LITERATURE SUMMARIES

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Two Approximation Algorithms for 3-Cycle Covers [1] introduces the topic, provides 2 algorithms for computing 3-cycle covers from maximum 2-cycle covers, and an algorithm combining them. Then Baser et al. prove that Max-3-DCC is APX-complete.

Minimum-weight Cycle Covers and Their Approximability [2] provides a good summary on approximability for minimum and maximum weight cycle covers. First, I learned that Min-D-DCC is known as the assignment problem, which is likely what we need for the basic Offer Network. Results for a constant factor approximation for L-cycle (general) covers for maximum weight are presented and proven, yet the minimum case is harder. These approximations need the triangle inequality.

Read *From Graph Matching Problem to Assignment Problem slides*[1]. Good overview and visual explanation of assignment problem. Not clear how to use for ONs.

MIT *Lecture Notes on Bipartite Matching*[2] cover the minimum weight perfect matching set-up (which then reduces to minimum-cost flow if desired), duality with vertex covers (not vertex cycle covers), and some algorithms to solve them.

MIT *Advanced Methods in Algorithms HW 5*[3] explains how to use perfect matching in a bipartite graph to find a vertex-disjoint cylce cover, basically, in ON terminology, by duplicating each task and having an "offer" and a "request" side to turn the directed graph into an undirected graph.

Expertise Matching via Constraint-Based Optimization [3] discusses the problem of matching experts to problems while taking account of various constraints: load balancing, spreading top-level experts among problems, etc. Provide convex min-cost flow problem formulation. Also a way to correct the matching online via user feedback, potentially useful in the case one user in a proposed match (in an ON) declines and others agree!

Open-WBO: a Modular MaxSAT Solver[4] provisdes a good brief introduction to what weighted boolean optimization is, and the approaches taken.

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1 http://romain.raveaux.free.fr/document/FromGraphMatchingToAssignmentProblem.pdf
2 http://math.mit.edu/~goemans/18433S09/matching-notes.pdf
3 https://courses.cs.ut.ee/MTAT.03.286/2014_fall/uploads/Main/Solutions-HW5-fall2014
4 http://baldur.iti.kit.edu/sat2014/slides/52.pdf

Open-WBO: A Modular MaxSAT Solver [**?**] covers the contents of the slides in more detail, the methods used to allow more natural constraints (that are converted to CNF encodings), how long these take, and the performance using different SAT solving algorithms. Worth looking into given assignment problem and max-flow are often solved using linear programming (although this doesn't seem amenable to online?)

REFERENCES

[1] Markus Bläser and Bodo Manthey. Two approximation algorithms for 3-cycle covers. In *Proceedings of the 5th International Workshop on Approximation Algorithms for Combinatorial Optimization*, APPROX '02, pages 40–50, London, UK, UK, 2002. Springer-Verlag.

[2] Bodo Manthey. Minimum-weight cycle covers and their approximability. *CoRR*, abs/cs/0609103, 2006.

[3] Wenbin Tang, Jie Tang, and Chenhao Tan. Expertise matching via constraint-based optimization. In *Proceedings of the 2010 IEEE/WIC/ACM International Conference on Web Intelligence and Intelligent Agent Technology - Volume 01*, WI-IAT '10, pages 34–41, Washington, DC, USA, 2010. IEEE Computer Society.

[4] Ruben Martins, Vasco Manquinho, and Inês Lynce. *Open-WBO: A Modular MaxSAT Solver,*, pages 438–445. Springer International Publishing, Cham, 2014.