Skinner Paper Skeleton

Research hypothesis: Dynamic Bayesian Networks will perform better than standard Bayesian Networks at maintaining a Target Track when it is lost via occlusion, over increasing intervals of occlusion

1. Abstract
2. Introduction
   1. Problem frame: Multiple target tracking (MTT) of indistinct and occluded objects
      1. Some applications: vehicle counting/traffic, air traffic control, patterns of life, counter UAV, etc
   2. Introduce probabilistic techniques as means of solving
   3. Introduce Bayesian Networks as applicable framework
   4. Introduce Dynamic Bayesian Networks (DBNs) as extension of BNs
      1. Little history
      2. Core differences
   5. Introduce theoretical enhancements of DBNs from BNs
3. Related Work
   1. Relevant applications of BNs to same problem frame
      1. MTT – ID Linking w/ BN: <https://ieeexplore.ieee.org/document/1641021>
      2. TT w/ Bayes Estimation: <https://link.springer.com/chapter/10.1007/978-1-4615-0363-7_5>
      3. Joint TT, Classification, Intent w/ Bayes: <https://www.researchgate.net/publication/333182882_A_Bayesian_Framework_for_Joint_Target_Tracking_Classification_and_Intent_Inference>
      4. TT w/ recursive Bayesian state est.: <https://www.sciencedirect.com/science/article/abs/pii/S0165168418303190>
   2. Relevant applications of DBNs to same problem frame and other problem frames
      1. Context augmented DBN for event recognition: <https://www.sciencedirect.com/science/article/abs/pii/S0167865513002882>
      2. Scene modeling + anomaly detection w/ DBN: <https://link.springer.com/article/10.1007/s11760-008-0099-7>
      3. Semantic analysis of soccer w/ DBN: <https://ieeexplore.ieee.org/abstract/document/1658037>
      4. DBN for real-time crash prediction: <https://www.sciencedirect.com/science/article/abs/pii/S0968090X15000856>
   3. Non-Bayesian techniques applied to relevant problem frames and domains
      1. Multiple Object Tracking: literature review: <https://arxiv.org/pdf/1409.7618.pdf>
      2. Multi-sensor, MTT for air surveillance: <https://ieeexplore.ieee.org/document/7538367>
      3. Linear MTT w/ integrated Track Splitting Filter: [remotesensing-14-01289-v2.pdf](file:///C:/Users/Angus/Downloads/remotesensing-14-01289-v2.pdf)
      4. Aircraft encounter model of national aerospace: <https://www.ll.mit.edu/sites/default/files/page/doc/2019-02/17_2_2Kochenderfer.pdf>
      5. Threats and countermeasures for UAVs, UUVs: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9143730/>
4. Methodology
   1. DBN Mechanics
      1. Introduce BN mechanics, as background for DBNs
      2. Introduce DBN mechanics
   2. Task/Problem Frame/Domain specific
      1. Introduce Problem Frame/Domain details required to understand experiment
      2. In depth technical challenges
         1. Available sensors
         2. Compute constraints for various systems
      3. Lineage of techniques and algorithms developed to address
   3. Proposed Solution
      1. Shortcomings in pure BN approaches
      2. Where DBNs will address these
      3. Include pseudocode and description of implementation of algorithm
   4. Experimental validation
      1. Present experiment that shows improvement on hypothesis measure
         1. Fully define the hypothesis measure and why matters
      2. Define experimental scenarios, controllable parameters, source data/simulation frameworks
         1. Stone Soup looks like the best bet for simulating Target Tracking (Multiple) and state estimation: <https://stonesoup.readthedocs.io/en/latest/index.html>
         2. Potentially use video dataset as well, several exist – vehicles, soccer games: <https://openaccess.thecvf.com/content/CVPR2022W/CVSports/papers/Cioppa_SoccerNet-Tracking_Multiple_Object_Tracking_Dataset_and_Benchmark_in_Soccer_Videos_CVPRW_2022_paper.pdf>
         3. Open Dataset Recorded by Single Cameras for Multi-Player Tracking in Soccer Scenarios: applsci-12-07473-v2.pdf
5. Results
   1. Display results figures in way that convey meaning and tell a story
   2. Discuss the meaning of each figure, and what conclusions can be drawn from them with respect to:
      1. Probabilistic reasoning in general
      2. BNs/DBNs in general
      3. The task/problem frame
   3. Identify and discuss any unexpected results, or under-performance by DBNs
6. Conclusions
   1. Restate research premise and approach in general
   2. Reiterate key takeaways about effectiveness of proposed solution
   3. Identify areas of improvement and potential future research
7. References