Algorithm Simulated Annealing for the Knapsack Problem

Define the total number of iterations N
Initialize temperature T
Define the cooling rate α

for *iteration* $= 1$ to N **do**
    Record your current assortment of objects ξ_1. $\xi = \{x_1, x_2, \ldots, x_n\}$, $x_i \in \{0, 1\}$
    Pick an item at random with equal probability.
    Assess whether to add it to your backpack:
    if adding this new object into your bag exceeds the weight limit **then**
        Select an item at random from your bag or the one in your hand.
        Drop that item.
        Repeat until the objects in your bag are below the weight limit.
    else
        Add the item to your bag.
    end if

    Record the outcome as a trial assortment ξ_1'.
    Compare the value of the trial assortment with the original, V_1' and V_1 respectively.
    Calculate $V(\xi) = \sum_{i=1}^{n} v_i x_i$, for $i = 1, 2, \ldots, n$.

    Determine the acceptance probability P:
    if $V_1' > V_1$ **then**
        Accept the new trial assortment as the new assortment $\xi_2 = \xi_1'$.
    else
        Calculate $\Delta V = V_1' - V_1$.
        Calculate $P = \exp(\Delta V / T)$.
        Generate a random number r between 0 and 1.
        if $r < P$ **then**
            Accept the new trial assortment as the new assortment $\xi_2 = \xi_1'$.
        else
            Discard the trial assortment and set the original assortment as the new assortment $\xi_2 = \xi_1$.
        end if
    end if

    Update the temperature $T = T \cdot (1 - \alpha)$ according to the cooling schedule.
end for