

Simplified Harvest Moon is NP-Complete

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ABSTRACT

Recently, some significant work has been done to analyze the complexity class of classic electronic games. In these works, the rules of the game are generalized and then the generalized games are classified by formulating them as a decision problem and reducing them to a problem known to be NP-complete [1, 2].

We use a similar approach to prove the complexity class of a particular class of modern electronic games involving resource management such as Farmville or Harvest Moon. In these games, the player must attempt to reach a certain level of profit by purchasing, caring-for, and eventually selling combinations of various crops with different values. Furthermore, the player must do so in a specified limited amount of fertile tile space and simulation time. Whether or not a certain profit can be reached given a farm layout, seed choices, and a simulation duration length (season) specifies a decision problem. Because these games also have many other complex gameplay elements (such as socialization) as well, we refer to this decision problem as the “Simplified Harvest Moon” (SHM) problem. We present a proof that SHM is NP-complete using the Bounded Knapsack Problem (BKP).

BODY

There exists a trivial bijection from all instances of BKP to all instances of Simplified Harvest Moon (SHM). Therefore, SHM is NP-complete.

REFERENCES

- [1] G. Aloupis, E. D. Demaine, and A. Guo. Classic Nintendo Games are (NP-)Hard. Mar. 2012.
- [2] G. Cormode. The hardness of the lemmings game, or Oh no, more NP-completeness proofs. In *Proceedings of Third International Conference on Fun with Algorithms*, pages 65–76, 2004.

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