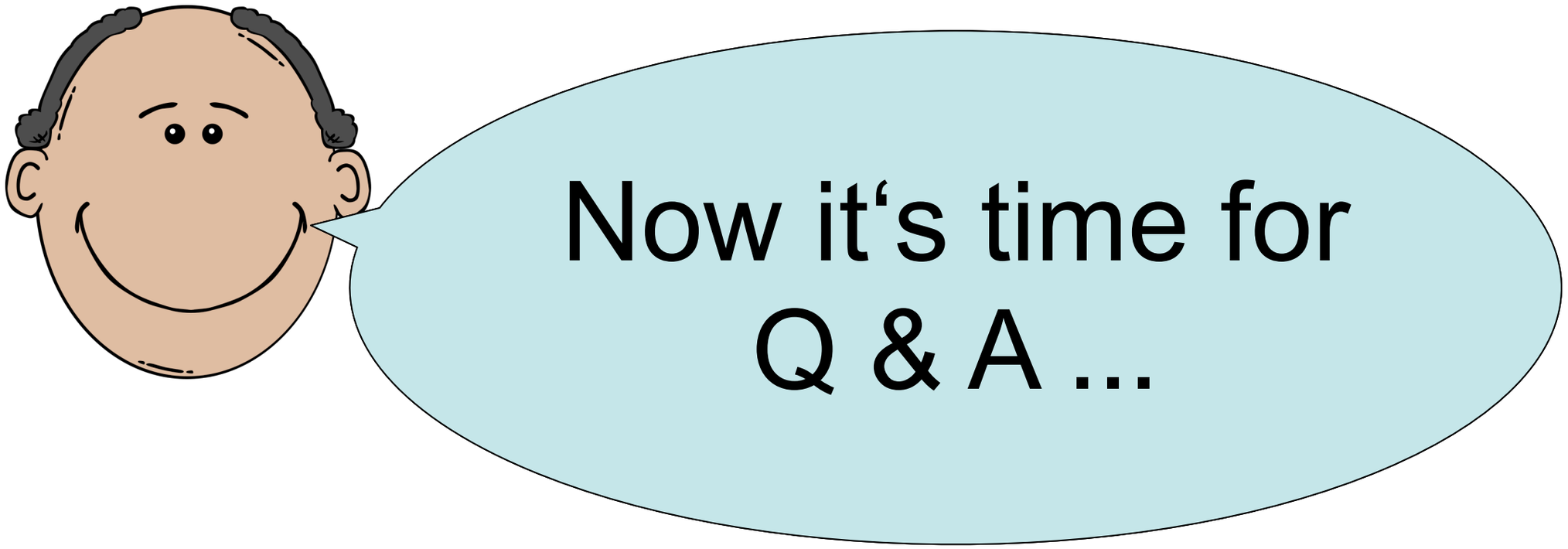
Conclusion:

- Preference SQL is a first choice for a new generation of LBS.
- It provides One-Step-Search functionality.
- It offers the integration of context models and facilitates user modeling.

Future Work:

- Extension of the SQL standard to support spatial extensions such as SQL-MM Spatial
- Development of new *Spatial Preferences* derived from authentic user scenarios
- *Spatial Group Preferences* for complex planning applications



Spatial Preferences for One-Step-Search in Location-Based Services

F. Wenzel, S. Paulus, W. Kießling

Vienna, 21st Nov. 2011

Showcase

Showcase

- Location-based Android client operating on OpenStreetMap and commercial data
- Application assists users in finding personalized hiking tours, POIs, restaurants, gas stations and ATMs

- The showcase illustrates the main benefits of Preference SQL for LBS:
  - **One-Step-Search** that delivers results without repeated calibration of search parameters
  - **Spatial Preferences** as a new way to incorporate spatial information into search queries
  - **Best personalized results** without the occurrence of flooding or the empty result effect

Schedule: today at **14:40** and **16:25 during coffee break**

For further information, tutorials, downloads and feedback please visit

http://trial.preferencesql.com