Graph theory can help detect site-to-site variation in Multisite Testers

Graph Theory Approach for Automatic Test Board Parameter Extraction in Multisite IC Testing

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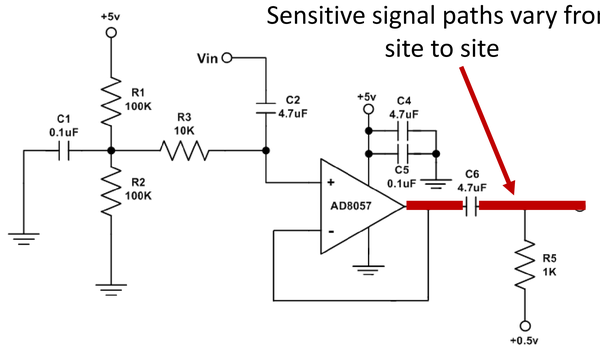
Take a picture to download the **full paper** at my ETS 2022 research repository

https://github.com/AbrahamSteenhoek/ETS2022_Research_Repository

MOTIVATION



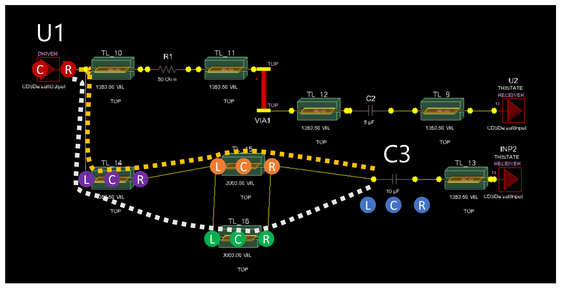
- Site-to-site (s2s) variation in multisite testers negatively impacts yield loss
- Analyzing parameters related to MST hardware can point out root causes for s2s variation
  - Arduous process if parameters are collected manually

NEED a method for extracting hardware parameters that:

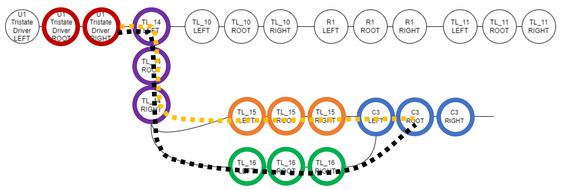
- Can extract params **relevant to s2s variations**
- Is an **automated** end-to-end solution

METHOD

Topology of sample test circuit



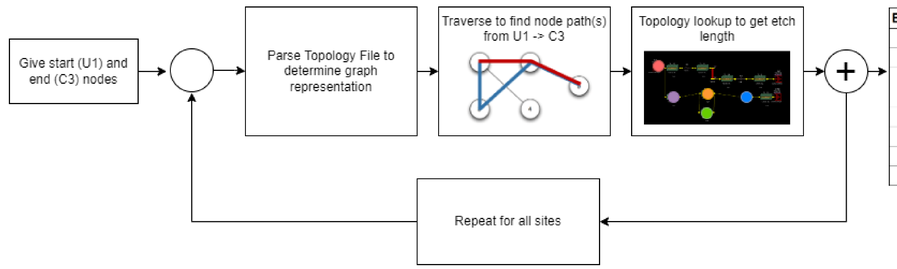
Graph representation of topology



- The "topology" of a testing circuit can be represented as a graph with nodes and edges
  - Topology: physical layout of PCB
  - Nodes: PCB components, traces, vias, etc.
    - Nodes contain metadata (e.g. etch length)
  - Edges: component connections
- **Flexible** – Graph traversals can analyze any parameter related to PCB topology
  - The path U1 → C3 is found with a traversal
- **Automated** – Graph analysis can be run on any set of topology data files
- **General** – Graph theory approach is agnostic to Probe Cards and CAD tools

KEY RESULTS

ELE Tool Flow Diagram



Etch Len, path 1 (mm)	Etch Len, path 2 (mm)	Site (#)
4409.941		1
7755.13		2
4608.838	4608.496	3
5736.229		4
4608.305		5
3617.021	3617.124	6
4647.202	4647.305	7
5372.46	5372.118	8

- Etch Length Extractor (ELE) tool applies our approach on real MST designs
- Etch lengths found with ELE match measurements found with manual processes
- **Flexible** – Extracts any parameter related to path between two components
- **Detected root causes** – Board parameters from the ELE motivated hardware revisions on future TI MST designs
- **Automated end-to-end solution** – ELE can be scripted to extract parameters from every site on a MST design automatically