**SENSOR PLACEMENT IN WATER DISTRIBUTION NETWORKS**

**Placement Method**

**Description:**

for the first level of boruvka

the network splits into 2 clusters

the highest centrality edge with regards to flow is chosen one per cluster

for the next level which is 8 clusters we use a minimal number of sensors by placing one in each cluster

in case of fixed number of sensors we place in clusters which are adjacent to small clusters to use a combination of sensors info to narrow down to the leak cluster

**Flow Sensors:**

Calculate edge betweenness centrality using flow difference for all possible leaks as edge weight

Let Q have the sorted edges in the order of highest to lowest centrality

For the top level of boruvka clusters

Get the highest edge centrality edge for each cluster from Q

Condition: The sensors are at least x hops away from each other

This will be the placement of flow sensors

Edges 22-23 and 78-79.

**Pressure Sensors:**

For the next level of clusters

Calculate node betweenness centrality using pressure difference for all possible leaks as node weight

Let P have the sorted nodes in the order of highest to lowest centrality

Get highest node centrality for each cluster from P

These are the potential pressure sensor placement points

Reducing the number of sensors

Get rid of trivial placement by removing sensors which are too close to each other

Condition: The distance between each pair has to be more than a fixed percent of the size of the smaller cluster.

This will be the placement of the pressure sensors.

Nodes 58, 6, 109.