# On-the-Fly Array Initialization

Torben Hagerup and Frank Kammer

**Abstract.** We show that for all given $n, t, w \in \{1, 2, \ldots\}$ with $n \leq 2^w$, an array of $n$ entries of $w$ bits each can be represented on a word RAM with a word length of $w$ bits in at most $nw + \lceil n(t/(2w))^t \rceil$ bits of uninitialized memory to support constant-time initialization of the whole array and $O(t)$-time reading and writing of individual array entries. At one end of this tradeoff, we achieve initialization and access (i.e., reading and writing) in constant time with $nw + \lceil n/w^t \rceil$ bits for arbitrary fixed $t$, to be compared with $nw + \Theta(n)$ bits for the best previous solution, and at the opposite end, still with constant-time initialization, we support $O(\log n)$-time access with just $nw + 1$ bits, which is optimal for arbitrary access times if the initialization executes fewer than $n$ steps.