Abstract :

In the authors' previous work on the multiplication by a constant, optimisations have been done on the RADIX-2 ^{r} heuristic based on Radix-2 ^{r} arithmetic, which is a fully predictable, and a sub-linear-runtime heuristic. This improved version of RADIX-2 ^{r} is called RADIX-2 $^{r+}$. The latter makes the former more competitive in term of average number of additions compared with existing heuristics. In this study, the authors propose a new heuristic for multiplication by a constant, denoted H-RADIX, which combines RADIX-2 $^{r+}$ with a common sub-pattern (Lefevre's CSP) heuristic. It belongs to the category of common subexpression elimination algorithm. Results of the designed hybrid algorithm (H-RADIX), namely, the average number of additions and the smallest value that requires *q* adders, are compared with the standard canonical signed digit (CSD) representation, RADIX-2 $^{r+}$, and Lefevre's CSP algorithms. The results highlight the efficiency of the designed heuristic, up to *N*-bits = 64. H-RADIX uses 37.496, 5.015 and 3.082% less additions than CSD, RADIX-2 $^{r+}$, and Lefevre's CSP, respectively.