



Sokoban

Sokoban^[a] is a puzzle video game in which the player pushes boxes around in a warehouse, trying to get them to storage locations. Designed in 1981 by Hiroyuki Imabayashi, it was first published in Japan in 1982 by his company Thinking Rabbit for the NEC PC-8801 computer. The game was later ported to various platforms and followed by new titles. It became popular in Japan and internationally, inspiring unofficial versions, a subgenre of box-pushing puzzle games, and artificial intelligence research.

Gameplay

The warehouse is a grid composed of floor squares and impassable wall squares. Some floor squares contain a box and some are marked as storage locations. The number of boxes equals the number of storage locations.

The player, often represented as a worker character, can move one square at a time horizontally or vertically onto empty floor squares, but cannot pass through walls or boxes.

To move a box, the player walks up to it and pushes it to an empty square directly beyond the box. Boxes cannot be pushed to squares with walls or other boxes, and they cannot be pulled.

The puzzle is solved when all boxes are on storage locations.

Progressing through the game requires careful planning and precise maneuvering.^[2] A single mistake, such as pushing a box into a corner or obstructing the path of others, can render the puzzle unsolvable, forcing the player to backtrack or restart. Anticipating the consequences of each push and considering the overall layout of the puzzle are crucial to avoid deadlocks and complete the puzzle successfully.^[3]

History

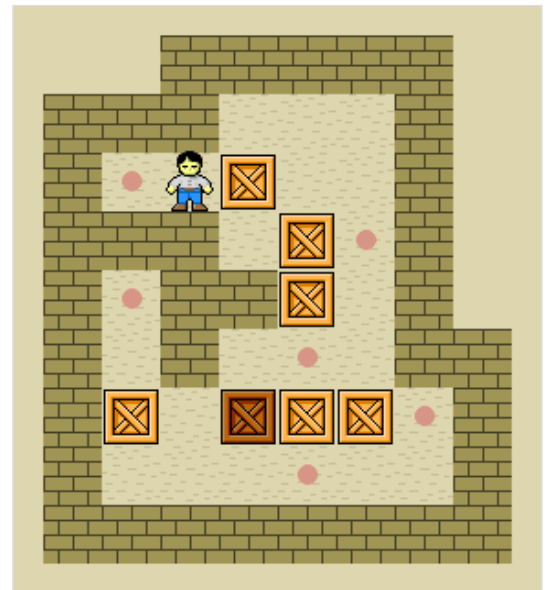
Sokoban was created in 1981^[4] by Hiroyuki Imabayashi.^{[5][6][7]} The first commercial game was published for the NEC PC-8801 computer in December 1982 by his company, Thinking Rabbit, based in Takarazuka, Japan. Ports and new titles for various platforms appeared in subsequent years. In 1988, Spectrum HoloByte published *Sokoban* in the U.S. for the IBM PC, Commodore 64, and Apple II as *Soko-Ban*.^[8] In 1990, FCI released *Boxxle* for the Game Boy in both North America and Europe,^[9] followed by *Boxxle II* in 1992.^[10] Between 1996 and

Sokoban



Sokoban official fan kit banner

Genre(s)	Puzzle
Developer(s)	Thinking Rabbit Unbalance
Publisher(s)	Thinking Rabbit Unbalance
Creator(s)	Hiroyuki Imabayashi
Platform(s)	Various
First release	<i>Sokoban</i> (倉庫番) 1982
Latest release	<i>The Sokoban</i> 2021



A *Sokoban* puzzle being solved

2000, several *Sokoban* games were released for Windows and PlayStation in Japan.^[11] In 2001, the Japanese software company Falcon acquired the trademarks for *Sokoban* and Thinking Rabbit. Since then, Falcon has continued to develop and license official *Sokoban* games.

Versions

Since its debut in 1982, *Sokoban* has been released on various platforms, primarily in Japan but also in other regions. Most titles are independent without a continuous narrative or unified series, though a few are direct sequels to a specific earlier release—for example, *Sokoban 2* (1984) follows *Sokoban* (1982), and *Soko-ban Revenge* (1991) is a sequel to *Soko-ban Perfect* (1989). The following table lists a selection of official *Sokoban* titles.^[12]

Year	Title	Country	Platform	Publisher
1982	<i>Sokoban</i> (倉庫番) ^{[13][14]}	Japan	<u>NEC PC-8801</u>	<u>Thinking Rabbit</u>
1983	<i>Sokoban [Extra Edition]</i> (倉庫番[番外編]) ^[15]	Japan	NEC PC-8801	<u>PC Magazine</u>
1984	<i>Sokoban 2</i> (倉庫番2) ^[16]	Japan	NEC PC-8801	<u>Thinking Rabbit</u>
1986	<i>Namida no Sokoban Special</i> (涙の倉庫番スペシャル)	Japan	<u>Famicom Disk System</u>	<u>ASCII</u>
1988	<i>Soko-Ban</i> ^[17]	US	<u>IBM PC</u> , <u>XT</u> , and <u>AT</u>	<u>Spectrum HoloByte</u>
1989	<i>Soko-ban Perfect</i> (倉庫番Perfect)	Japan	<u>NEC PC-9801</u>	<u>Thinking Rabbit</u>
1990	<i>Boxyboy</i>	US	<u>TurboGrafx-16</u>	<u>NEC</u>
1991	<i>Soko-ban Revenge</i> (倉庫番Revenge)	Japan	NEC PC-9801	<u>Thinking Rabbit</u>
2016	<i>Sokoban Touch</i> (倉庫番Touch)	International	<u>Android</u> , <u>iOS</u>	<u>Thinking Rabbit</u>
2018	<i>Sokoban Smart</i> (倉庫番スマート)	Japan	<u>Windows</u>	<u>Thinking Rabbit</u>
2021	<i>The Sokoban</i>	International	Nintendo Switch, PlayStation 4	Unbalance

Reception

By June 1984, the original *Sokoban* had sold 22,000 copies in Japan;^[18] by March 1985, it had reached 30,000 copies.^[19]

Sokoban was a hit in Japan. According to Spectrum Holobyte, the game had sold over 400,000 copies there before the 1988 release of the title *Soko-Ban* in the United States.^{[20][21]} That title received a positive review from *Computer Gaming World*, which described the game as simple yet mentally challenging and praised its addictive nature.^[22]

Legacy

Cultural impact

An active fan community has produced thousands of custom puzzles,^[23] unofficial versions,^{[24][25]} and software tools, including puzzle editors, solvers, and solution optimizers.^[26]

Derivatives

Sokoban is considered the originator of a puzzle game subgenre featuring box-pushing mechanics, commonly referred to as "Sokoban-like" games.^{[27][28]}

- **Alternative tilings:** While *Sokoban* is played on a square grid, its fundamental rules are, in principle, applicable to boards with other tilings. *Hexoban*^[29] exemplifies this, utilizing regular hexagons.
- **Multiple pushers:** In the variant *Multiban*,^[30] the puzzle contains more than one pusher. In the game *Sokoboxes Duo*,^[31] strictly two pushers collaborate to solve the puzzle.
- **Designated storage locations:** In *Sokomind Plus*,^[32] some boxes and target squares are uniquely numbered. In *Block-o-Mania*,^[33] the boxes have different colours, and the goal is to push them onto squares with matching colours.
- **Alternative game objectives:** Several variants feature different objectives from the traditional *Sokoban* gameplay. For instance, in *Interlock*^[34] and *Sokolor*,^[35] the boxes have different colours, and the objective is to move them so that similarly coloured boxes are adjacent. In *CyberBox*,^[36] each puzzle has a designated exit square, and the objective is to reach that exit by pushing boxes, potentially more than one simultaneously. In a variant called *Beanstalk*,^[37] the objective is to push the elements of the puzzle onto a target square in a fixed sequence.
- **Additional game elements:** *Push Crate*, *Sokonex*,^[38] *Xsok*, *CyberBox*,^[39] and *Block-o-Mania*,^[40] all add new elements to the basic puzzle. Examples include holes, teleports, moving blocks and one-way passages.
- **Character actions:** In *Pukoban*,^[41] the character can pull boxes in addition to pushing them.
- **Reverse mode:** Some Sokoban programs allow players to play a puzzle backward. This approach can help players better understand the puzzle structure and develop effective solving strategies. Starting with all boxes on storage locations, the player pulls the boxes to return to the initial puzzle state. Solutions found this way solve the standard puzzle when both the order and the direction of the moves are reversed.^[42]

Computer science research

Sokoban has been studied using the theory of computational complexity. The computational problem of solving *Sokoban* puzzles was first shown to be NP-hard.^{[43][44]} Further work proved it is also PSPACE-complete.^{[45][46]}

Solving non-trivial *Sokoban* puzzles is difficult for computers because of the high branching factor (many legal pushes at each turn) and the large search depth (many pushes needed to reach a solution).^{[47][48]} Even small puzzles can require lengthy solutions.^[49]

The *Sokoban* game provides a challenging testbed for developing and evaluating planning techniques.^[50] The first documented automated solver, Rolling Stone, was developed at the University of Alberta. It employed a conventional search algorithm enhanced with domain-specific techniques such as deadlock detection.^{[51][52]} A later solver, Festival, introduced the FESS search algorithm and became the first automatic system to solve all 90 puzzles in the widely used XSokoban test suite.^{[53][54]} Despite these advances, even the most sophisticated solvers cannot solve many highly complex puzzles that humans can solve with time and effort, using their ability to plan ahead, recognize patterns, and reason about long-term consequences.^{[55][56][57]}

See also

- Logic puzzle
- Sliding puzzle
- Transport puzzle
- Motion planning



Notes

- a. Japanese: 倉庫番, Hepburn: *Sōko-ban*; lit. 'warehouse keeper'^[1]

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External links

- [Official Sokoban site \(https://www.sokoban.jp/\)](https://www.sokoban.jp/) (in Japanese)
 - [The University of Alberta Sokoban page \(https://webdocs.cs.ualberta.ca/~games/Sokoban/\)](https://webdocs.cs.ualberta.ca/~games/Sokoban/)
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