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Ap-
                 p\bar{e}ndix
                  \mathbf{x}_u Minimize \ F_u(\mathbf{x}_u, \mathbf{x}_l) = F_1(\mathbf{x}_{u1}) + F_2(\mathbf{x}_{l1}) + F_3(\mathbf{x}_{u2}, \mathbf{x}_{l2})
                                                   \mathbf{x}_{l}Minimize \quad f_{l}(\mathbf{x}_{u}, \mathbf{x}_{l}) = f_{1}(\mathbf{x}_{u1}, \mathbf{x}_{u2}) + f_{2}(\mathbf{x}_{l1}) + f_{3}(\mathbf{x}_{u2}, \mathbf{x}_{l2}),
where \quad \mathbf{x}_{u} = (\mathbf{x}_{u1}, \mathbf{x}_{u2}), \quad and \quad \mathbf{x}_{l} = (\mathbf{x}_{l1}, \mathbf{x}_{l2})
  (1)
                 egin{array}{c} F_1 \\ F_2 \\ F_3 \\ f_1 \\ f_2 \\ f_3 \\ |\mathbf{x}_{u1}| = 0 \end{array}
                    |\mathbf{x}_{u2}| =
                   \begin{vmatrix} \mathbf{x}_{l1} \end{vmatrix} =
              q
|\mathbf{x}_{l2}| = |\mathbf{x}_{l1}| = |\mathbf{y}_{l1}| = |\mathbf{y}_{l1}| = |\mathbf{y}_{l2}|
                        F_{1} = \sum_{\substack{i=1 \ i=1 \ x_{l} = i}}^{p} x_{u1i}^{2}
F_{2} = \sum_{\substack{i=1 \ i=1 \ x_{l} = i}}^{p} x_{l1i}^{2}
F_{3} = \sum_{\substack{i=1 \ x_{u2i}}}^{p} x_{u2i}^{2} + \sum_{\substack{i=1 \ x_{u2i}}}^{r} (x_{u2i} - tanx_{l2i})^{2}
f_{1} = \sum_{\substack{i=1 \ i=1 \ x_{l1i}}}^{p} x_{u1i}^{2}
f_{2} = \sum_{\substack{i=1 \ x_{l1i}}}^{p} x_{l1i}^{2}
f_{3} = \sum_{\substack{i=1 \ x_{u2i}}}^{p} (x_{u2i} - tanx_{l2i})^{2}
  (2)
                        \begin{array}{l} x_{u1i} \in [-5,10], \forall i \in 1,2 \dots, p \\ x_{u2i} \in [-5,10], \forall i \in 1,2 \dots, r \\ x_{l1i} \in [-5,10], \forall i \in 1,2 \dots, q \\ x_{l2i} \in (\frac{-\pi}{2},\frac{\pi}{2}), \forall i \in 1,2 \dots, r \end{array}
                       F_{1} = \sum_{i=1}^{p} x_{u1i}^{2}
F_{2} = -\sum_{i=1}^{p} x_{l1i}^{2}
F_{3} = \sum_{i=1}^{r} x_{u2i}^{2} - \sum_{i=1}^{r} (x_{u2i} - \log x_{l2i})^{2}
f_{1} = \sum_{i=1}^{p} x_{u1i}^{2}
f_{2} = \sum_{i=1}^{q} x_{l1i}^{2}
f_{3} = \sum_{i=1}^{r} (x_{u2i} - \log x_{l2i})^{2}
  (4)

    \begin{array}{l}
            x_{u1i} \in [-5, 10], \forall i \in 1, 2 \dots, p \\
            x_{u2i} \in [-5, 1], \forall i \in 1, 2 \dots, r \\
            x_{l1i} \in [-5, 10], \forall i \in 1, 2 \dots, q
    \end{array}

                 x_{l2i} \in (0, e], \forall i \in 1, 2 \dots, r
                        F_{1} = \sum_{i=1}^{p} x_{u1i}^{2}
F_{2} = \sum_{i=1}^{q} x_{l1i}^{2}
F_{3} = \sum_{i=1}^{r} x_{u2i}^{2} - \sum_{i=1}^{r} (x_{u2i} + tanx_{l2i})^{2}
f_{1} = \sum_{i=1}^{p} x_{u1i}^{2}
f_{2} = q + \sum_{i=1}^{q} (x_{l1i}^{2} - cos2\pi x_{l1i})
f_{3} = \sum_{i=1}^{r} (x_{u2i} - tanx_{l2i})^{2}

    \begin{array}{l}
      x_{u1i} \in [-5, 10], \forall i \in 1, 2 \dots, p \\
      x_{u2i} \in [-5, 10], \forall i \in 1, 2 \dots, r \\
      x_{l1i} \in [-5, 10], \forall i \in 1, 2 \dots, q
    \end{array}

                 x_{l2i} \in (\frac{-\pi}{2}, \frac{\pi}{2}), \forall i \in 1, 2 \dots, r
(7)
??
                       F_{1} = \sum_{i=1}^{p} x_{u1i}^{2}
F_{2} = -\sum_{i=1}^{q} x_{l1i}^{2}
F_{3} = \sum_{j=1}^{p} x_{u2i}^{2} - \sum_{i=1}^{r} (|x_{u2i}| - \log(1 + x_{l2i}))^{2}
f_{1} = \sum_{i=1}^{p} x_{u1i}^{2}
f_{2} = q + \sum_{i=1}^{q} (x_{l1i}^{2} - \cos 2\pi x_{l1i})
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