Figure S1. Different phases of the SMA, Related to STAR Methods
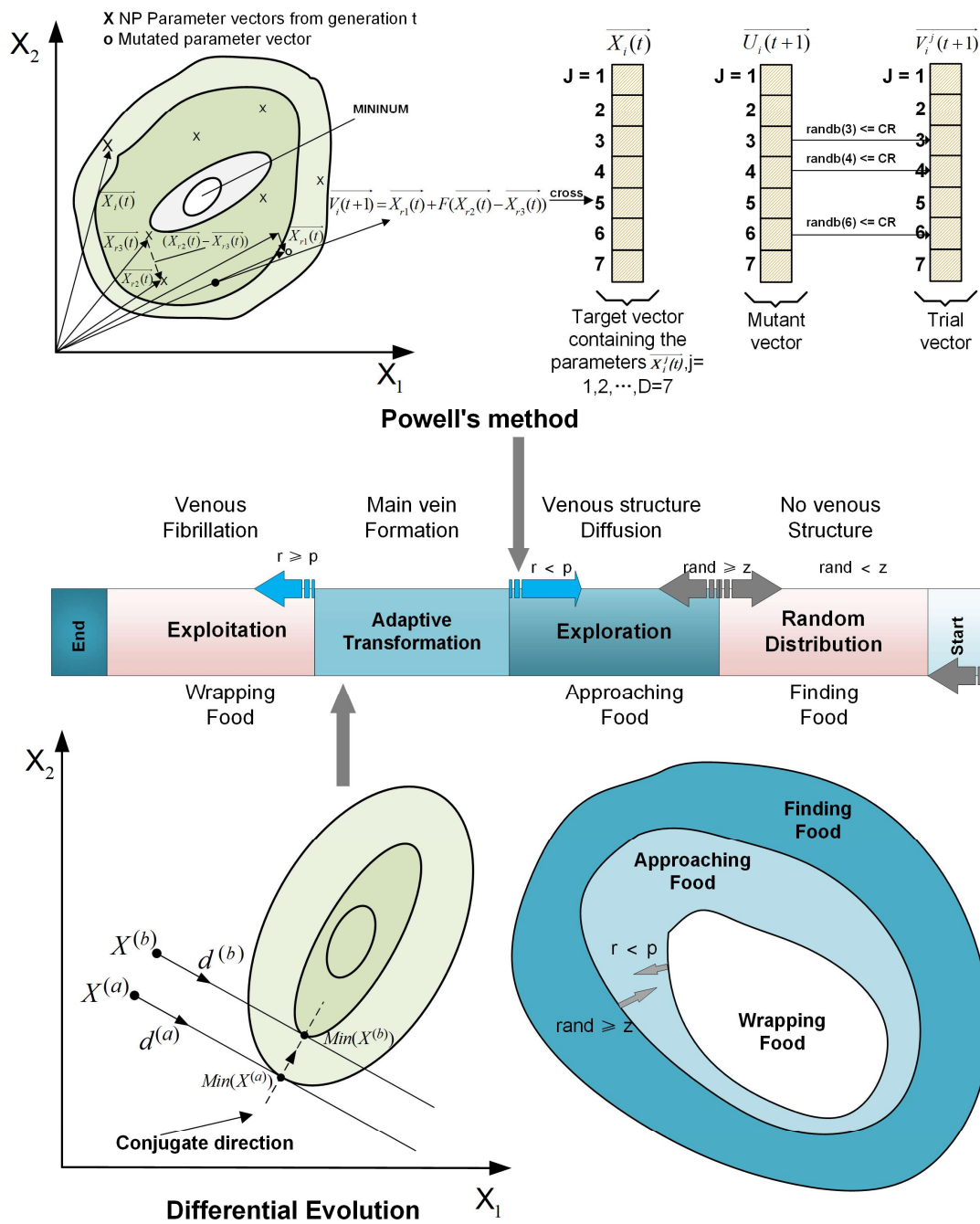
X_2

X NP Parameter vectors from generation t
o Mutated parameter vector

MININUM

$\overrightarrow{X_i(t)}$

$\overrightarrow{X_{r3}(t)}$

$(\overrightarrow{X_{r2}(t)} - \overrightarrow{X_{r3}(t)})$

$\overrightarrow{X_{r2}(t)}$

$\overrightarrow{X_{r1}(t)}$

$\overrightarrow{V_i(t+1)} = \overrightarrow{X_{r1}(t)} + F(\overrightarrow{X_{r2}(t)} - \overrightarrow{X_{r3}(t)})$

cross

X_1

$\overrightarrow{X_i(t)}$

J = 1
2
3
4
5
6
7

Target vector
containing the
parameters $x_i^j(t)$, j=
$1, 2, \cdots, D = 7$

$\overrightarrow{U_i(t+1)}$

J = 1
2
3
4
5
6
7

randb(3) <= CR
randb(4) <= CR
randb(6) <= CR

Mutant
vector

$\overrightarrow{V_i^j(t+1)}$

J = 1
2
3
4
5
6
7

Trial
vector

Powell's method

Venous
Fibrillation

Main vein
Formation

Venous structure
Diffusion

No venous
Structure

$r \geqslant p$

$r < p$

$rand \geqslant z$

$rand < z$

End

Exploitation

**Adaptive
Transformation**

Exploration

**Random
Distribution**

Start

Wrapping
Food

Approaching
Food

Finding
Food

X_2

$X^{(b)}$

$d^{(b)}$

$X^{(a)}$

$d^{(a)}$

$Min(X^{(b)})$

$Min(X^{(a)})$

Conjugate direction

Differential Evolution

X_1

**Finding
Food**

**Approaching
Food**

$r < p$

$rand \geqslant z$

**Wrapping
Food**

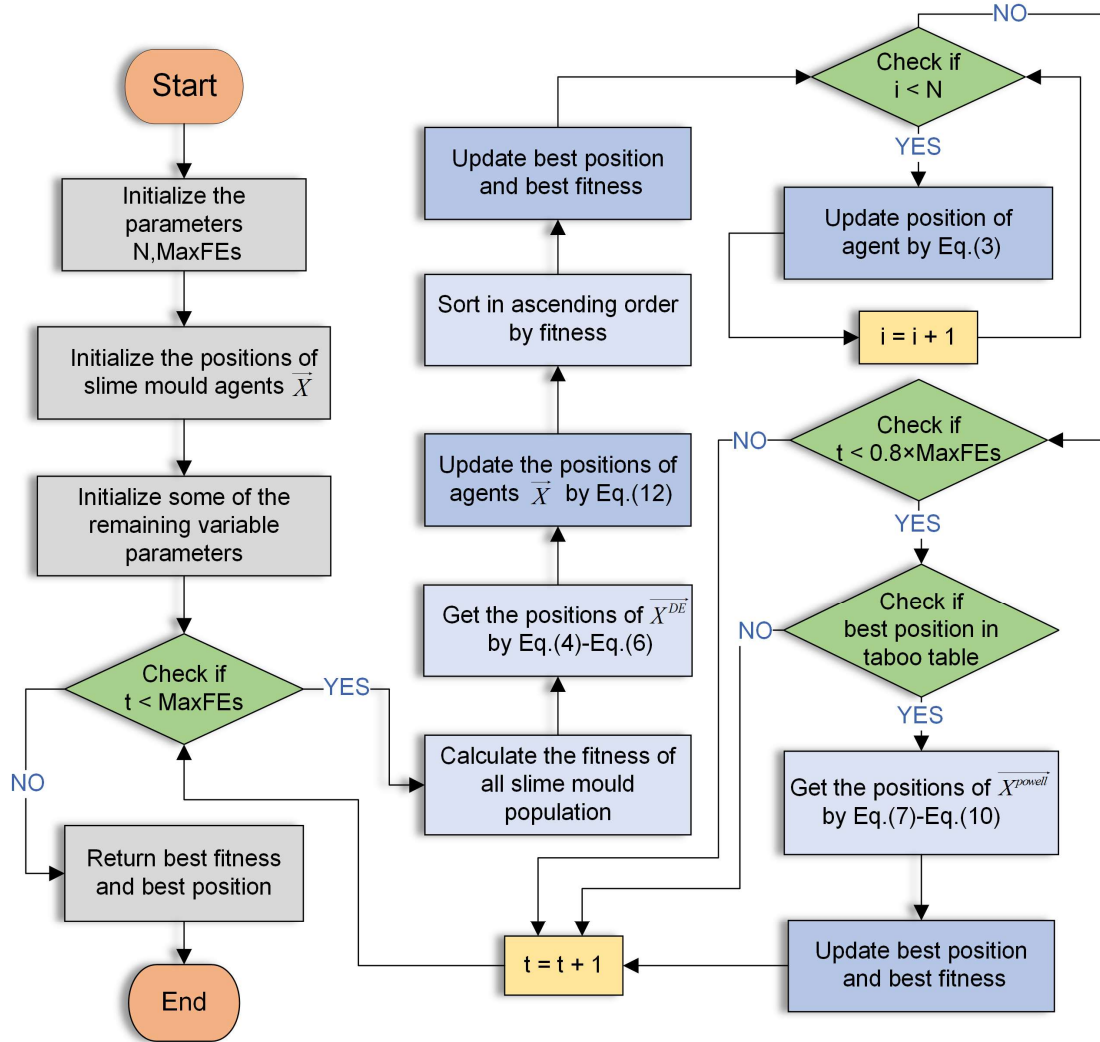**Figure S2**. Overview logic of PSMADE, Related to STAR Methods

Figure S3. Flowchart of PSMADE, Related to STAR Methods