# Bust-a-Move/Puzzle Bobble is NP-Complete

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**Abstract**

We prove that the classic 1994 Taito video game, known as Puzzle Bobble or Bust-a-Move, is NP-complete. Our proof applies to the perfect-information version where the bubble sequence is known in advance, and it uses just three bubble colors.

*"A girl runs up with somethin' to prove.*
*So don't just stand there. Bust a move!"*
— Young MC [YDD89]

## 1 Introduction

Erik grew up playing the action platform video game *Bubble Bobble* (バブルボブル), starring cute little brontosauruses Bub and Bob,[1] on the Nintendo Entertainment System. (The game was first released by Taito in 1986, in arcades [Thea].) Some years later (1994), Bub and Bob retook the video-game stage with the puzzle game *Puzzle Bobble* (パズルボブル), known as *Bust-a-Move* in the United States [Theb, Wik]. This game essentially got Stefan through his Ph.D.: whenever he needed a break, he would play as much as he could with one quarter. To celebrate the game's 21-year anniversary, we analyze its computational complexity, retroactively justifying the hours we spent playing.

In Puzzle Bobble, the game state is defined by a hexagonal grid, each cell possibly filled with a

# Gaming is a hard job, but someone has to do it!

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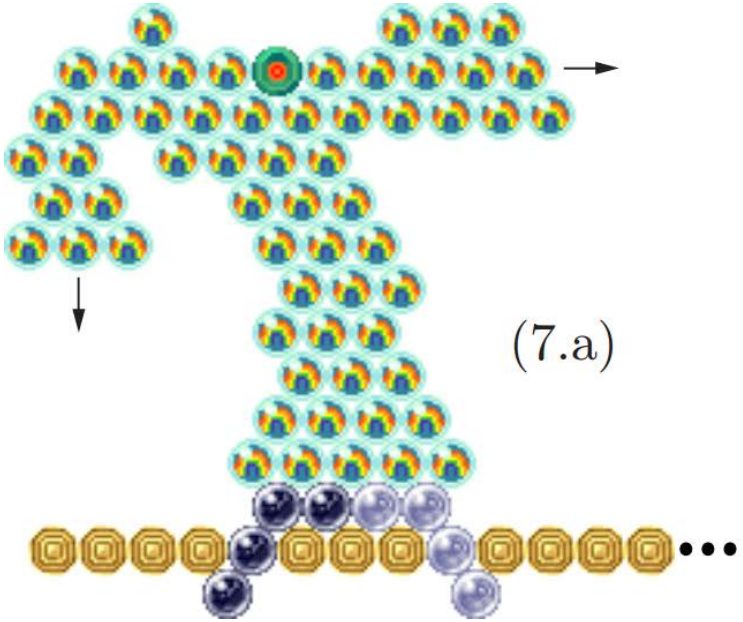
**Abstract.** We establish some general schemes relating the computational complexity of a video game to the presence of certain common elements or mechanics, such as destroyable paths, collecting items, doors activated by switches or pressure plates, etc.. Then we apply such "metatheorems" to several video games published between 1980 and 1998, includ-



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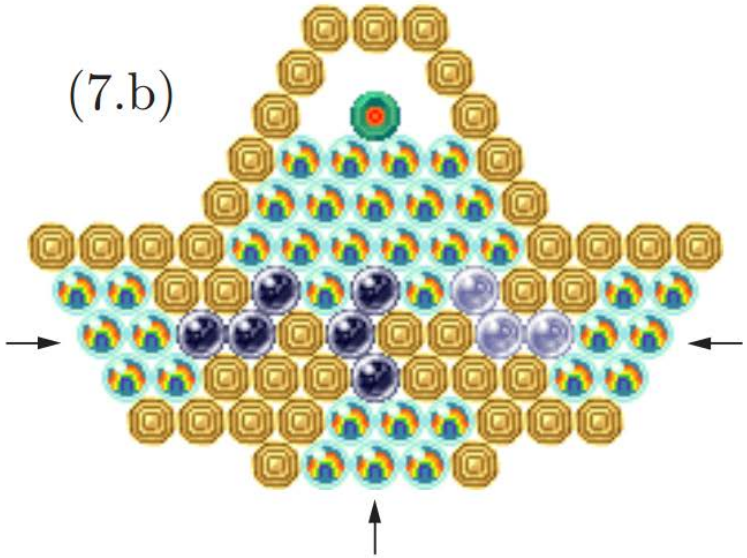

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