CMSC 858F: Algorithmic Game Theory
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Introduction to Algorithmic Game Theory
Chapter 13 Notes

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1 Overview

I have split these notes into two main parts. In section 2, there are some general recommendations, or bugs from the chapter. In section 3, I have listed some other results on counting problems.

2 General Improvements

- In the note after Definition 13.1.1, there is a [before $|y|$ which is not closed.
- Before Definition 13.2.3, it says "The next definition is due to Erik Demaine.", one of the authors of the paper. I am not sure why this is. If it is because he created the original notion of the definition, this could be made more clear.
- Just before Theorem 13.3.1, "Are there sets ... is #P-complete." should be a question "... #P-complete?"
- In Theorem 13.3.1, part 1, there is a typo. "Eucler Circuit" should be "Euler Circuit"
- In Exercise 13.5.2, is "#PLthSAT" the correct notation? Or should it be "#PL-3SAT". The second is more in keeping with the non-# notation
- In Figure 13.3 caption, it says "NEED FIGURE HERE". Probably known already, but in case it has been missed I include it here

- In the proof of Theorem 13.6.1, the reference for Takahiro is just a ?. Additionally, this line goes off the side of the page.
- In Exercise 13.8.3, part 2, I think this result would be better to include directly, not as an exercise.
- In the proof of Theorem 13.8.4, there is a Figure "TO BE ADDED LATER". Again, inclusion here in case this was not known. There is also one in the proof of Theorem 13.8.6.
- In Definition 13.9.1, problems such as #MM are not defined. It is not immediately clear if this the number of maximal matchings in a graph, or the size of the maximal matching? This would be good to clarify.
- In Definition 13.10.1, there should be a closed bracket after "(called the threshold".
- In Section 13.10, it would be good to include some intuition about why #2-SAT is #P-complete, even though 2-SAT is in P.

3 Other Problems

- Number of k-colorings for a graph G.
- Number of linear extensions for a poset [1]
- #DNF - how many satisfying assignments are there for a DNF formula? [2]

References

[1] Brightwell, Graham R.; Winkler, Peter. *Counting linear extensions.* 1991. Order. 8 (3): 225–242.

[2] Oprea, Florin; Chawla, Shuchi. *Randomized Algorithms, Lecture 8.* 6 October 2004. MIT.

https://www.cs.cmu.edu/afs/cs/academic/class/15859-f04/www/scribes/lec8.pdf