Virtual Mechanical Puzzles

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Introduction

The term "Virtual Mechanical Puzzle" seems like a good example of a contradictio in terminis. About one-and-a-half years ago I probably would have argued that myself. For a while now I am not so sure anymore. In this article I am taking you along to investigate this very issue.

I could come straight to the point, but I choose to take a byway. Next to the issue of discussing *Virtual* Mechanical Puzzles, I first want to briefly investigate the term *Mechanical* Puzzle. Actually, I will start with the investigation of the term "*Puzzle*".

The point of this article is not to start a feud about words, but to show my fascination for a new phenomenon: virtual mechanical puzzles. In order to convince myself that this actually is a new phenomenon and to better understand my own fascination I needed to do the above mentioned investigations. I hope you enjoy this investigation and the puzzles I will introduce. If you have other insights about this issue I am happy to discuss them with you.

The term *Puzzle*

Many definitions of the term *puzzle* can be found if you search the web. I will show you a few and end with the version I have formulated. It will not be THE definition, but the best I can come up with that serves its purpose within this article.

What is a puzzle?

> "*A puzzle is a problem or enigma that tests the ingenuity of the solver. In a basic puzzle, one is intended to put together pieces in a logical way in order to come up with the desired solution. Puzzles are often contrived as a form of entertainment, but they can also stem from serious mathematical or logistical problems — in such cases, their successful resolution can be a significant contribution to mathematical research.*"
> http://en.wikipedia. org/wiki/Puzzle

This is a very long definition; too long in my opinion.

> "*Something, such as a game, toy, or problem, that requires ingenuity and often persistence in solving or assembling.*" http://www.thefreedictionary.com/puzzle

The length is good, but I think it confuses the definition of "puzzle" with things that it should be distinguished from, such as games, toys and (serious) problems in general.

A very lengthy discussion of what a puzzle is is provided by Scott Kim. He does not really provide a definition but discusses its properties (see http://scottkim.com/thinkinggames/whatisapuzzle/index.html).

Obviously I can find many more definitions; some better, some worse. Let me just give you my short and probably incomplete definition of what a puzzle is.

> "*A puzzle is a problem created*[1] *solely for the fun of finding the solution.*"
> Rik van Grol (2012)

So, puzzle is not synonymous with problem. A puzzle is a problem, but it should not be a my-life-depends-on-it serious problem. Because then it simply remains a problem and possibly represents

[1] Created should also be read as "identified". Otherwise some problems that we now call puzzles, like old Chinese puzzle locks would not be seen as puzzles.

some life struggle. A puzzle is created (or is identified as a puzzle) because it is fun to work on a problem (without stress) and it gives an extreme feeling of accomplishment if you solve the puzzle.

Let me finish here by comparing “puzzle” with a “puzzle game”. A puzzle game is a puzzle plus some game features, like a time element (do it as quickly a possible), or random/unexpected hurdles (it is not the hurdle itself that adds the game element, but the fact that it is random/unexpected; a hurdle that is statically present can be dealt with logically). A puzzle can be solved completely by mind first, then you only need to repeat it in reality. For a puzzle game you need to practice and you may need to do it over and over again to get the best time. The manipulation part of a dexterity puzzle could also be seen as a game-feature. It probably is, but manipulation is an integral part of a mechanical puzzle – it requires manipulation to physically solve it. This brings me to the definition of a *mechanical puzzle*.

The term *Mechanical Puzzle*

The term mechanical puzzle is strange. Is the puzzle mechanical or the solution method? What is mechanical? Having a mechanism is part of it? Or being a mechanism? I guess that looking at what we (collectors of mechanical puzzles) see as mechanical puzzles is more that the puzzle *exists* as a 3D-object and can be touched (compared to a math puzzle) and manipulated than that it has a mechanical part.

So, let me present to you my definition of a mechanical puzzle:

> “*A mechanical puzzle is a puzzle that exists as a physical object, and generally requires some form of manipulation to solve it.*” Rik van Grol (2012)

I explicitly say *generally requires* because some mechanical puzzles do not (think of an impossible object). So, maybe I can shorten my definition of a mechanical puzzle to:

> “*A mechanical puzzle is a puzzle that exists as a physical object.*” Rik van Grol (2012)

The term *Virtual Mechanical Puzzle*

As I said before, the term virtual mechanical puzzle sounds like a contradictio in terminis. Virtual means that it does not exist, while I just translated mechanical into existing as a physical object. So how could a virtual mechanical puzzle ever exist? Although this is what I would have said a few years ago and stopped thinking about it, I would now need to add that the term does make sense. The point is that a virtual mechanical puzzle is an *illusion* of a mechanical puzzle. So my definition becomes:

> “*A virtual mechanical puzzle is a mechanical puzzle that does not physically exists, but gives the illusion of a true mechanical puzzle.*” Rik van Grol (2012)

A few years ago I had not seen, or so I thought, examples of a virtual mechanical puzzle. Now I have seen them, and I even have a few.

Virtual mechanical puzzles — do they exist?

The fact that I am asking the question can be seen as a clue that I believe that a virtual mechanical puzzle exists. Obviously that is no proof in itself, but I have found a puzzle that fits the definition and which motivated me to pose the question in the first place. In fact I only came up with the definition after I got enthusiastic about this puzzle and decided to write about it.

There is a computer puzzle that I have had for a long time that I did not consider to be a virtual mechanical puzzle, but that fits the definition as well. There are actually quite a few puzzles that more or less fit the definition, but they were not realistic enough to give me the urge to write about them. I guess that the realism of the illusion is the essential difference here; some illusions are better than others... In the case of the puzzle that motivated me to write this article the illusion is so strong that you tend to forget that the puzzle does not really exists.

The first example of a virtual mechanical puzzle is an electronic maze-game called *Labyrinth*. It is an electronic implementation of a so-called ball-in-maze puzzle. You need to manoeuvre a ball through a labyrinth avoiding the holes by tilting the puzzle. The mechanical puzzle equivalent is shown in Figure 3. The screen is very small and the resolution of the display is very low and in black & white, see Figure 1. All in all the illusion is weak. Moreover, the device includes game elements: a time-constraint, and a spider that is trying to catch the ball.

Figure 1. *Labyrinth*, an electronic maze game by Radica

Another example is the PC/Mac-game *Heaven & Earth* by amongst others Michael Feinberg and Scott Kim. *Heaven & Earth* is a PC/Mac-game published in 1992 by Buena Vista Software [2]. The game features four parts: *The Pendulum*, *Heaven & Earth*, *The Illusions* and *The Pilgrimage*. Amongst the puzzles in *The Illusions* (designed by Scott Kim) were several that I now perceive as virtual mechanical puzzles. While most programs are controlled by the keyboard or by moving the pieces using the mouse pointer, in *Heaven & Earth* the sensation of a mechanical puzzle is realised. Instead of moving the pieces with the mouse pointer, after starting the game the mouse is directly "connected" to a puzzle piece; the mouse is so to say the handle by which you hold the piece. The game is out of print but can be downloaded for free [1] and on the website from Scott Kim [3] you can find the information needed to start the game (passwords). Try out the illusions *Antimaze*, *Identity Maze* and several others. As it is a PC-program it does not give the full illusion of holding a mechanical puzzle. Moreover, the actual puzzles do not represent real mechanical puzzles (most would be impossible to implement).

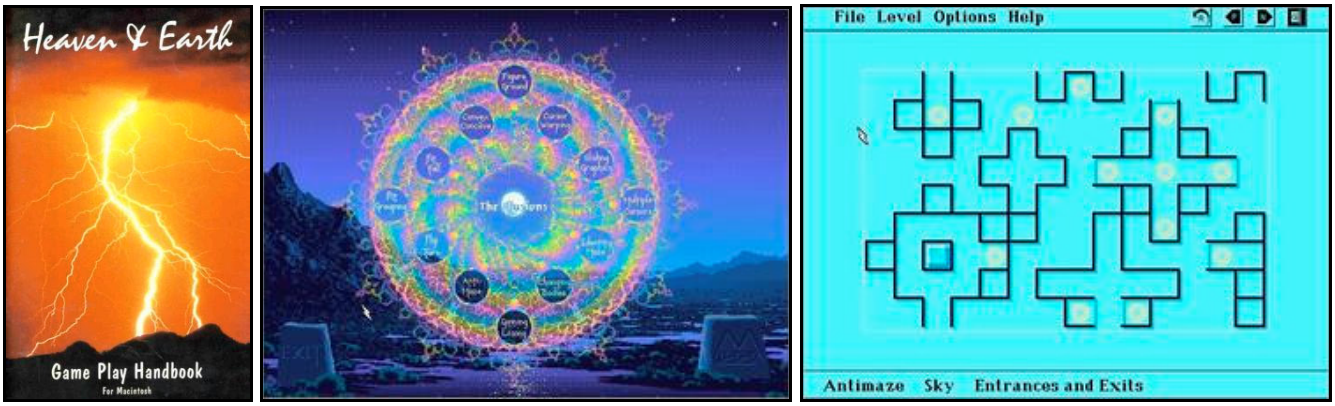


Figure 2. *Heaven & Earth*, *The Illusions*, *Antimaze*

The ultimate example of a virtual mechanical puzzle —the reason for this article— is the program *Labyrinth* from Illusion Labs. I have this program on my iPhone and iPad[2]. I do not know whether or not it exists on the Android apps market. *Labyrinth* is another digital implementation of so-called ball-in-maze puzzles. A well-known ball-in-maze puzzle is shown in Figure 3. The objective is to run the ball through the maze to the end without dropping the ball in one of the holes. The ball is controlled by gravity or in other words by tilting the table. The virtual mechanical version works exactly the same. You see the ball rolling, you hear the ball rolling, and bouncing against the wall. You can almost feel the ball rolling… But the ball does not exist! You cannot pick it up and hold it in your hand, so, the ball

[2] The iPhone and iPad and other smartphones and tablets are equipped with a high-resolution screen for a realistic view and a gyroscope to register orientation and movement.

does not exist. Yet the puzzle as a whole, including the ball exist. So, a perfect example of a virtual mechanical puzzle.

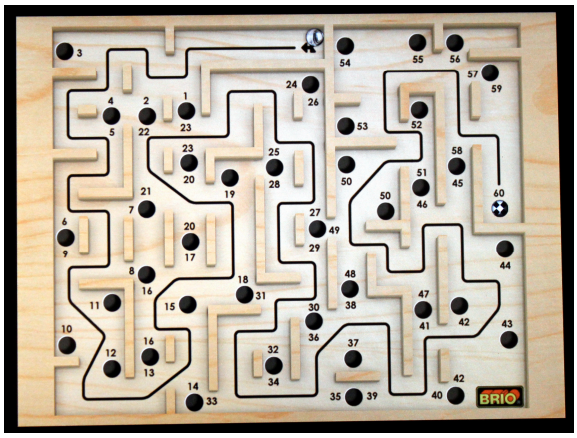
Labyrinth is virtual mechanical puzzle because the illusion is so good; you forget it is not real. The ball reacts naturally, and the view has depth (when you tilt the maze the perspective of your view changes).

Figure 3. A typical ball-in-maze puzzle

Since the appearance of the iPhone and iPad[3] many ball-in-maze apps have appeared but only few of these are really good. In some of them the balls move as if the puzzle is submerged into a liquid. Others seem to be controlled from a large distance, they do not react quickly enough to your tilt-movements. I have looked at the followings apps:

- *MMazeLite* (Marble Maze Lite) is great, instead of moving the ball to a hole you move the ball through a field with objects to some location.
- *Ball & Maze* is OK, but now the ball is in a viscous substance, too slow to feel real.
- *Micro Labyrinth* – simple mazes, quick enough, but still it does give the illusion of a real maze.
- *Mazes HD* – random mazes, ball moves are not realistic enough, too bouncy!

There may be others that I have no knowledge of.



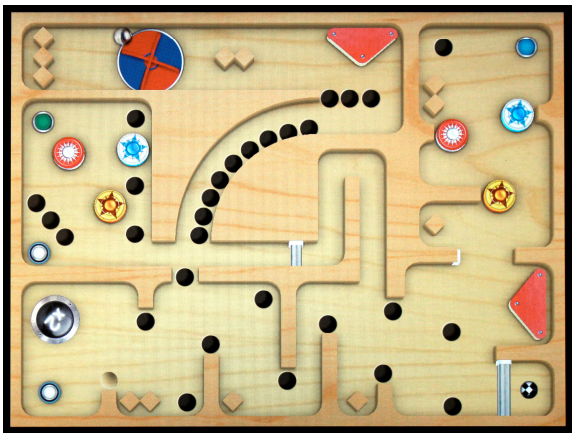


Figure 3. *Labyrinth* on the iPad; the classic ball-in-maze puzzle (left), with gadgets (right)

What virtual mechanical puzzles can add

Labyrinth (or *Labyrinth 1*) is just a teaser. It is free and after playing a number of puzzles (different mazes with an increasing level of difficulty) it invites you to buy *Labyrinth 2*. *Labyrinth 2* is amazing. *Labyrinth 2* has the same qualities as *Labyrinth*, but it has some interesting additional features that are only possible because it is a virtual puzzle.

- *Labyrinth 2* has a Ghost ball replaying your best achievement – beat the Ghost ball, beat yourself.
- *Labyrinth 2* has all kinds of gadgets like ball shrinking funnels, ball duplicators, magnets, optical break-switches, fences, fans, cannons, etc..

Admittedly, these features add to the game element of this type of dexterity puzzle. However, these elements are fixed and predictable so you can beat them with logic and dexterity.

So, in conclusion, there is a New World out there. Try it out!

[1] http://www.allgame.com/game.php?id=551
[2] http://en.wikipedia.org/wiki/Scott_Kim
[3] http://www.scottkim.com/heavenearth/

[3] There are probably also plenty of examples in the Android apps world.