Strategical analysis of trajectories in a competitive video game

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Outline

- Motivations
 - E-sport
 - Real applications
- 2 First steps
 - DotA 2
 - Purpose
- 3 State of the art
 - TRACLUS
 - DBSCAN
 - K-means
- 4 Ideas
 - Attractive points
 - Interface
 - Conclusion

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E-sport Real applications

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E-sport Real applications



- With the new technologies, the trajectories are more studied.
- Classical sport is hard to study.
- New kind of sport is growing : the electronic sport.
- Research is easier on e-sport : lots of data available.

E-sport Real applications

What is e-sport ?

- E-sport is a competition between players through a video game.
- Two teams are facing each other, like in a classical sport.
- Tournaments where the winner gains a reward.

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E-sport Real applications

A growing phenomenon



The reward of the greatest DotA 2 tournament, a prize pool of more than 10 millions dollars.

E-sport Real applications

Other applications for trajectory studies

- Classical sport.
- Consumer behavior analysis.
- Ships meeting.

DotA 2 Purpose

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DotA 2 Purpose

DotA 2 : Defense of the Ancients

- The studied game : DotA 2.
- Competitive game in 5 versus 5.
- Pushing-game in the fashion of rugby or american football.
- Goal : destroy the enemy base.



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DotA 2 Purpose



- Data mining approach : no additional knowledge.
- Analyze trajectories and find knowledge.
- Find specific strategies only in the players trajectories ?
- Provide a tool for the players, coachs, casters.

DotA 2 Purpose



- Transform trajectories into sequences.
- Mine these sequences.
- Strategies are frequent patterns.

TRACLUS DBSCAN K-means

Outline

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 E-sport
 Real applications

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State of the art

- TRACLUS [Lee and al. 2007]
- Following [Li and al. 2013]
- Attraction and Avoidance [Li and al. 2013]
- Flocking [Benckert and al. 2008]

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TRACLUS : from trajectories to sequences.

- Compression of the trajectories.
- Clustering of segments.
- Representative trajectory.

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Distance between the segments



Problem : the distance is not symmetric.

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Clustering : DBSCAN

DBSCAN : a density algorithm.



Problem : extension of the neighborhood.

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Motivations First steps State of the art Ideas

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Representative trajectories



Representative trajectory don't fit with segments within cluster.

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Problems with this method

- Distance is not symmetric
- Neighborhood can easily extend
- All segments can be in the same cluster

Motivations First steps State of the art Ideas

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Clustering : K-means



Clusters are better.

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Coverage of the map with k-means



Results are good, but it's not enough.

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A new method is needed

- The solution is good, but problem with the labeling.
- Several labels for the same movement.
- Central zone is fuzzy.

Attractive points Interface

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Attractive points Interface

Attractive points

130 Attractive points



Trajectories are represented by segments between attractive points.

Attractive points Interface



- Transformation of trajectories into series of segments.
- Mining of the sequences.
- Show results on the interface.

Motivations First steps State of the art Ideas

Attractive points Interface

Web interface

Radiant team : Shadow Fiend CDOTA_Unit_Hero_ShadowShaman CDOTA_Unit_Hero_WitchDoctor Clockwerk Terrorblado	Dire team : CDOTA, Unit Hero_StormSpirit Enigma Juggernaut Zous Earthshaker	
		Shadow Fiend CDOTA, Unit, Hero_ShadowShaman CDOTA_Unit_Hero_WitchDoctor Clockwork Terrorblade
	0 0,25.0 0,25.2	CDOTA_Unit_Hero_StormSpirit Enigma Juggernaut Zeus Earthshaker

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- Work in Progress.
- Results are encouraging.
- Sequences are easier to extract with attractive points.



- Temporal evolution.
- Heat map.
- Adapt the attractive points with time.

Heat map



Before 20min

After 20min

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