The Hardness of "Lemmings"

Philip Geißler

May 14, 2018

Intentions

The complexity of "Lemmings" is a topic in the research of games, more specifically computer games. And although it is a relatively simple game, it was still proposed as a training for artificial intelligence because of its relative difficulty despite of the simple rules and levels. Therefor, knowledge of the complexity of "Lemmings" would be quite helpful in determining if this would be a useful problem that an algorithm could be trained on.

Propositions

- "Lemmings" can be valuable for training an artificial intelligence as it proves to be hard enough to defy brute forcing.
- A reduction from a "Lemmings" level to 3SAT is possible
- Solutions for some levels can only be found in exponential time. (if $P \neq NP$)
- Solutions for all levels can be checked in polynoial time.

$\hookrightarrow$ "Lemmings" is NP-Complete.

- The above holds true for levels with only 1 Lemming, too.

Sources

All information in this Handout as well as all information in the presentation regarding the proofs is taken from:
Cormode, Graham, The Hardness of the Lemmings Game, or Oh no, more NP-Completeness Proofs, 01.2004
`bit.ly/2wzy9QY`

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