Project 5

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The SIGBOVIK paper we chose was “On the Turing Completeness of Eeny, Meeny, Miny, Moe” by Javier Lim. Though it is satirical, like all SIGBOVIK papers, the author presents a well reasoned, albeit informal, proof that the children’s game “eeny, meeny, miny, moe” (EMMM) is Turing Complete through a reduction from the Rule 110 cellular automaton (CA). Lim’s goal is to show that such a CA can be simulated by this children’s game. He accomplishes this by structuring playthroughs of the game, using only one word instead of four, as a “resettable one bit memory” (ROBM) [2]. A “signal” is passed from one player to another by passing the counter role to them. This ROBM is further abstracted into a DFA and then as a chip, several of which are connected together to simulate the cellular automaton. Lim shows that 120 EMMM players are needed for each CA cell, which makes the reduction O(n) [2]. Fundamentally, Lim has shown a way to formulate this game as an esoteric programming language, or esolang. He even provides a link to a program that simulates a Rule 110 CA using this formulation of EMMM [2].

Javier Lim’s paper relates closely to many of the core topics covered in CPSC 439. The entire paper is an unconventional reduction as discussed in chapter 14 of the textbook *An Introduction to Theoretical Computer Science* by Boaz Barak [1]. Though reductions are used to prove the hardness of functions in that chapter, a similar kind of argument is used in the paper to demonstrate Turing Completeness. Turing Completeness is a central component of the course and is first outlined in chapter 8 of the textbook [1]. This implies that eeny, meeny, miny, moe is equivalent in computational power to a Turing Machine and, transitively, modern RAM based machines. Cellular automata are also discussed in chapter 8 as the simplest possible machine that surprisingly turns out to be Turing Complete [1]. Lim also presents a DFA for the game, a concept covered in chapter 6, as well as calculating the time complexity of the reduction, covered in chapter 13 [1]. Finally, the “results” of the paper imply that eeny, meeny,

miny, moe is an example of an accidentally Turing Complete system, a concept discussed in chapter 10 of the textbook [1].

Lim's article is humorous because of the absurdity of a children's game being used for computation, let alone being Turing Complete. The game's name is also nonsensical, which humorously contrasts with serious and intellectual sounding terms like "Turing Completeness" and "cellular automata." The idea of *proving* such a ridiculous claim using mathematical reasoning is similarly absurd. Further, the idea of computer scientists running around trying to corral morasses of children into performing computations using EMMM is quite hilarious. Some other jokes Lim adds are a way to implement multiple threads using "rock, paper, scissors" as well as implying that EMMM could be used as a pseudo-random number generator[2]. He states that such a multi-threaded version "opens the door to non-deterministic multithreaded computation, which sounds pretty fancy indeed" [2].

The article is satirical in that it pokes fun at theoretical computer scientist's obsession with finding the simplest possible Turing Complete models of computation. The Rule 110 cellular automaton is a perfect example of this, since no sane person would ever try to perform computation using one (apart from doing so as a challenge), making them practically useless. The article also satirizes the numerous esolangs that have been developed for "fun," such as Brainfuck, which are similarly useless. Lastly, Lim satirizes the subdiscipline of Language-theoretic security (LANGSEC), which seeks to make systems more secure by finding those that are accidentally Turing Complete, such as templates in C++. Lim argues that EMMM is such a system [2].

In regards to genuine insights presented by the paper, there are, of course, not many. If anything, it provides another example of a simple system that could theoretically be used for computation. Perhaps, though, it poses some interesting questions about forms of computation embedded in cultural artifacts, such as games, as well as in the intersection between the way

we use language and computation. It makes one wonder if there are other “real world” games, such as chess, that could be Turing Complete.

To conclude, “On the Turing Completeness of Eeny, Meeny, Miny, Moe” is a funny and surprisingly intellectually rigorous paper that directly touches on important concepts in the theory of computation. This shows that, though SIGBOVIK is purely for amusement, the authors of the papers are genuine computer scientists who thoroughly understand the discipline.

References

[1] B. Barak, *Introduction to Theoretical Computer Science*. 2022. Available: https://introtcs.org/public/index.html

[2] J. Lim, “On the Turing Completeness of Eeny, Meeny, Miny, Moe,” SIGBOVIK, pp. 162–174, 2023.