New Solutions

We have currently solved some unsolved problems from QAPLIB to proven optimality

Instance: esc32c

\[
\begin{pmatrix}
15, 12, 27, 13, 22, 8, 24, 23, 20, 19, 4, 2, 1, 7, 6, 3, 5, 18, 17, 21, 14, 29, 16, 32, 26, 11, 31, 30, 28, 10, 25, 9
\end{pmatrix}
\]

Considering the 13 rows (and columns) with all elements equal to zero in the flow matrix there are at least 13! = 6227020800 optimal solutions.

\[
\begin{pmatrix}
15, 12, *, 13, 22, 8, 24, 23, 20, 19, 4, 2, 1, 7, 6, 3, 5, 18, 17, 21, *, *, *, *, *, *, *, *, *, *, *, *
\end{pmatrix}
\]

where * is given by all permutations of the elements in the set \( S \),

\[ S \in \{9, 10, 11, 14, 16, 25, 26, 27, 28, 29, 30, 31, 32\} \]

The (proven) optimal value 642 was obtained in about 8h on a single PC.
New Solutions...

**Instance: esc32d**

\[
(18, 29, 10, 2, 25, 32, 22, 20, 24, 17, 30, 9, 1, 26, 31, 21, 19, 23, 27, 16, 13, 6, 3, 11, 15, 7, 8, 5, 14, 4, 12, 28)
\]

Considering the 14 rows (and columns) with all elements equal to zero in the flow matrix there are at least \(14! = 87178291200 \approx 10^{11}\) optimal solutions.

\[
\]

where * is given by all permutations of the elements in the set \(S\),

\[
S \in \{3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 15, 16, 27, 28\}
\]

The (proven) optimal value 200 was obtained in about 35h on a single PC.
New Solutions...

**Instance: tai64c**

\[
(1,15,32,35,61,41,29,18,12,45,63,59,47,2,3,4,5,6,7,8,9,10,11,13,14,16,17,19,20,21,22,23,24,25,
26,27,28,30,31,33,34,36,37,38,39,40,42,43,44,46,48,49,50,51,52,53,54,55,56,57,58,60,62,64)
\]

Considering the 51 rows (and columns) with all elements equal to zero in the flow matrix there are at least \(51! \approx 1.55 \cdot 10^{66}\) optimal solutions.

\[
(1,15,32,35,61,41,29,18,12,45,63,59,47,*,...,* )
\]

where * is given by all permutations of the elements in the set \(S\),

\[
S \in \{ 2,3,4,5,6,7,8,9,10,11,13,14,16,17,19,20,21,22,23,24,25,26,27,28,30,31,33,34,36,37,38,39,40,42,43,44,46,48,49,50,51,52,53,54,55,56,57,58,60,62,64 \}
\]

The (proven) optimal value 1855928 was obtained in about 51h on a single PC.