Service Center Optimization (Nonlinear Integer Programming)

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Question: Is there any fast algorithm to solve the following problem?

Problem: Let

1. the ideal number of service centers in the region of level 1-5 be X_1，X_2，X_3，X_4，X_5
2. the current number of service centers of level 1-5 be N_1，N_2，N_3，N_4，N_5
3. the capability of service center of level 1-5 be a_1，a_2，a_3，a_4，a_5
4. the unit cost of the capability of service centers of level 1-5 be C_1，C_2，C_3，C_4，C_5
5. the total capability of service centers in the region should be in [D_{min}，D_{max}]
6. the total number of service centers of competitor in the region is N'

The ideal structure of service centers in the region should satisfy:

1. Total capability fits the service demand
2. Total of number of service centers match competitors' level in some sense
3. The level structure match some pre-defined proportion, p_1：p_2：p_3：p_4：p_5
4. Total service cost if low
5. The change to current structure is small

This can be written as the following optimization problem:

$$D_{min} <= a_1 X_1 + a_2 X_2 + a_3 X_3 + a_4 X_4 + a_5 X_5 <= D_{max}$$

$$P_{min}\, N' <= X_1 + X_2 + X_3 + X_4 + X_5 <= P_{max}\, N'$$

$$X_1 : X_2 : X_3 : X_4 : X_5 \approx p_1 : p_2 : p_3 : p_4 : p_5$$

$$Min\left\{ \frac{a_1 C_1 X_1 + a_2 C_2 X_2 + a_3 C_3 X_3 + a_4 C_4 X_4 + a_5 C_5 X_5}{\sqrt{(\frac{X_1 - N_1}{N_1})^2 + (\frac{X_2 - N_2}{N_2})^2 + (\frac{X_3 - N_3}{N_3})^2 + (\frac{X_4 - N_4}{N_4})^2 + (\frac{X_5 - N_5}{N_5})^2}} \right.$$