

Play Truchet: Using the Truchet Tiling to Engage the Public with Mathematics

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Abstract

David Riemann presented a paper at Bridges 2009 that demonstrated use of the Truchet tiling to embed hidden messages in what appears to be an abstract design. The National Museum of Mathematics (MoMath) has used this technique multiple times, in everything from restroom décor to large-scale public demonstrations. This talk will share the exciting math outreach that was inspired by Dave’s creative paper.

Experiences with Truchet Tiling at the National Museum of Mathematics

Square tiles split along the diagonal into two triangles of contrasting color (“Truchet tiles”) were first described in the early 1700s by Sébastien Truchet. A variation on this tiling, using two quarter-circles connecting the midpoints of adjacent sides, was popularized in 1987 by Cyril Stanley Smith. At Bridges 2009, in his paper titled “Text from Truchet Tiles,” [1] David Riemann presented an application of this later version of the Truchet tiling in which structured sections are interspersed among a generally random field. Riemann demonstrated how a simple Truchet contour could be used to represent letters and numbers, creating a visually pleasing tiling that on first glance appears random, but on closer look provides a secret or hidden message.

At George Hart’s suggestion, the National Museum of Mathematics (MoMath) took advantage of Riemann’s clever combination of mathematics and art to create the unique tilings in the Museum’s restrooms. To many visitors, the colorful wall tilings are simply an abstract design, but to those who take a moment to look more carefully, mission-focused messages appear. These tilings have become a favorite feature of the “Hidden Math” tours at MoMath.



Figure 1: *Hidden messages in the Museum’s restroom tiling: “Figure it Out!”*

Several years after its opening, and after seeing the positive public engagement with the restroom tilings, MoMath innovated to create *two* messages on the same field, one in each of the two colors, each visible at a different angle. This tiling became the basis of a 200-person group construction at the Museum's annual fundraiser, followed by an amusing disclosure of the two hidden messages.

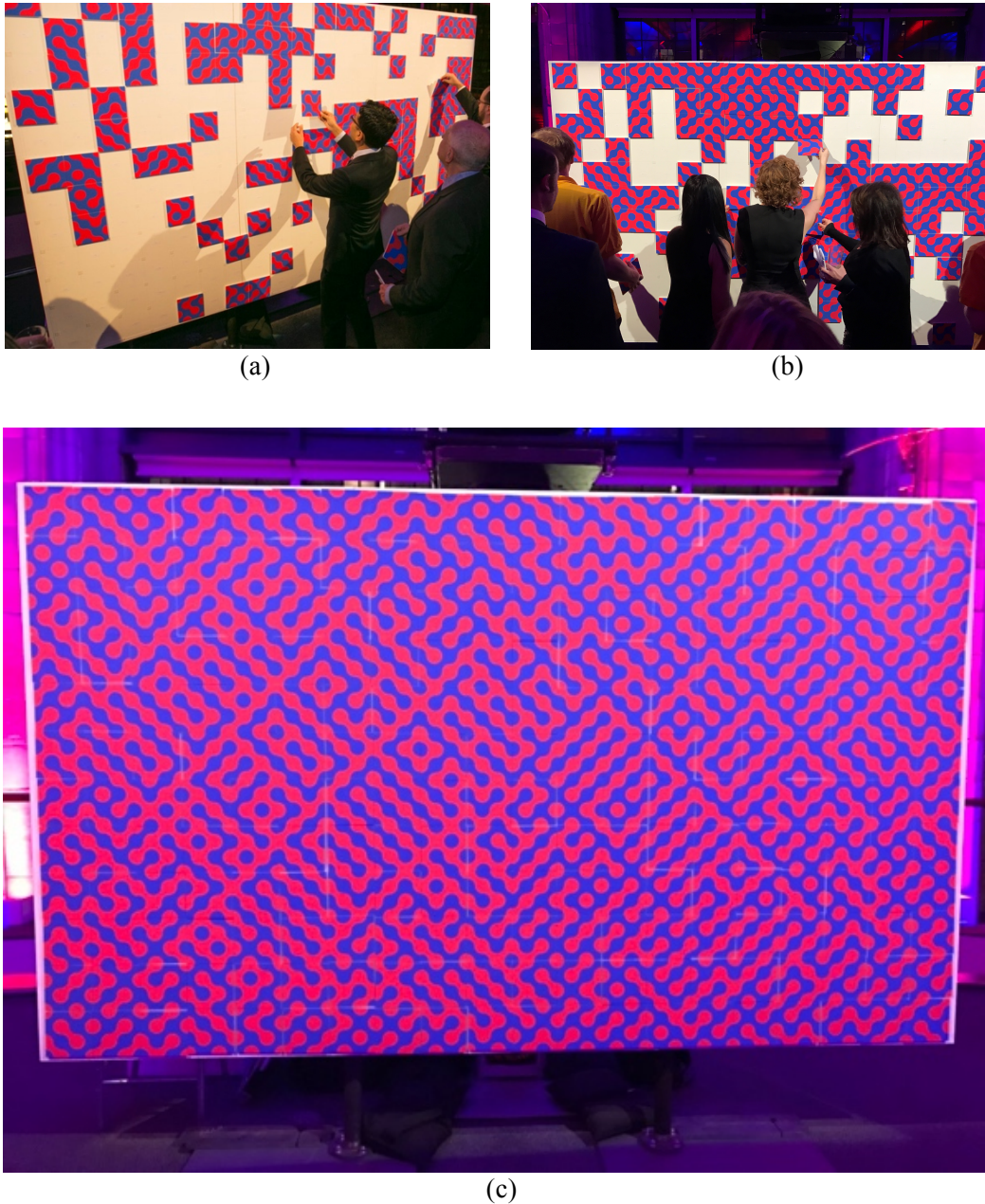


Figure 2: Group construction (a) of “Partisan Patterns” at MoMath’s annual gala (b); “Vote for MoMath” appears on both the right and left wings of the completed construction (c).

Going a step further, MoMath decided to turn this tiling into a tabletop game, providing challenge cards and sets of tiles that people could use to “race” – who could replicate the indicated design as quickly as possible?



Figure 3: “*Tetra Truchet.*”

The engagement and delight with this game led to a bigger thought: what if we turned this tiling into a larger-scale game, using giant cubes colored with the Truchet pattern? The result was delightful: kids and adults alike loved racing to build the indicated design, as well as building their own abstract patterns comprised of an “aesthetically pleasing, meandering set of mostly closed curves.” An interesting mathematical question arose: “How many possible ways are there to design these cubes so that the black and white pattern continues unbroken over all twelve edges?” Other mathematical questions are also interesting to consider: “How many different ways are there to orient the original Truchet tile (in two dimensions) vs. Smith’s revised tile?” These and other questions will form the basis of new activities and educator sessions at MoMath this fall.



Figure 4: “*Play Truchet.*”



Figure 5: “Play Truchet” at *Math Metropolis: the New York Math Festival (2017)*.

David Riemann’s innovative use of a mathematical tiling and the Bridges conference are thus responsible for the engagement of thousands of members of the general public, with the “Play Truchet” cubes making appearances at the National Math Festival, at two different World Science Festival installations, at *Math Metropolis: the NY Math Festival*, as part of the NYC Flatiron Business Improvement District’s Winter Solstice celebration, and with the many youth who attend MoMath’s teen and tween social programs.



Figure 6: *NYC Flatiron Business Improvement District’s Winter Solstice Celebration*. “Happy Solstice 2016” (a) is the finished message created by event attendees (b).

Acknowledgements

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References

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- [2] C. Smith. “The Tiling Patterns of Sebastien Truchet and the Topology of Structural Hierarchy.” *Leonardo*, vol. 20, no. 4, 1987, pp. 373-385. <https://muse.jhu.edu/article/600574/pdf>