The Reaction Grid

Context for the cell list

- A cell list[1] is a data structure to find combinations of objects within a given cut-off distance of each other.
    - Cell size defined using a user defined reaction radius.
    - Enables efficient geometric search of nearby objects and combinatorial matching of nearby components.
- The cell list is integral in the incremental update.
- The cell list can be used in the rule mapping function φ.
- Other potential methods are bounding volume hierarchies[2], k-d trees[3], etc.

1. (Slattery, 2022); 2. (Ericson, 2004); 3. (Bentley, 1975)

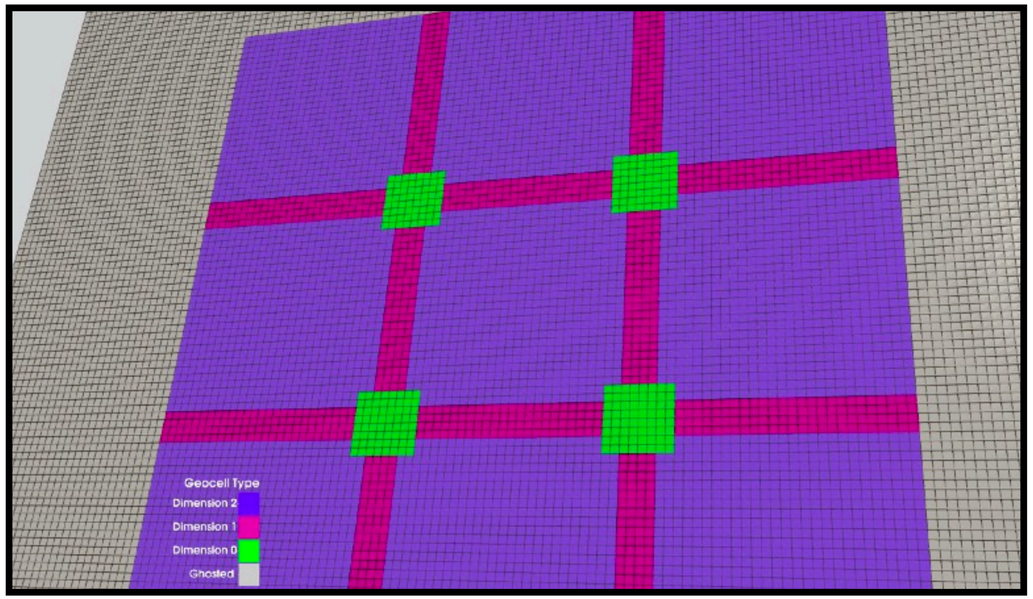

Figure 24: ECC overlaid with a “reaction grid” from a cell list and “ghost cells”.

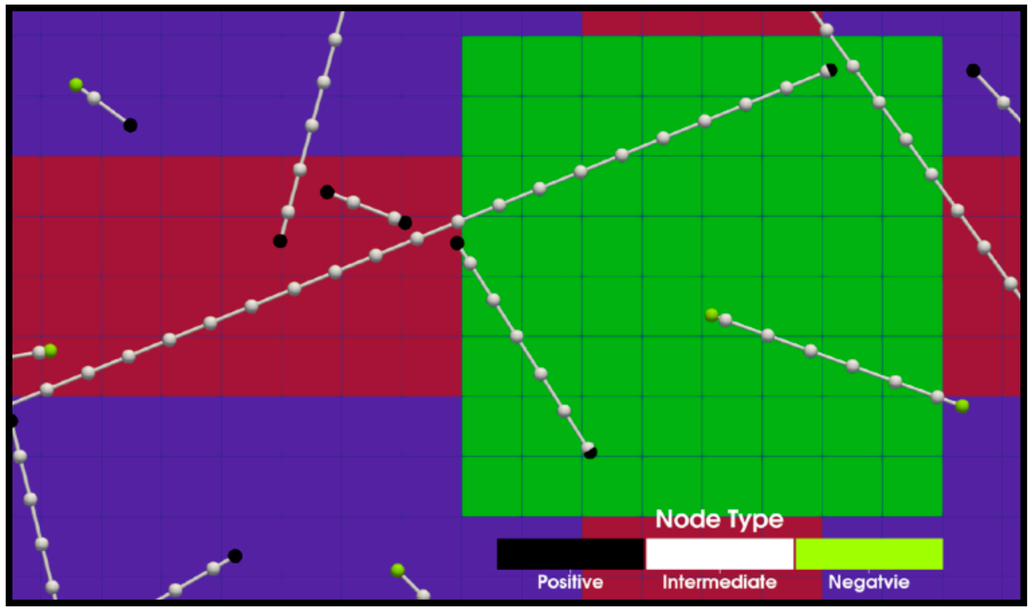

Figure 25: Zoomed in version with graph rules shown.

Incremental Update

Local updates and global state synchronization of matches

- Following a rewrite event:
    1. Component invalidation
    2. Rule match invalidation
    3. Component matching
    4. Component validation
    5. Rule matching
    6. Rule match validation

- The incremental update is spatially local.
- The component matches are fully online and only incremental updated.
- Rule matches are semi-online and incrementally within a geocell.
    - Recomputed as needed during synchronization.