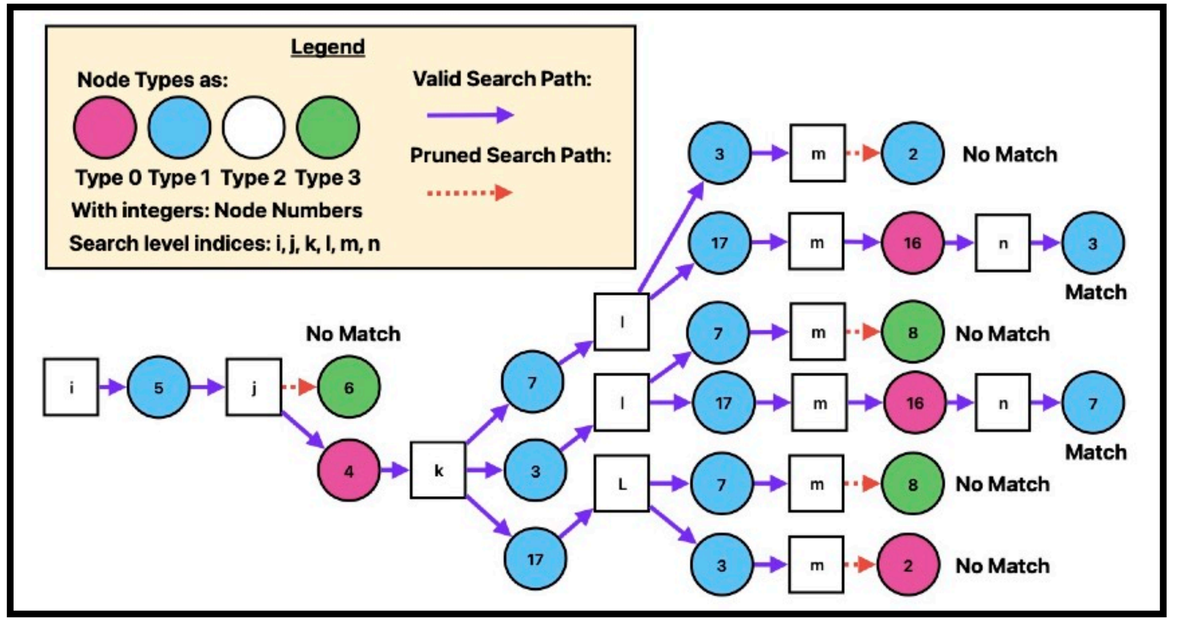
Subgraph Patern Recognition

Heuristic matching and the search space.

- Rooted search started on each node in the graph.
- A search from every nodes is required to find all automorphisms.

```
match = {∅};
for i ∈ G(V) do
    if λ_i = type 1 then
        continue;
    for j ∈ nbrs(i) do
        if λ_j = type 0 then
            continue;
        for k ∈ nbrs(j) \ {i} do
            if λ_k = type 1 then
                continue;
            for l ∈ nbrs(j) \ {i,k} do
                if λ_l = type 1 then
                    continue;
                for m ∈ nbrs(l) \ {j} do
                    if λ_m = type 0 then
                        continue;
                    for n ∈ nbrs(j) \ {i,k,l} do
                        if λ_n = type 1 then
                            continue;
                        match.append(i,j,k,l,m,n);
```

Search Algorithm

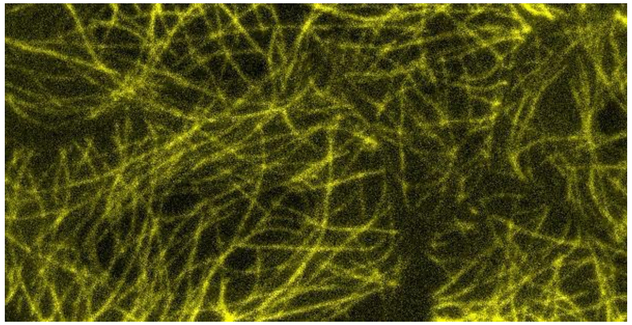


Sample Search Tree

Sources: (Medwedeff and Mjolsness, 2023)

Overview and Motivation

The Plant Cell Cortical Microtubule Array (CMA) DGG



Cortical microtubules in Arabidopsis petiole cells[1].

- The organization of the plant CMA is important for different cell processes.
- The results in this section are from the precursor to DGGML, CajeteCMA[2].
- We use this model as a test problem for the emergent effects of the crossover, zippering, and collision induce catastrophe.
- We also use this as an initial test of the “survival of aligned” hypothesis[3].

- We ran three experiments:
  - In experiment 1 we found long-time network like behavior.
  - In experiment 2 we found long-time behavior of local alignment.
  - In experiment 3 we found evidence indicating the approximate algorithm is faster than the exact, even in serial.

1. (Mjolsness and Wightman) unpublished image data

2. (Medwedeff and Mjolsness, 2023); 3. (Tindemans et al., 2010)