COMS 512 Project Poroposal:
`Symbolic model checking` (using BDDs/MDDs)

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1. **Abstract :**

   In concurrent systems the finite state models increases exponentially as the number of components in the system increases. This phenomenon is widely known as state explosion problem in automatic verification. Due the this reason it is difficult to implement finite state verification method to small systems.To encounter this problem a new method was proposed which is known as Symbolic Model Checking.

2. **Description :**

   In computer science binary decision diagram or BDD is a data structure that is used to represent a data structure. Model checking is used in various systems to check a formal system model against a specification given by a logical expression. But constructing the accurate model of an industrial system is time consuming. To elude the difficulty of model construction some power techniques are used that are known as MDD or Model Driven Development.

3. **Relation with coursework :**

   Symbolic model checking is used for system verification. In computer science, specifically software engineering and hardware engineering, formal methods are a particular kind of mathematically based techniques for the specification, development and verification of software and hardware systems. Now the verification of software and hardware systems are performed using the symbolic model checking.

   In class we have already covered the topics kripke structures, CTL, Petri net and Markov chains. These topics will work in unison with BDD and MDD in Symbolic model checking.

4. **Articles included in survey :**

   I have consulted several articles in these field of study. Among these 4 major articles are primarily shortlisted for this project. More articles will be studied and included in the project in future if the need arises.

These articles are Graph-Based Algorithms for Boolean Function Manipulation by Randal E. Bryant [1],Symbolic Boolean manipulation with ordered binary-decision diagrams by Randal E. Bryant [2],Applying SAT methods in Unbounded Symbolic Model Checking by K. L. McMillan[3] and ymbolic Representations and Analysis ofLarge Probabilistic Systems by Andrew Miner and David Parker[4].

References

[1] Randal E. Bryant. *Graph-Based Algorithms for Boolean Function Manipulation.*IEEE Transactions on Computers archive Volume 35 Issue 8, August 1986 Pages 677-691.

[2] Randal E. Bryant. *Symbolic Boolean manipulation with ordered binary-decision diagrams.*Journal ACM Computing Surveys (CSUR) Volume 24 Issue 3, Sept. 1992 Pages 293-318.

[3] K. L. McMillan. *Applying SAT methods in Unbounded Symbolic Model Checking.* Doctoral Dissertation Symbolic model checking: an approach to the state explosion problem.Carnegie Mellon University Pittsburgh, PA, USA.

[4] Andrew Miner, David Parker. *Symbolic Representations and Analysis of Large Probabilistic Systems.* Validation of Stochastic Systems - A Guide to Current Research, 2004 Pages 296-338.