

Model-Based Diagnosis with Low-Cost Fault Identification

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Problems & Ideas

- Model-Based Diagnosis Problem:

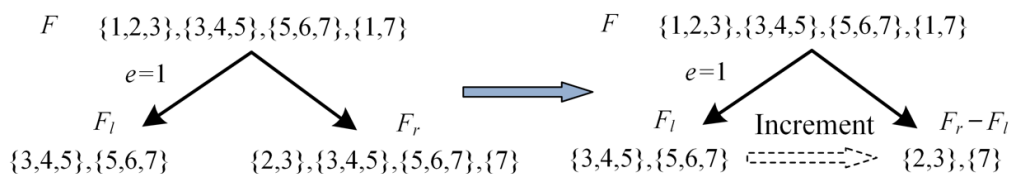
- An MBD problem can be defined as a triple $\langle SD, Comps, Obs \rangle$, which is a model of the diagnosed system. Comps is a set of components, Obs is an observation, and SD is a system describes.
- Δ is set of components, x is component.
- Diagnosis problem: $SD \wedge Obs \wedge \bigwedge_{x \in \Delta} Ab(x) \wedge \bigwedge_{x \in Comps \setminus \Delta} \neg Ab(x) \neq \perp$

- Ideas:

Based on the BAMHS collision set algorithm, solve the right branch using the left branch incrementally.

Propose an approximate probability for the intersection of the solution set and the increment set.

When the solution sets of the left branch and right branch both have intersections, it is considered a superset.



BAMHS algorithm combined with incremental strategy

Increment代表增量策略, F_l 依次增量 $F_r - F_l$ 中的每一个集合.
 $MHS(F) = \text{Min}((MHS(F_l) \otimes \{e\}) \cup (MHS(F_l) \otimes_{i=1}^k S_i)), S_i \in (F_r - F_l)$

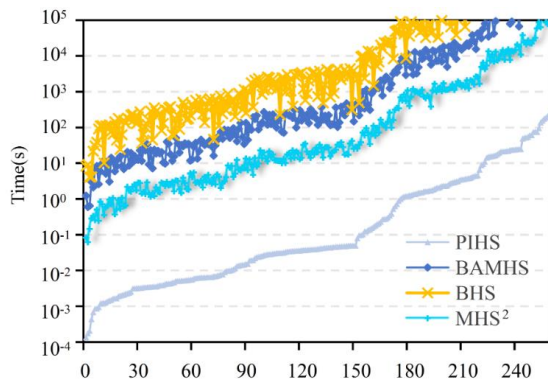
Main Contributions

- Contributions:

- A new framework is proposed for calculating the posterior failure probabilities of all components;
- Two effective strategies for eliminating redundant solution sets are introduced;
- The algorithm demonstrates a high degree of accuracy in computing the posterior failure probabilities of all components using the international benchmark dataset.

- Experiments:

- Comparison of algorithms: HSD, D-CMMO, DC, DC*
- Experimental data: ISCAS-85



ISCAS-85	PIHS	BAMHS	IBAMHS	BHS
c432	1	0.82	0.84	0.68
c880	1	0.51	0.55	0.37
c1355	1	0.24	0.24	0.17
c2670	1	0.35	0.28	0.21
c3540	1	0.15	0.17	0.11
c499	1	0.29	0.31	0.22
c5315	1	0.28	0.28	0.18
c1908	1	0.07	0.08	0.04
c7522	1	0.06	0.06	0.04
c6288	1	0.02	0.02	0.02

Left: #Running time of pihs algorithm and compared algorithm

Right: #Percentage of instances solved by PIHS algorithm and compared algorithm.