**-Reliable P-Minimax regret for Received Power**

**Inputs and Indices**

*i =* index of demand nodes

*j =* index of potential antenna locations

*k =* index of possible scenarios (lower and upper bound; could use a distribution to almost make a scenario simulation (normal))

*hik =* Demand at node *i* for scenario *k*

*dijk =* Received Power from node *i* to potential antenna site *j* under scenario *k*

*P =* Max number of potential antenna facilities

*U* = minimum percentage covered required

*Vk =* value of demand-weighted total received power under the compromise locations

*=* Best p-median value that can be obtained under scenario *k* (constant)

*Rk =* Regret of scenario *k*

*mk* = a large constant specific to scenario *k* (largest possible regret for scenario k)

Fj = If antenna site j is a feasible antenna site

Cj = if antenna site j is a necessary antenna site

**Decision Variables**

**Problem Formulation**

This new problem formulation is very similar, but is trying to get rid of the solution being overly sensitive to extreme scenarios that may have a low probability of occurring. This introduces *W,* which minimizes the -reliable p-minimax regret. Also introduces constraint 5 and 6. Also, a decision variable is added, which shows where the maximum value was found.

Needed to change the Regret equation (Rk) because the original problem is minimizing the distance, while we are (potentially) trying to maximize the signal strength. Since the best case scenario will be a maximum.

Obj Function is just the minimum expected regret

1. Is there cannot be more than an allotted amount of antennas
2. Every demand node can only be met by one antenna site
3. ∀ j,k – at least 90% of demand nodes must be assigned (this is what makes our formulation different)
4. ∀ i,j,k – must be antenna at j under scenario k in order for a demand node i to be covered by that antenna
5. ∀ k – Defines the regret equation
6. probability associated with the set of scenarios over which the maximum regret is computed must be at least . We refer to as the reliability and the set of scenarios whose Zk values equal 1 as the reliability set.
7. maximum regret in terms of the regret values for the individual scenarios and the decisions regarding which scenarios to include in the reliability set.
8. ∀ j - Antenna cannot be placed at a location that is not a feasible solution (Fj = 0)
9. ∀ j – Antenna must be placed at antenna site j