**Dataset Selection**

Data in the format of (id, longitude, latitude, time). Most are real animal movement data from MoveBank.org.

**Visualize in Google Earth**

Google earth can simulate movements with temporal information; window will pop-out.

**Interface**

**Function Details**

**Trajectory Clustering (SIGMOD’07)**

Trajectory clustering focuses more on the geometric information of movements. It discovers the clusters of sub-trajectories.

**Swarm Pattern (submitted) v.s. Convoy Pattern**

Both swarm and convoy patterns are trying to find the moving objects that move together. Two moving objects are considered “together” at one timestamp if they belong to the same cluster at that timestamp. The goal of convoy is to find objects that move together for at least \( k \) consecutive times. Swarm, which is more practical in real application, tries to discover the objects that are close for \( \min_t \) non-consecutive times. Technique challenge for swarm mining is the exponential search space up to \( 2^{\# \text{of objects}} \times 2^{\# \text{of timestamps}} \).

**Visualization**

Raw data visualization (each color represents one moving object); Mining results visualizations.

**Text Message**

Dataset properties; results.

**External Links**

More about the demo and about us.

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**Motivation**

With the maturity of tracking technologies, increasing amounts of movement data become widely available, such as vehicles, animals, climate, and human movement data. MoveMine, is designed for sophisticated moving object data mining by integrating several useful functions including pattern mining and trajectory mining using the state-of-the-art techniques. Our system is tested on various real movement data sets, such as those provided by MoveBank.org (an international organization of biologists). It will benefit people to carry out versatile analysis on these kinds of data.

**Step 1:** Detect the regions that are frequently visited (reference spot).

**Step 2:** Detect periods for each reference spot.

**Step 3:** Summarize periodic behavior.

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**Visualization**

Raw data visualization (each color represents one moving object); Mining results visualizations.

**Text Message**

Dataset properties; results.

**External Links**

More about the demo and about us.

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**Reference**

Zhenhui Jessie Li, Ming Ji, Lu-An Tang, Yintao Yu, Jiawei Han.

University of Illinois at Urbana-Champaign

Jae-Gil Lee, IBM Almaden

Roland Kays, New York State Museum

Director of MoveBank.org

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**Periodic Pattern (KDD’10)**

Periodicity is a frequently happening phenomenon for moving objects. Finding periodic patterns is difficult due to the fact that each timestamp is associated with a 2D spatial point as well as the noisy, sparse and uncertain nature of the data.

**Vertical Clustering**

Combine Fourier Transform and auto-correlation to find that periodicity.

**Step 1:** Detect the regions that are frequently visited (reference spot).

**Step 2:** Detect periods for each reference spot.

**Step 3:** Summarize periodic behavior.

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**Step 2:** Detect periods for each reference spot.

**Periodic behavior:**

- Periodic pattern
- Convoy pattern

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**Visualization**

Raw data visualization (each color represents one moving object); Mining results visualizations.

**Text Message**

Dataset properties; results.

**External Links**

More about the demo and about us.

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**Reference**


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**Step 3:** Summarize periodic behavior.

**Periodic behavior:**

- Periodic pattern
- Convoy pattern

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**Visualization**

Raw data visualization (each color represents one moving object); Mining results visualizations.

**Text Message**

Dataset properties; results.

**External Links**

More about the demo and about us.

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**Reference**

Swarm: Mining Moving Object Clusters, In Submission.

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**Reference**

Discovery of Convoys in Trajectory Databases, PVLDB, 2008.