Experimental results of the IBSH with $f_1(M, \pi)$ and $f_3(M, \pi)$ as the heuristic evaluation function under four control factor levels, i.e., $c_1 \in \{1, 2, 3, 4\}$, are recorded in Table 1 and Table 2, respectively. The best result for each instance under different factor levels are marked in bold.

Table 1 Experimental results of IBSH algorithm with $f_1(M, \pi)$ under different control factor values

| Instance | $c_1 = 1$ | $c_1 = 2$ | $c_1 = 3$ | $c_1 = 4$ |
|---|---|---|---|---|
| In01 | **280** | 282 | 283 | 292 |
| In02 | **379** | 380 | 381 | 413 |
| In03 | **469** | **469** | **469** | 545 |
| In04 | 587 | **572** | 591 | 675 |
| In05 | 230 | 231 | **224** | 235 |
| In06 | 327 | 315 | **309** | 320 |
| In07 | 392 | 384 | **380** | 397 |
| In08 | 468 | 455 | **450** | 488 |
| In09 | 172 | **168** | 172 | 181 |
| In10 | 234 | 233 | 234 | **230** |
| In11 | 277 | 276 | **274** | 284 |
| In12 | 329 | **328** | **328** | 330 |
| In13 | 159 | 159 | **154** | 167 |
| In14 | 225 | 221 | 216 | **213** |
| In15 | 263 | 262 | **259** | 266 |
| In16 | 310 | 315 | **306** | 329 |

As shown in Table 1, with $f_1(M, \pi)$ as the heuristic evaluation function, IBSH with $c_1 = 1$ (2, 3, and 4) can find best results in 3 (4, 10, and 2) out of 16 instances. Hence, we set $c_1 = 3$ in $f_1(M, \pi)$.

Table 2 Experimental results of IBSH algorithm with $f_3(M, \pi)$ under different control factor values

| Instance | $c_1 = 1$ | $c_1 = 2$ | $c_1 = 3$ | $c_1 = 4$ |
|---|---|---|---|---|
| In01 | **272** | 277 | 278 | 278 |
| In02 | 375 | **370** | **370** | **370** |
| In03 | 454 | **451** | 453 | 453 |
| In04 | 545 | **530** | **530** | **530** |
| In05 | **221** | 230 | 230 | 230 |
| In06 | **305** | 320 | 320 | 320 |
| In07 | **374** | 381 | 381 | 381 |
| In08 | **449** | 452 | 452 | 452 |
| In09 | **166** | 170 | 170 | 170 |
| In10 | **229** | 235 | 238 | 238 |
| In11 | **274** | 275 | 284 | 284 |
| In12 | 328 | **324** | 326 | 326 |
| In13 | **154** | 165 | 165 | 165 |
| In14 | **217** | 220 | 220 | 220 |
| In15 | **255** | 267 | 267 | 267 |
| In16 | **301** | 304 | 304 | 304 |

As shown in Table 2, with $f_3(M, \pi)$ as the heuristic evaluation function, IBSH with $c_1 = 1$ (2, 3, and 4)

can find best results in 12 (4, 2, and 2) out of 16 instances. Hence, we set $c_1 = 1$ in $f_3(M, \pi)$.