That Is Not Art, It Is a Puzzle!

Oskar van Deventer
m.o.vandeventer@planet.nl

Abstract

Mechanical puzzles are typically not recognized as art. After all, they are functional objects and moreover, how can a $10 plastic toy be art? Yet, mechanical puzzles have both intellectual and material aesthetics that are appreciated by connoisseurs and can give strong emotional experiences to the solver, all characteristics of fine art. This paper will provide examples of my puzzle designs where the resulting puzzle/object, the design process or both require the overcoming of difficulty. And some of them happen to look nice as well.

Introduction

Although I have designed mechanical puzzles since 1978, I never considered myself an artist. After all, I was just enjoying myself with designing, making and solving mechanical puzzles. It was not until I met Brett Rothstein that I realised that mechanical puzzles could also be considered a form of art. Where, for instance, sculpture can be described as “the pursuit of shape”, Brett Rothstein, an art historian at Indiana University, describes mechanical puzzles as “the pursuit of difficulty” [1, 2]. It was an interesting experience to be interviewed by an art historian, because that's when I realized that puzzle design may be an art form like sculpture.

George Miller (a fellow puzzle designer interested in art) took a more activist approach. It felt wrong to him that mainstream art connoisseurs did not recognize the value of mechanical puzzles. Throw some paint at a canvas, hang it on a wall, and with a glance everyone understands it is art. However, it may take days or months to develop an intricate mechanical puzzle, it stimulates the thinking powers of the solver, and it may keep them occupied for hours or days. George took some of his puzzles to the local museum and quizzed the curators: “puzzle or art”. A Rubik’s Cube: definitely “just” a puzzle. An intricately sculpted wooden puzzle: definitely art. But many of the puzzles triggered debate among the curators. The interaction resulted in a wonderful exhibition at the Sonoma Valley Museum of Art [3].

I am thrilled to be invited as keynote speaker at the Bridges conference, where we can continue this conversation. Most of my papers and presentations on puzzles are a medley of designs of mine, explaining a bit about their background and design process. This one will be no different. I’ll leave it up to you to decide which of these are art and which are just puzzles.

Interlocking Puzzles

An interlocking burr puzzle is a disassembly and reassembly puzzle made of notched sticks. Most interlocking burr puzzles are based on a cubic grid, like the classic six-piece burr (Figure 1a), which goes back hundreds of years. The six pieces intersect at 90 degrees. In 2002, Jim Storer presented the Berserk Burrcirc, which has four burrs on a ring (Figure 1b). It may be the first non-cubic-grid burr puzzle. This got me thinking, could I design a six-piece burr with all circular pieces? The result of this thought process were Bulbous Burr and Arch Burr (Figure 2). Interestingly, there are two places where the six pieces intersect at 90 degrees.

Moving on from circles, any mathematician knows that there are three types of continuous motion: linear, circular and helical. So could one make burrs with helices?

The first result was Candy Wrapper, a twisted version of Arch Burr (Figure 3a). The pieces intersect again at two places at 90 degrees. Every piece has a rectangular cross-section, as the puzzle would be too fragile (or too big) with square cross-sections.

A second result was Cold Fusion (Figure 3b), which is like an inverted Candy Wrapper. Surprisingly, all pieces can be twisted out without bumping into each other.

A third result was Hurly Burly (Figure 4), where pairs of helices from loops. The puzzle has four places where six pieces intersect at 90 degrees. The solution has an interesting coordinate motion, where key pieces in a loop push each other.

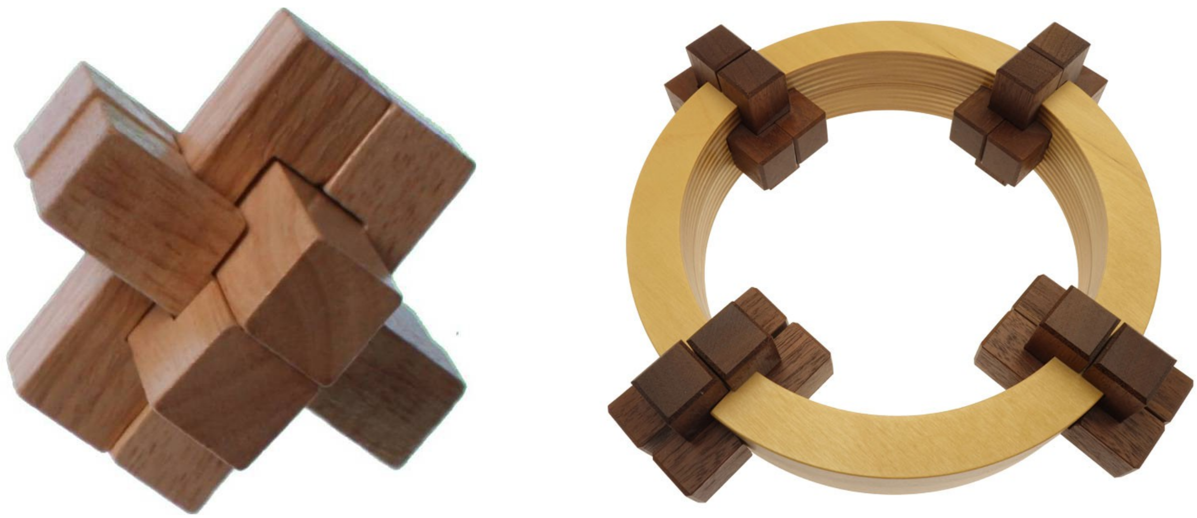

Figure 1: *a) Classic 6-piece burr, b) Four burrs on a ring by Jim Storer.*

Figure 2: *a) Bulbous Burr, 3D printed at Materialise, b) Arch Burr, produced by Bits & Pieces*

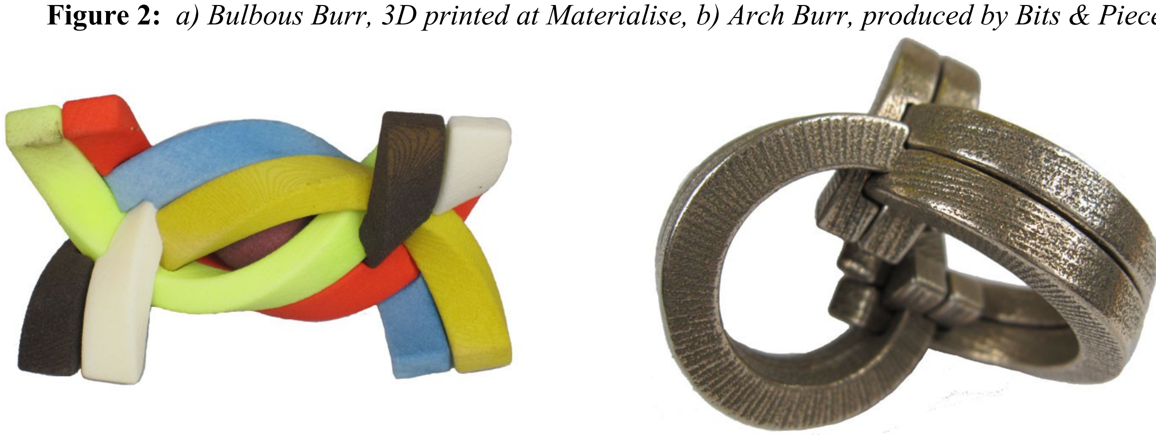

Figure 3: *a) Candy Wrapper, b) Cold Fusion, both 3D printed at Shapeways.*

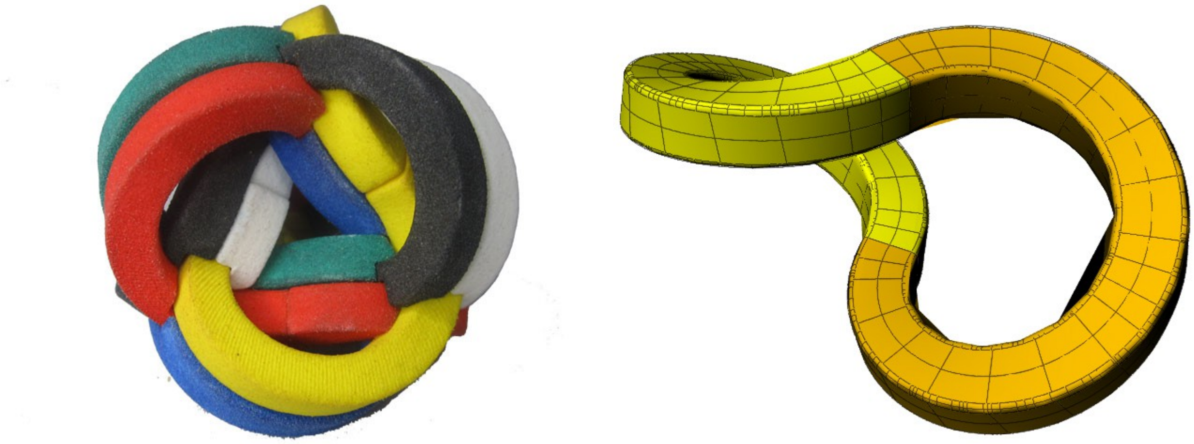

Figure 4: *a) Hurly Burly, 3D printed at Shapeways. b) one loop.*

Hurly Burly turned out to have an interesting topological property. Three looped pieces seemed interlocked like Boromean rings, but they were actually topologically separate. This idea got a spin-off in Knotsplosion (Figure 5a), which is a linear-motion puzzle with three looped pieces intersecting in four places. Impossiburr (Figure 5b) is another puzzle in a similar vein, a six-piece burr looking like an impossible Penrose triangle.

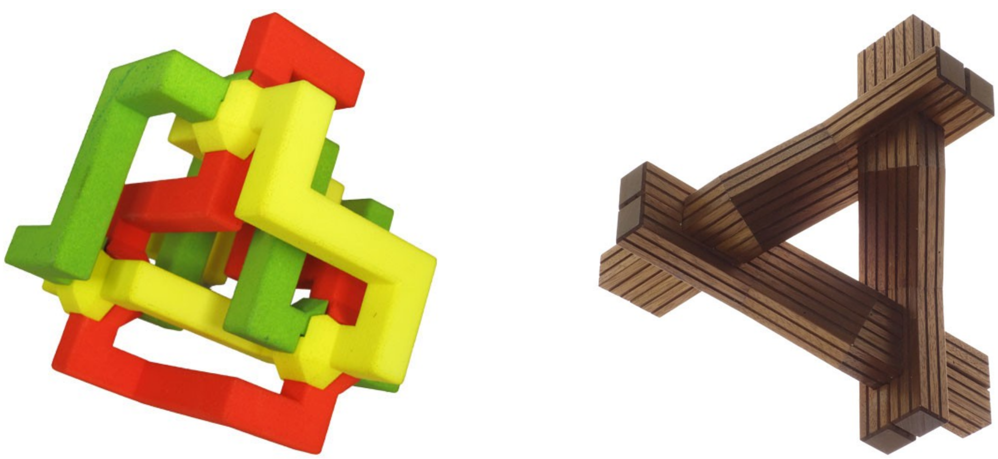

Figure 5: *a) Knotsplosion, 3D printed at Shapeways. b) Impossiburr, crafted by Tom Lench*.

Twisty Puzzles

Thanks to 3D printing, the design of twisty puzzles has turned into an art form during the last ten years, where new geometries are explored and demonstrated as physical puzzles. Most innovations are presented at the Twisty Puzzles Forum [4]. Figures 5-7 show some of my twisty puzzle designs, where I experimented with gears, geometries and fractals.

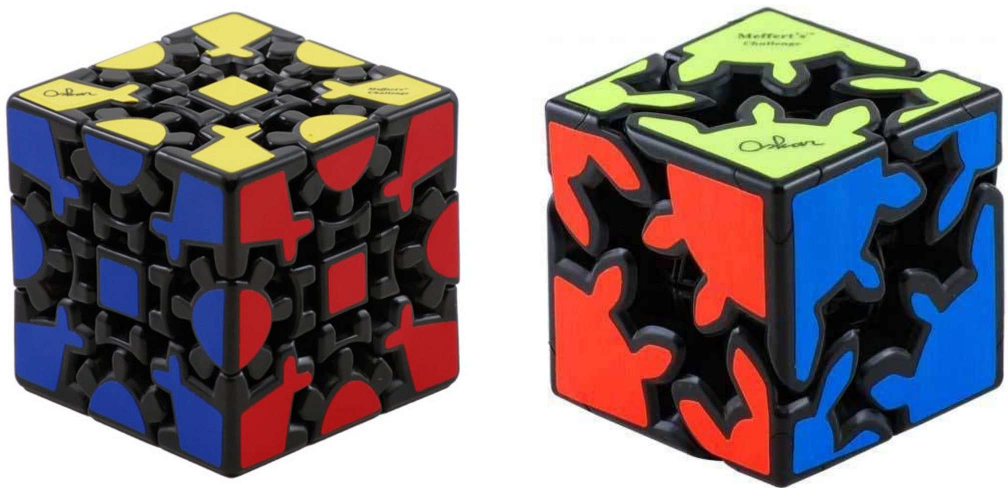

Figure 5: *a) Gear Cube and b) Gear Shift, both with Bram Cohen and produced by Mefferts*.

Figure 6: *a) Weird Disk 6x6, b) Weird Disk 5x7, both 3D printed at Shapeways*.

Figure 7: *a) Fractal Twist, b) Fractal Tree, both 3D printed at Shapeways*.

Puzzling Gears

Ever since I learned how to draw involute gears, I have been designing geared puzzles and unusual gear designs. Here are some of those.

Tailspin is a concatenation of gears, where all gears move together (Figure 8a). The object is a dexterity puzzle: can you move the object so that the set of gears makes a full swing? Donut Transformer (Figure 8b) has a similar concatenation of gears, but now hidden from sight. By moving the handles, the object transforms all the way from a straight line into a torus.

Figure 8: *a) Tailspin, produced by Thinkfun, b) Donut Transformer, 3D printed at Materialise.*

Valentine Gear Sphere (Figure 9a) is a sphere with seven heart-shaped gears. The gears are confined between a top gear with threefold rotational symmetry and a base gear with fourfold symmetry. The gears dance all the way around the sphere. Captured Gears (Figure 9b) is a planetary gear system with a threefold symmetrical sun gear, a fourfold symmetrical annulus gear, and seven small circular gears between them. What makes this contraption special is that the sun gear crosses the annulus gear at some places.

Figure 9: *a) Valentine Gear Sphere, b) Captured Gears, both 3D printed at Materialise.*

Gear chain is a loop of connected gears. The object is to make shapes and patterns. The puzzles are fairly easy to solve for loops with an even number of gears, e.g., sixteen gears making a square as in Figure 10. However, they turn out to be extremely hard to solve for an odd number of gears, e.g. nineteen gears arranged as a hexagon. This is because if there is only one tooth off with the gear that you start with, the whole thing won't mesh when you place the final gears.

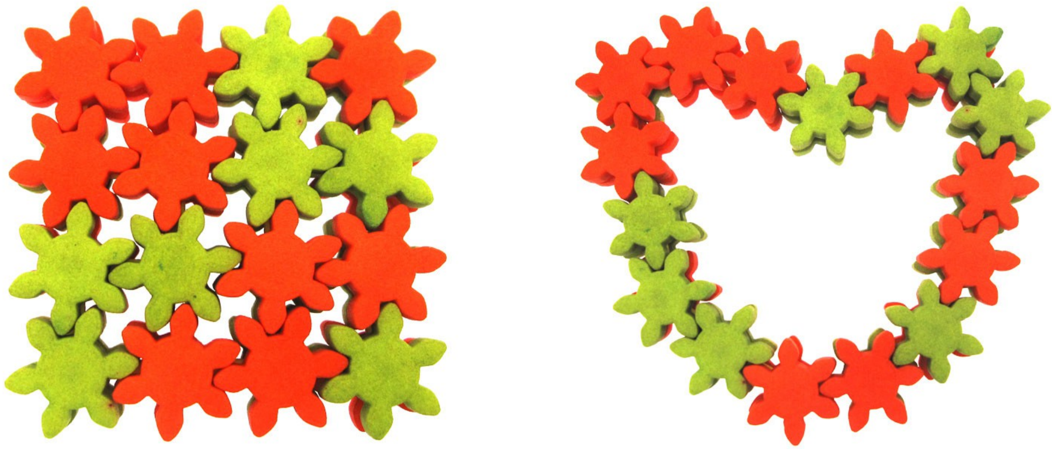

Figure 10: *Gear Chain, 3D printed at Materialise. a) Solved. b) Opened into a chain*.

Non-transitivity is a puzzling behaviour that has previously been demonstrated with, e.g., dice and elections. I developed Non-Transitive Gears (Figure 11), a gear system with ratchets and three gear sets placed in a loop. When one turns the red gear, the blur gear turns twice as slow, and the green gear twice as fast. So B<R<G. Similarly, R<G<B and G<B<R. So the relationship is non-transitive.

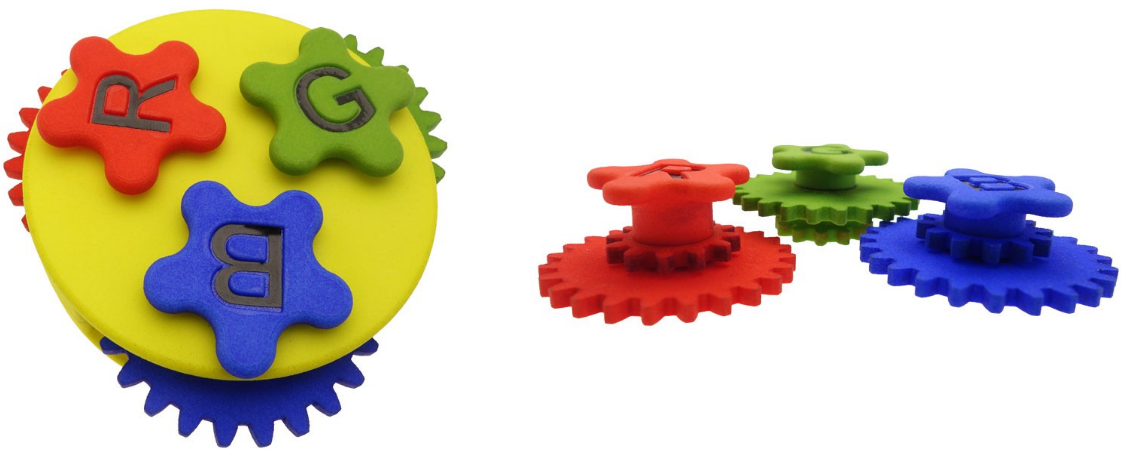

Figure 11: *Non-Transitive Gears, with Alexander Poddiakov, 3D printed at Materialise*.

Puzzle Rings

It was Bram Cohen who introduced me to puzzle rings, i.e., jewelry that disassembles and is a puzzle to reassemble. Our first ring project together was Sixth Sense (Figure 12a), a highly complicated six-band design. I extended Bram's pattern and made also an eight-band design, called Eight Track (Figure 12b). Olympic Puzzle Ring (Figure 13) is a five-band puzzle ring that shows Olympic Rings when scrambled. OoO Ring (Figure 14) is a topological oddity. Even though one ring is not linked with the other rings, it cannot come off when scrambled. Finally, Ring Bracelet (Figure 15) is a ten-band puzzle ring suggested by Carl Hoff. When scrambled, the rings form a loop that could be worn as a bracelet.

Figure 12: *a) Sixth Sense, by PuzzleringMaker, b) Eight Track, 3D printed at Materialise*.

Figure 13: *a) Olympic Puzzle Ring, b) scrambled, 3D printed at Shapeways*.

Figure 14: *a) OoO Ring, b) scrambled, 3D printed at Shapeways*.

Figure 15: *a) Ring Bracelet, b) scrambled, 3D printed at Shapeways.*

Conclusions

This paper presents just some of my designs. Please see more of my work at my YouTube channel [5], my website [6], my 3D printing shops [7, 8], and my mass-produced puzzles [9, 10]. I leave you to decide whether or not they are art.

References

[1] Brett Rothstein, "Making Trouble: Strange Wooden Objects and the Early Modern Pursuit of Difficulty", The Journal for Early Modern Cultural Studies 13:1 (2013), pp. 96-129, https://www.academia.edu/7102727/Making_Trouble_Strange_Wooden_Objects_and_the_Early_Modern_Pursuit_of_Difficulty.

[2] Brett Rothstein, "The Shape of Difficulty: A Fan Letter to Unruly Objects*", Penn State University Press, in press*; available spring 2019, http://arthistory.indiana.edu/faculty/rothstein.shtml.

[3] George Miller, "Intersections: Puzzles as Art", *exhibition at the Sonoma Valley Museum of Art*, 20 June – 16 August 2009, https://www.pressdemocrat.com/news/2283534-181/sonoma-valley-museum-of-art.

[4] Twisty Puzzles Forum – new puzzles, http://twistypuzzles.com/forum/viewforum.php?f=15.

[5] YouTube, Oskarpuzzle, https://www.youtube.com/oskarpuzzle.

[6] Oskar van Deventer, website, http://oskarvandeventer.nl/.

[7] iMaterialise, Oskarpuzzle, https://i.materialise.com/en/shop/designer/oskarpuzzle.

[8] Shapeways, Oskarpuzzles, https://www.shapeways.com/shops/oskarpuzzles.

[9] Puzzlemaster, Oskar van Deventer, https://www.puzzlemaster.ca/browse/inventors/oskar/.

[10] Sloyd, Oskar van Deventer, http://www.sloyd.fi/oskar-deventer-c-151_154.html?language=en.