Competitive Models, Game Tree Degrees, and Projective Geometry on Random Sets - A Preliminary

- Cyrus F Nourani

  Academia Berlin and California
  Berlin, 03.31.2102

-
-
- ASL Annual Meeting, Wisconsin, March 31, 2012

Competitive Models, Game Tree Degrees, and Projective Geometry on Random Sets - A Preliminary

Abstract: We can examine random sets as a basis to carry structures modeling towards a competitive culmination problem where models "compete" based on modeling game trees. A model rank is higher when a on game trees with a highe game tree degree, satsifies goals, hence realizing specific models where the plan goals are satisfied. Characterizing Competitive Model Degrees on Random Sets is a basis area to explore. A model is a competing model iff at each stage the model is compatible with the goal tree satisfiability criteria. Compatibility is defined on Random Sets where the correspondence between compatibility on random sets and game tree degrees are applied to present random model diagrams. Random diagram game degrees are applied and model ranks based on satifiabilitycomputability to optimal ranks are examined.

Keywords:Competitive Model Computing, Game Degrees,
Random sets and model compatibility Random Model Diagrams, Model Rank Computability

Random Sets

Random sets are random elements taking values as subsets of some space, are a mathematical models for set-valued observations and irregular geometrical patterns. Random sets in stochastic geometry (Kendall 1974) are examples. Besides sampling designs, confident regions, stochastic geometry and morphological problems, random sets appear in general as set-valued observed processes.

Games

Games play an important role as a basis to economic theories. Here the import is brought forth onto decision tree planning with agents. The author had presented specific agent decision tree

computing theories since 1994. and can be applied to present precise strategies and prove theorems on multliplayer games. Game tree degree with respect to models is defined and applied to prove soundness and completeness. A technique for modeling game tress satisfiability is based on competitive models (Author 2008).The present paper is a preliminary basis to carry on competitive model satisfiability as a basis to optimized decisions based on random sets (Matin Lof 1966).

Game Trees, Ranks, and Goals

Based on game trees on competitive models : AND/OR trees are game trees defined to solve a game from a player's standpoint.

```
 n an OR node.

   / | \

 m an AND node

 /__|__\

   / | \
```

Formally a node problem is said to be solved if one of the following conditions hold.

1. The node is the set of terminal nodes (primitive problem- the node has no successor).

2. The node has AND nodes as successors and the successors are solved.

3. The node has OR nodes as successors and any one of the successors is solved.

Asolution to the original problem is given by the subgraph of AND/OR graph sufficient to show that the node is solved.

Model Game Degree Random Sets

The random model diagrams is a new technique to characterize competitive model degrees based on random sets, where nondeterminisitc diagrams are applied to compatibility on models computations. geometry on random algorithms is previewed to projections on Boolean valued maps to product random sets. Model ranks are presented based on random model diagrams. Random diagram game trees where computability questions on model compatibly are addressed and model ranking complexity is examined.

Computational Geometry on Random Sets

In computational geometry, a standard technique to build a structure like a convex hull is to randomly permute the input points and then insert them one by one into the existing structure. The randomization ensures that the expected number of changes to the structure caused by an insertion is small, and so the expected running time of the algorithm can be upper bounded. This technique is called randomized incremental construction.

Graph problems are another area that Randomized algorithms are applied, for example, a randomized minimum

cut algorithm:

Compatibility defined on Random Sets

Example, a randomized minimum

cut algorithm:

find_min_cut(undirected graph G) {

while there are more than 2 nodes in G do {

pick an edge (u,v) at random in G

contract the edge, while preserving multi-edges

remove all loops output the remaining edges

}

output the remaining edges

}

Model Compatibility

From the author's descriptive epistemology 1994 ASL , e.g. (Nourish 2009) Now let us examine the definition of situation and view it in the present formulation.

Definition A situation consists of a nonempty set D, the domain of the situation, and two mappings: g,h. g is a mapping of function letters into functions over the domain as in standard model theory.   h maps each predicate letter, pn, to a function from Dn to a subset of {t,f}, to determine the truth value of atomic formulas as defined below. The logic has four truth values: the set of subsets of {t,f}.{{t},{f},

{t,f},0}. the latter two is corresponding to inconsistency, and lack of knowledge of whether it is true or f.

Comparability on Model Diagrams

A compatible set of situations is a set of situations with the same domain and the same mapping of function letters to functions. In other words definition has a proper definition by specific function symbols. Remark: The functions above are those by which a standard model could be defined by inductive

Theorem Two situations are compatible iff their corresponding generalized diagrams are compatible

with respect to the Boolean structure of the set to which formulas are mapped (by the function h above,

defining situations

Projective Random Sets

The correspondence between possible worlds and truth sets for situations, computability is definable by the generic-diagrams.

A tree game degree is the game state a tree is at with respect to a model truth assignment, e.g. to the parameters to the Boolean functions above. Let generic diagram or G-diagrams be diagrams definable by specific functions.

Model Ranks on Game Trees

Definition A random diagram game tree is a game tree where assignments to variables is defined on a Boolean function on a specified random set.

We can then rank models based on game-tree

satisfiability on a specific game tree degree. Thus we have a the model closest to a win when ranks higher on satisfiability. Based on the above we can state basic theorems:

Mathematical Specifics

Proposition A model has optimal rank iff the model satisfies every plan goal and has the lowest highest game tree degree.

Theorem There are computable models where optimal ranks can be determined

Based on computable models first author's ASL publications 2005- on we have nicer computability criteria.

Theorem Based on computable models with computable diagrams model compatibility is effectively computable.

New Areas to Explore

Areas to explore from here is (Merkel and Mihalovic 2004) where there are basic techniques to construct Martin-Löf random and rec-random sets with certain additional propertied any given set X we

construct a Martin-Löf random set from which X can be decoded effectively. By a variant of the basic construction can obtain a rec-random set that is weak truth-table conductible and we observe that there are Martin-Left random sets that are computably enumerable self-reducible. The model diagram reducibility areas we had carried on at ASL 1990's might be applicable.

Nourani,C.F.1996a,"Slalom Tree Computing," 1994, AI Communications, European AI Journal, December 1996.Nourani, C.F. 1999c, “Infinitary Multiplayer Games,” Summer Logic Colloquium, Utrect, August.

Nourani,C.F, 1997, "Descriptive Computing-The Preliminary Definition,” Summer Logic Colloquium,

July 1996, San Sebstian Spain. See AMS April 1997, Memphis.

Nourani,C.F.,”Descriptive Definability: A Model Computing Perspective on the Tableaux.”,CSIT

2000.: Ufa, Russia,msu.jurinfor.ru/CSIT2000

Nourani,C.F. 2009, A Descriptive Computing, Information Forum, Liepzig, Germany, March 2009.

SIWN2009 Program, Liepzig, Germany, March 2009.

SIWN2009 Program. The Foresight Academy of Technology Press

International Transactions on Systems Science and Applications, Vol. 5, No. 1, June 2009, pp. 60-69 .

D.G. Kendall (1974) Foundations of a theory of random sets. In Stochastic Geometry (E.F. Harding

and D.G. Kendall, editors) : 322-376. J.Wiley, New York.

Martin-Löf. "The Definition of Random Sequences." Information and Control, 9(6): 602-619,

1966.

Wolfgang Merkle and Nenad Mihailović, On the Construction of Effectively Random Sets

The Journal of Symbolic Logic, Vol. 69, No. 3 (Sep., 2004), pp. 862-878. Published by: Association for

Symbolic Logic

N. Cressie and G.M. Laslett (1987) Random set theory and problems of modeling. SIAM Review (29) :

557-574