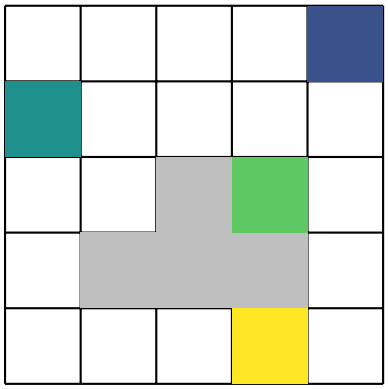


Algorithm 1 Weed Clearance Simulation

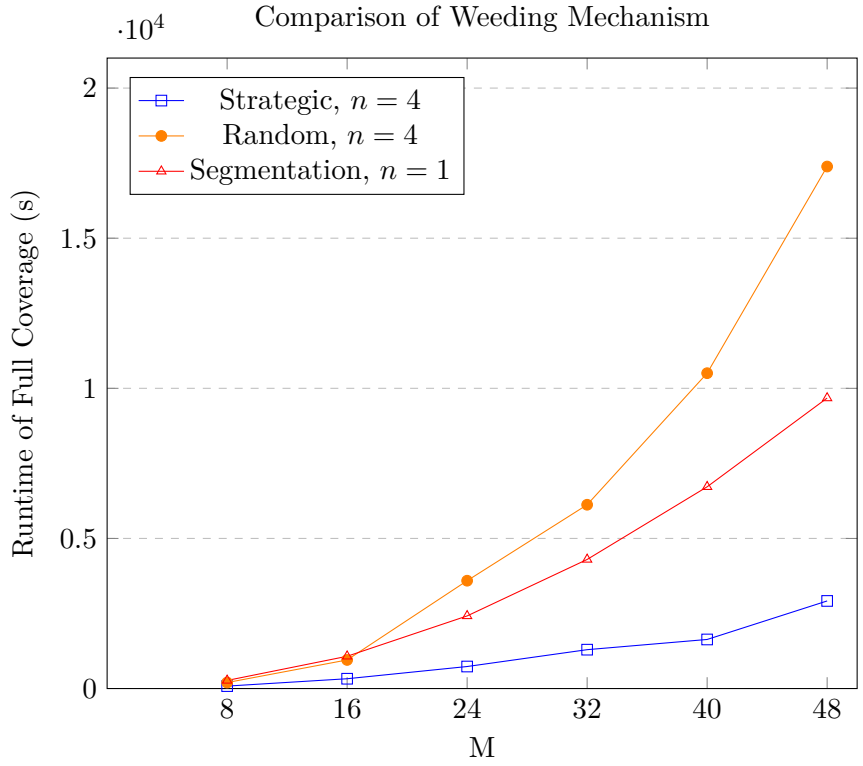
Require: $M, n, k_{\text{att}}, k_{\text{rep}}, d_0$

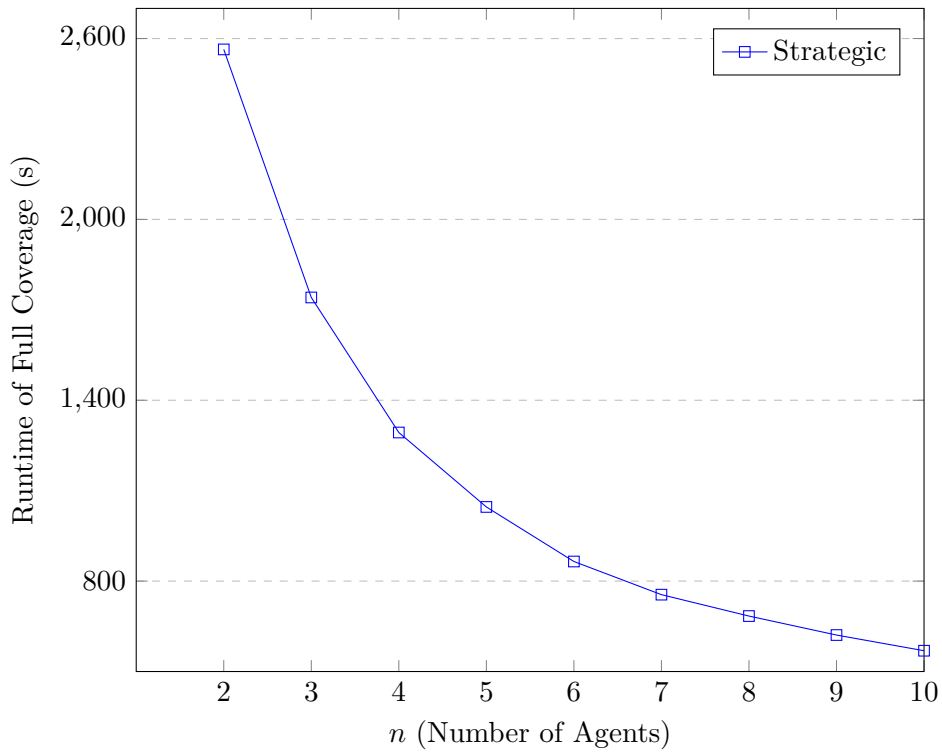
Ensure: $\max(runtime_i)$ for $i = 1$ to n

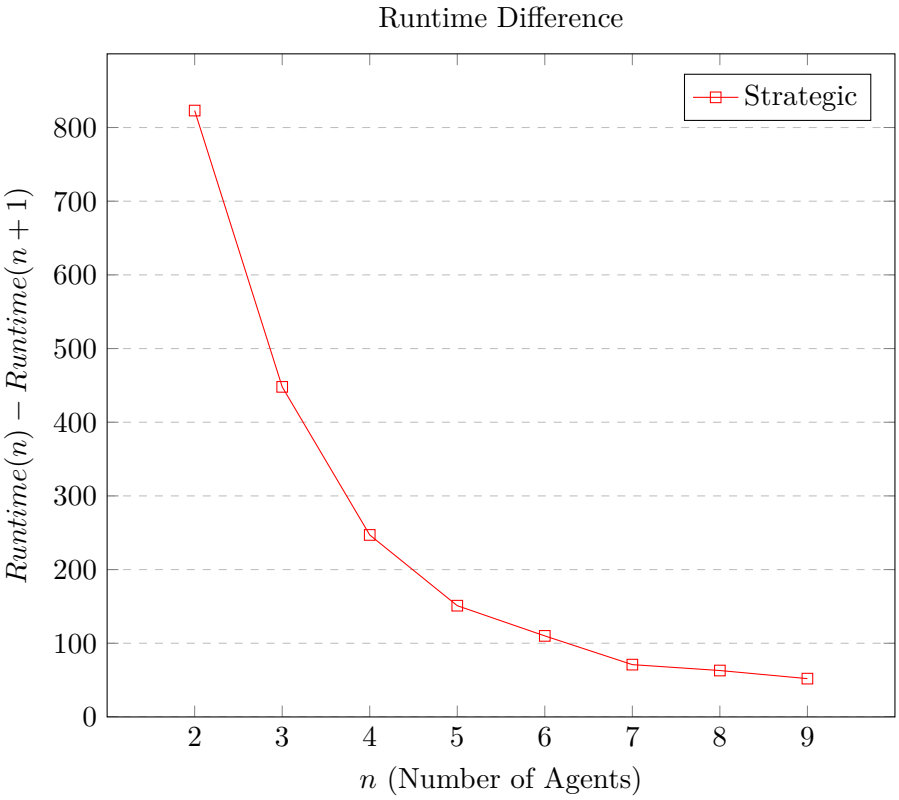
$Grid \leftarrow 2D\ Gaussian(M)$
$Agents \leftarrow \{\text{random positions}\}^n$
while $|\text{Covered}| < M^2$ **do**
    for $a \in Agents$ **do**
        $F_{\text{att}}(a) \leftarrow \sum -\frac{k_{\text{att}}}{(1+d_{ij}^2)^2}\vec{d}_{ij},\ \forall$ cells
        $F_{\text{rep}}(a) \leftarrow \sum \frac{k_{\text{rep}}(1/d_{ij}-1/d_0)^3}{d_{ij}^2}\vec{d}_{ij},\ \forall$ covered cells
        $U(a) \leftarrow \max\left(\frac{1}{\pi}\frac{1}{\gamma+\theta_{ij}^2}\right),\ \forall$ neighbors
        if $U(a) > U_{\text{best}}$ **then**
            Move a to best cell, update covered
        end if
    end for
end while
$runtime_i \leftarrow$ Compute runtime for each a_i
return $\max(runtime_i)$

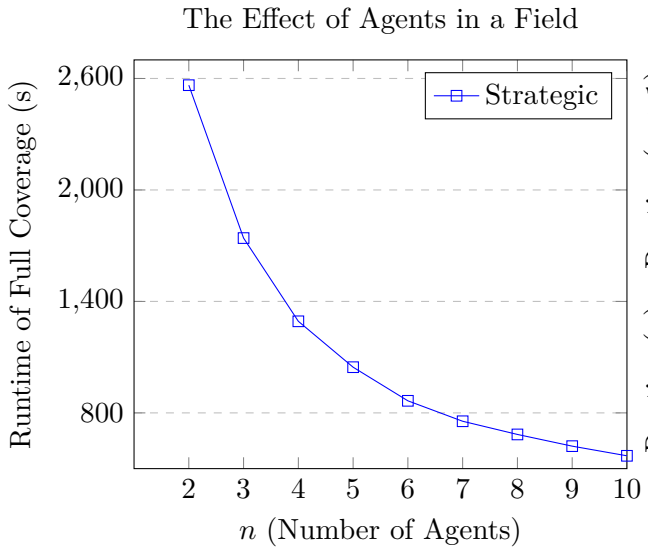
Algorithm 2 Weeding Simulation with Strategic Cell Selection

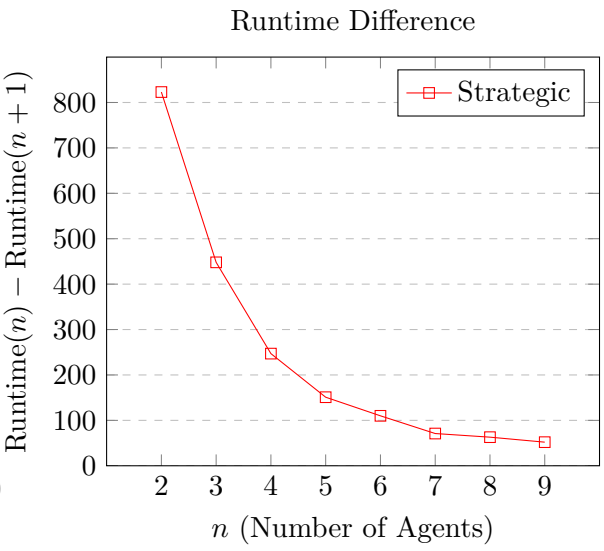
Initialize: Grid G with size $M \times M$, N patches with uniform distribution, n agents with random positions, parameters k_{att}, k_{rep}, d_0 and γ.
function MoveAgent($\mathbf{a}, G$):
    Best utility $U_{\text{best}} \leftarrow -\infty$, best move $\mathbf{m} \leftarrow$ None
    for each neighbor $\mathbf{n}$ of $\mathbf{a}$ **do**:
        Compute total force $\mathbf{F} = \mathbf{F}_{\text{att}} + \mathbf{F}_{\text{rep}}$
        $\theta \leftarrow \arctan 2(\mathbf{F}[1], \mathbf{F}[0])$
        $U \leftarrow C(\theta, \gamma)$, where θ is mapped to a Cauchy distribution with MAD γ
        if $U > U_{\text{best}}$ **then**:
            $U_{\text{best}} \leftarrow U$, $\mathbf{m} \leftarrow \mathbf{n}$
        end if
    end for
    return m
end function
while not all cells in G are covered **do**:
    for each agent $\mathbf{a}$ **do**:
        Mark cells within vision $\mathbf{m}$ as covered
        $\mathbf{m} \leftarrow$ MoveAgent($\mathbf{a}, G$)
        if $\mathbf{m} \neq$ None **then**:
            Update $\mathbf{a}$ position to $\mathbf{m}$, mark $\mathbf{m}$ as covered
        end if
    end for
end while
Output: Maximum runtime among all agents

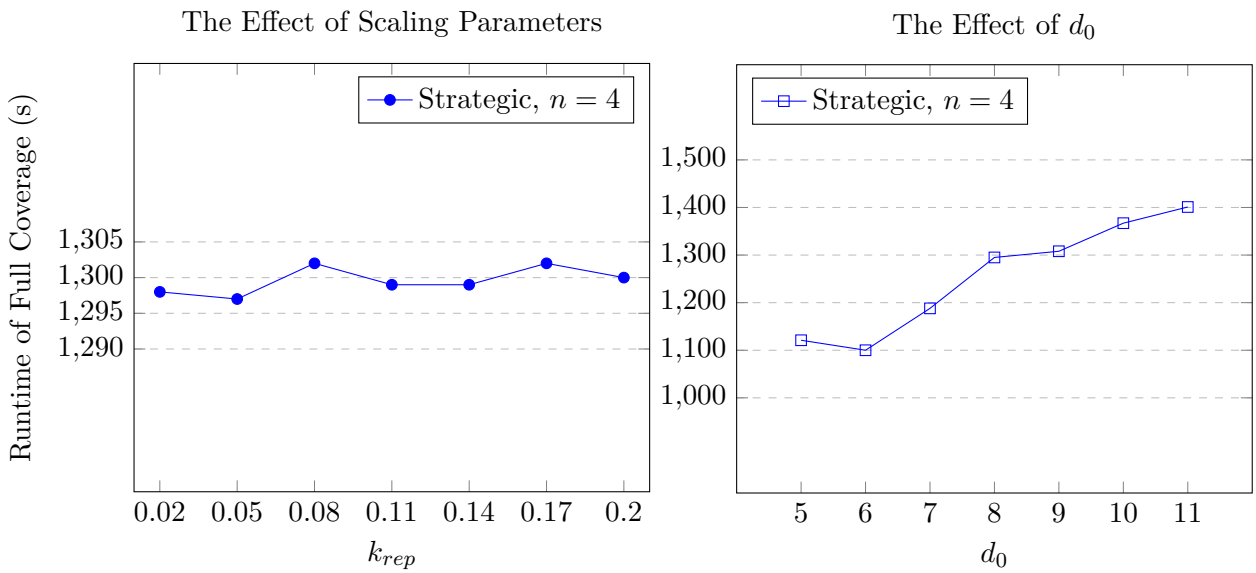

Comparison of Weeding Mechanism
$\cdot 10^4$
Strategic, $n = 4$
Random, $n = 4$
Segmentation, $n = 1$
Runtime of Full Coverage (s)
0
0.5
1
1.5
2
8
16
24
32
40
48
M


The Effect of Agents in a Field
Strategic
Runtime of Full Coverage (s)
800
1,400
2,000
2,600
2
3
4
5
6
7
8
9
10
n (Number of Agents)


Runtime Difference
Strategic
800
700
600
500
400
300
200
100
0
$Runtime(n) - Runtime(n+1)$
2
3
4
5
6
7
8
9
n (Number of Agents)


The Effect of Agents in a Field
Strategic
2,600
2,000
1,400
800
Runtime of Full Coverage (s)
2
3
4
5
6
7
8
9
10
n (Number of Agents)


Runtime Difference
Strategic
800
700
600
500
400
300
200
100
0
Runtime(n) − Runtime$(n+1)$
2
3
4
5
6
7
8
9
n (Number of Agents)


The Effect of Scaling Parameters
Runtime of Full Coverage (s)
Strategic, $n = 4$
1,305
1,300
1,295
1,290
0.02
0.05
0.08
0.11
0.14
0.17
0.2
k_{rep}
The Effect of d_0
Strategic, $n = 4$
1,500
1,400
1,300
1,200
1,100
1,000
5
6
7
8
9
10
11
d_0