UNDERSTANDING REFERENTIAL COORDINATION AS A PARTICLE SWARM OPTIMIZATION TASK

H. Chase Stevens

Supervisor: Dr. Hannah Rohde

CONTENTS

1. Referential Coordination
   - Rohde et al. 2012

2. Particle Swarm Optimization

3. Modeling Referential Coordination using Particle Swarm Optimization

REFERENTIAL COORDINATION

REFERENTIAL COORDINATION

Chocolate lab

REFERENTIAL COORDINATION

Chocolate lab

Corgi

REFERENTIAL COORDINATION

Chocolate lab

Corgi

American water spaniel / German longhaired pointer mix

REFERENTIAL COORDINATION

Chocolate lab

Corgi

American water spaniel / German longhaired pointer mix

REFERENTIAL COORDINATION

Chocolate lab

Corgi

~~American water spaniel / German longhaired pointer mix~~

"That brown dog"

REFERENTIAL COORDINATION

Chocolate lab

"That brown dog"?

Corgi

~~American water spaniel / German longhaired pointer mix~~
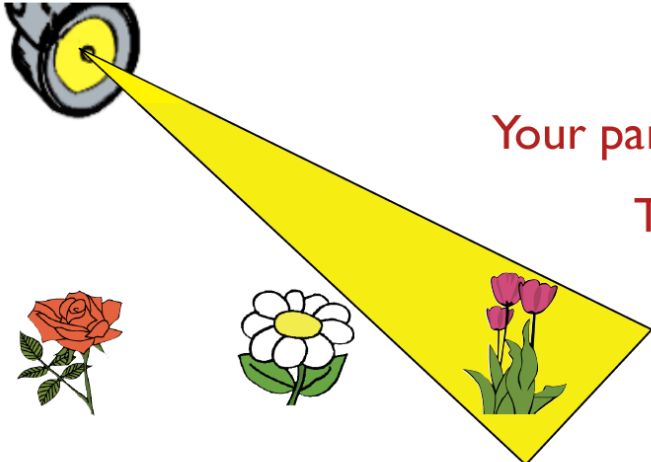
"That brown dog"

ROHDE ET AL. 2012

ROHDE ET AL. 2012

Name	Study 1 Cost	Study 2 Cost
"Flower"	**80**	**80**
"Rose"	60	80
"Daisy"	120	140
"Tulip"	280	165
"Tree"	**80**	**80**
"Apple Tree"	60	80
"Pine Tree"	120	135
"Palm Tree"	250	170
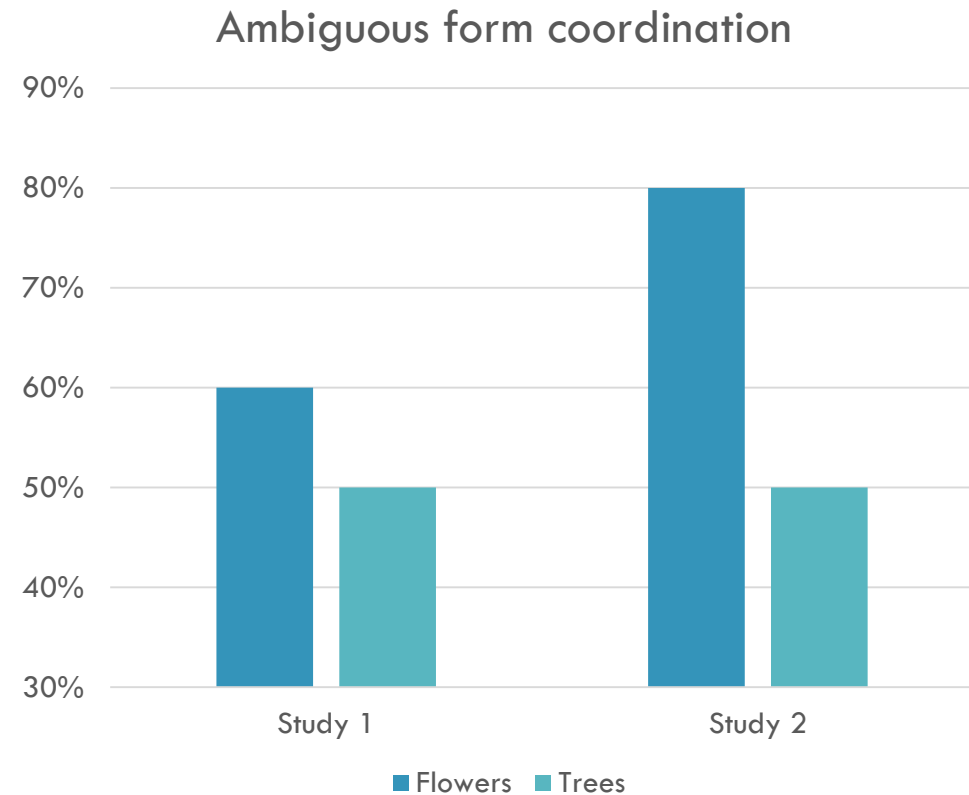
Ambiguous form coordination

Flowers Trees

PARTICLE SWARM OPTIMIZATION

PARTICLE SWARM OPTIMIZATION

Bird flocking simulations

Heppner & Grenander. (1990). A Stochastic Nonlinear Model for Coordinated Bird Flocks.

PARTICLE SWARM OPTIMIZATION

Bird flocking simulations

Heppner & Grenander. (1990). A Stochastic Nonlinear Model for Coordinated Bird Flocks.

+

Human behaviour
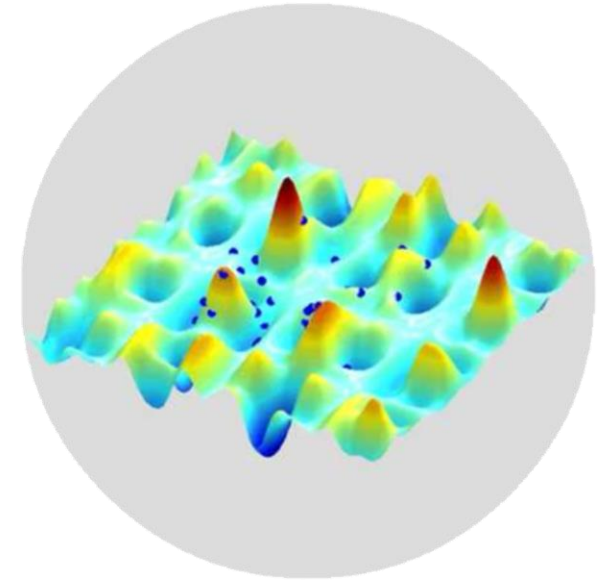
PARTICLE SWARM OPTIMIZATION

Bird flocking simulations

Heppner & Grenander.
(1990). A Stochastic
Nonlinear Model for
Coordinated Bird Flocks.
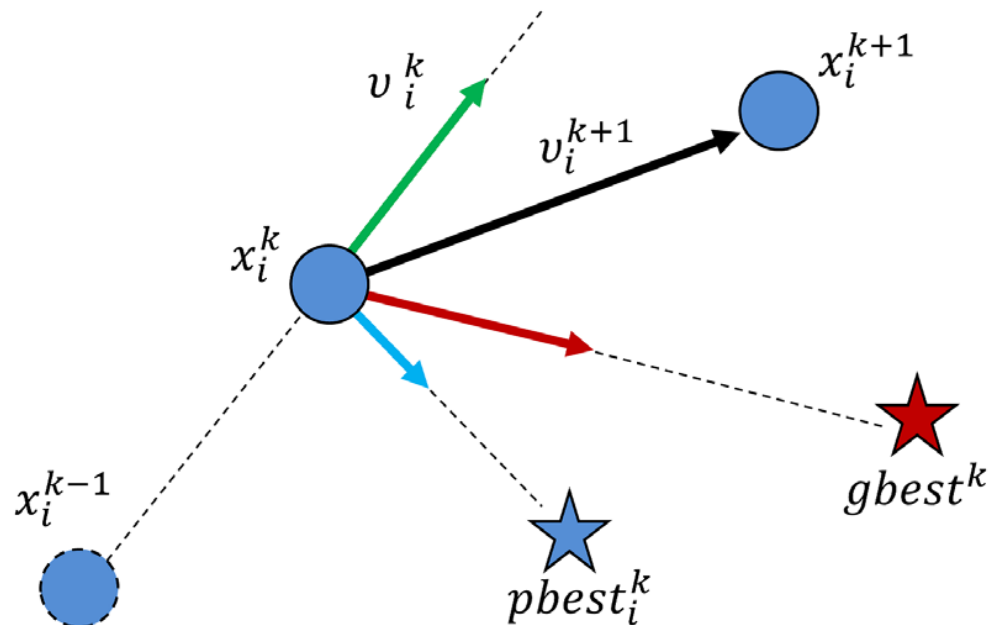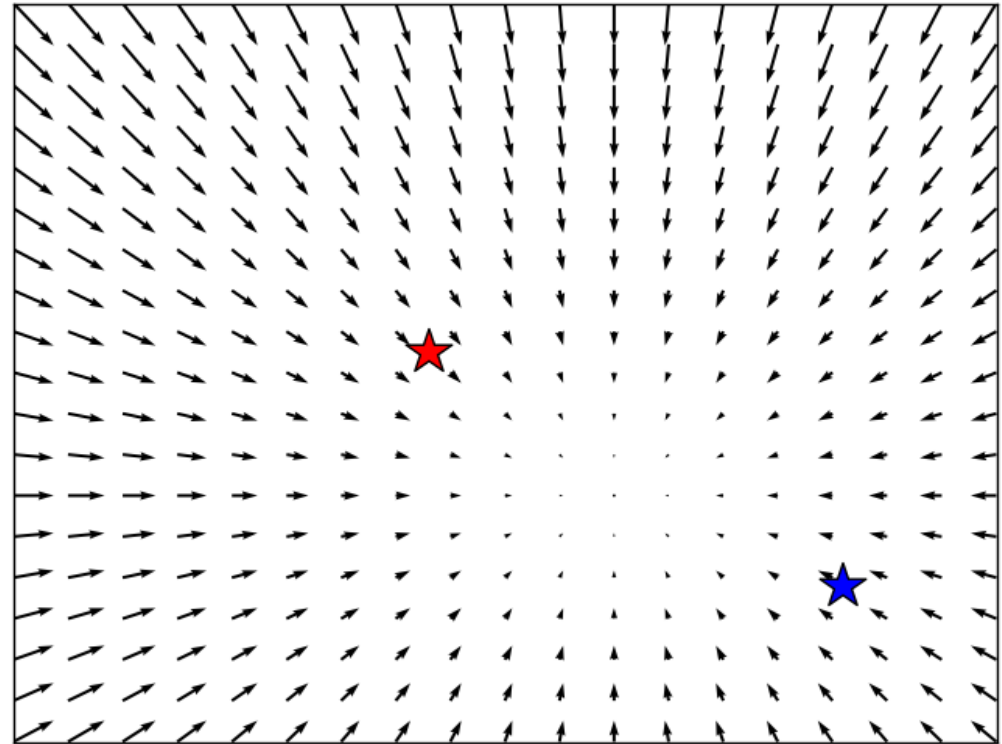
\+

Human behaviour

\=

PSO

Kennedy & Eberhart.
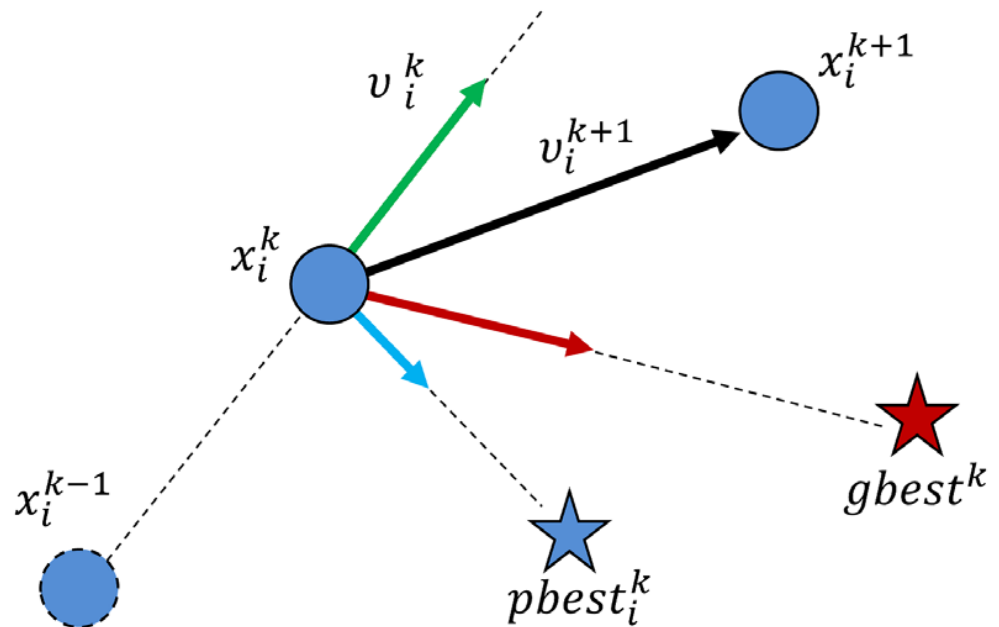(1995). Particle Swarm
Optimization.

PARTICLE SWARM OPTIMIZATION

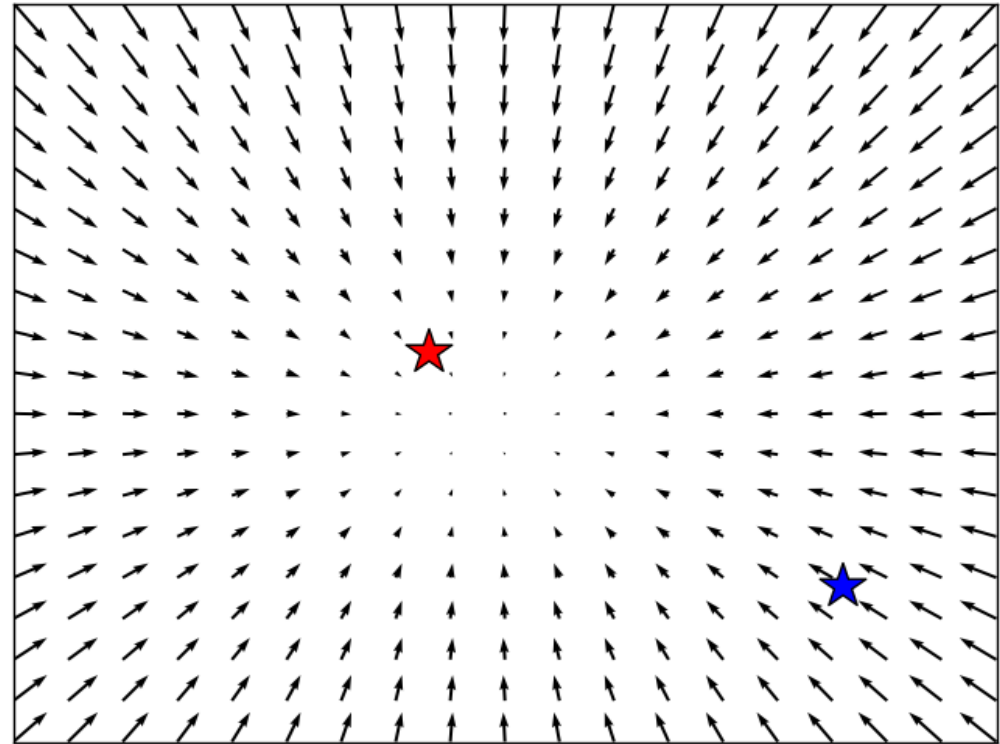$force_{gbest} = 2, force_{pbest} = 2, |\vec{v}| = 0$

Noto, M., et al. (2013). Agent-based Social Simulation Model for Analyzing Human Behaviours using Particle Swarm Optimization.
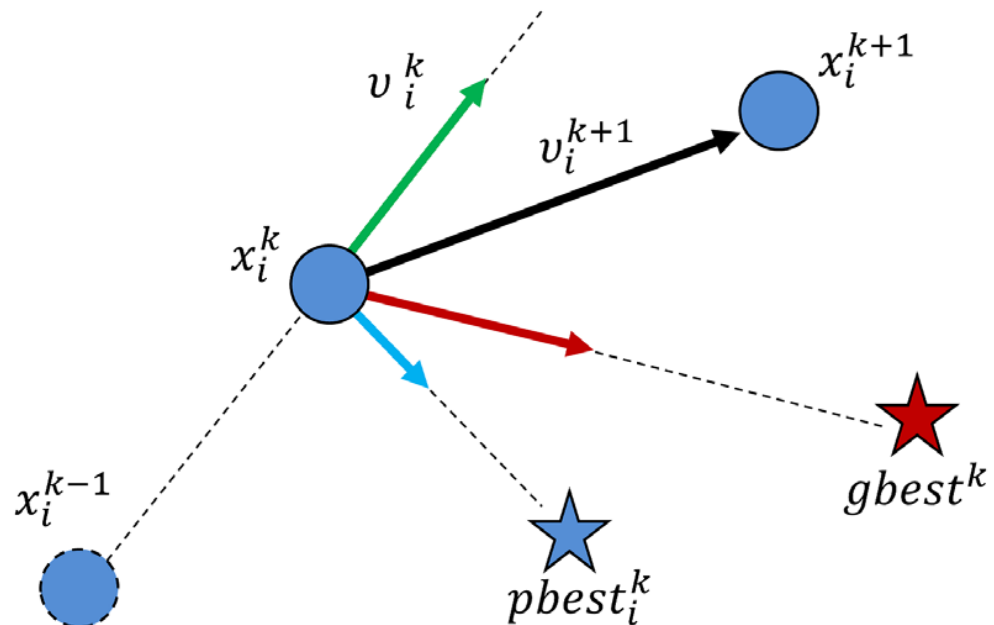
PARTICLE SWARM OPTIMIZATION

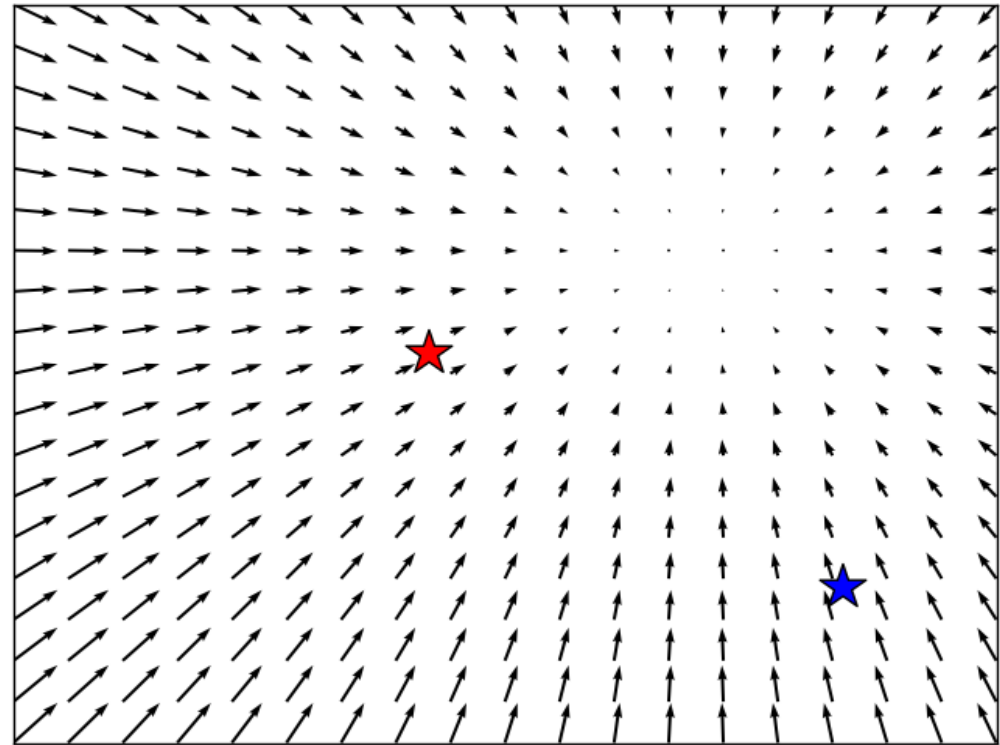$force_{gbest} = 4, force_{pbest} = 1, |\vec{v}| = 0$

Noto, M., et al. (2013). Agent-based Social Simulation Model for Analyzing Human Behaviours using Particle Swarm Optimization.
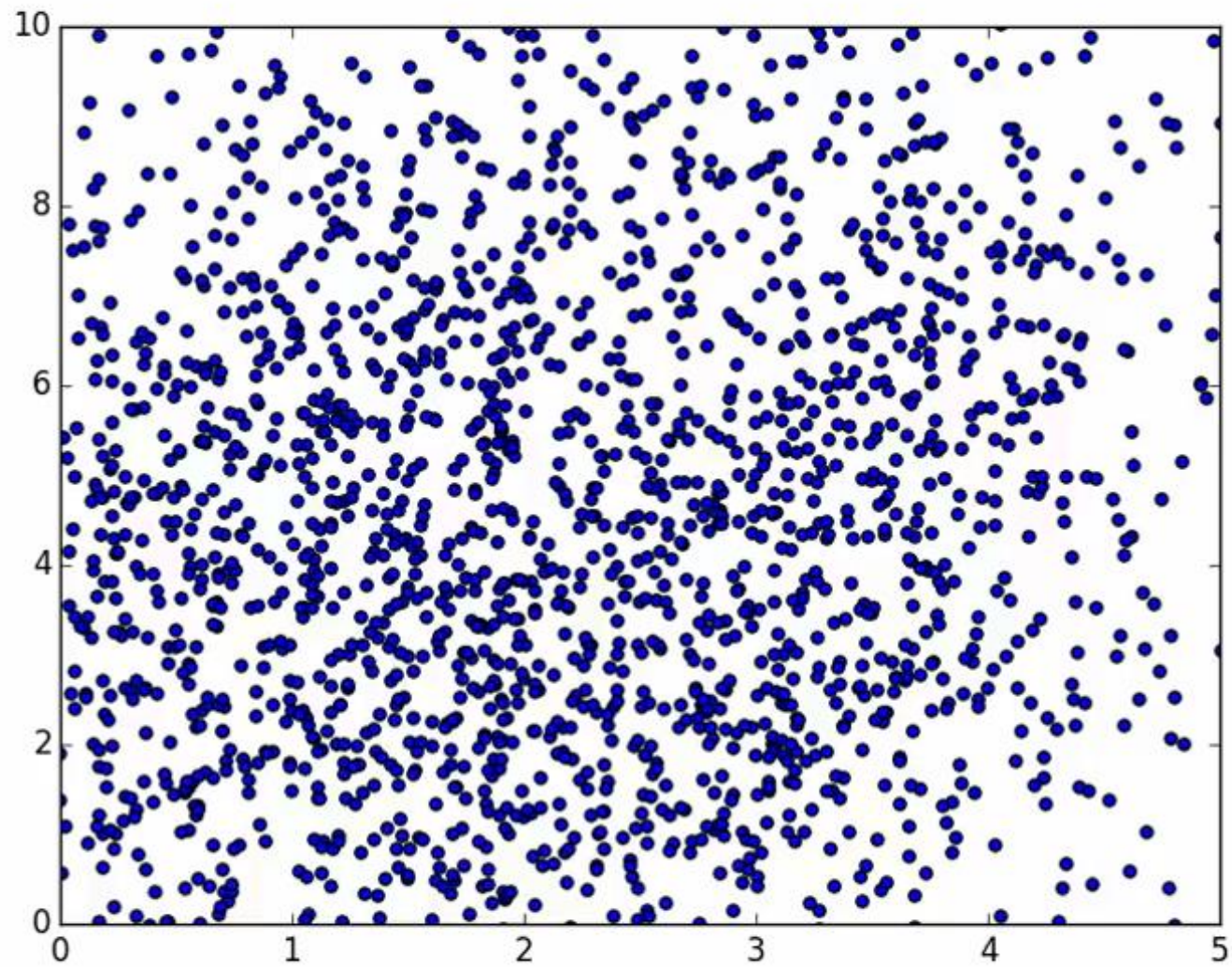
PARTICLE SWARM OPTIMIZATION

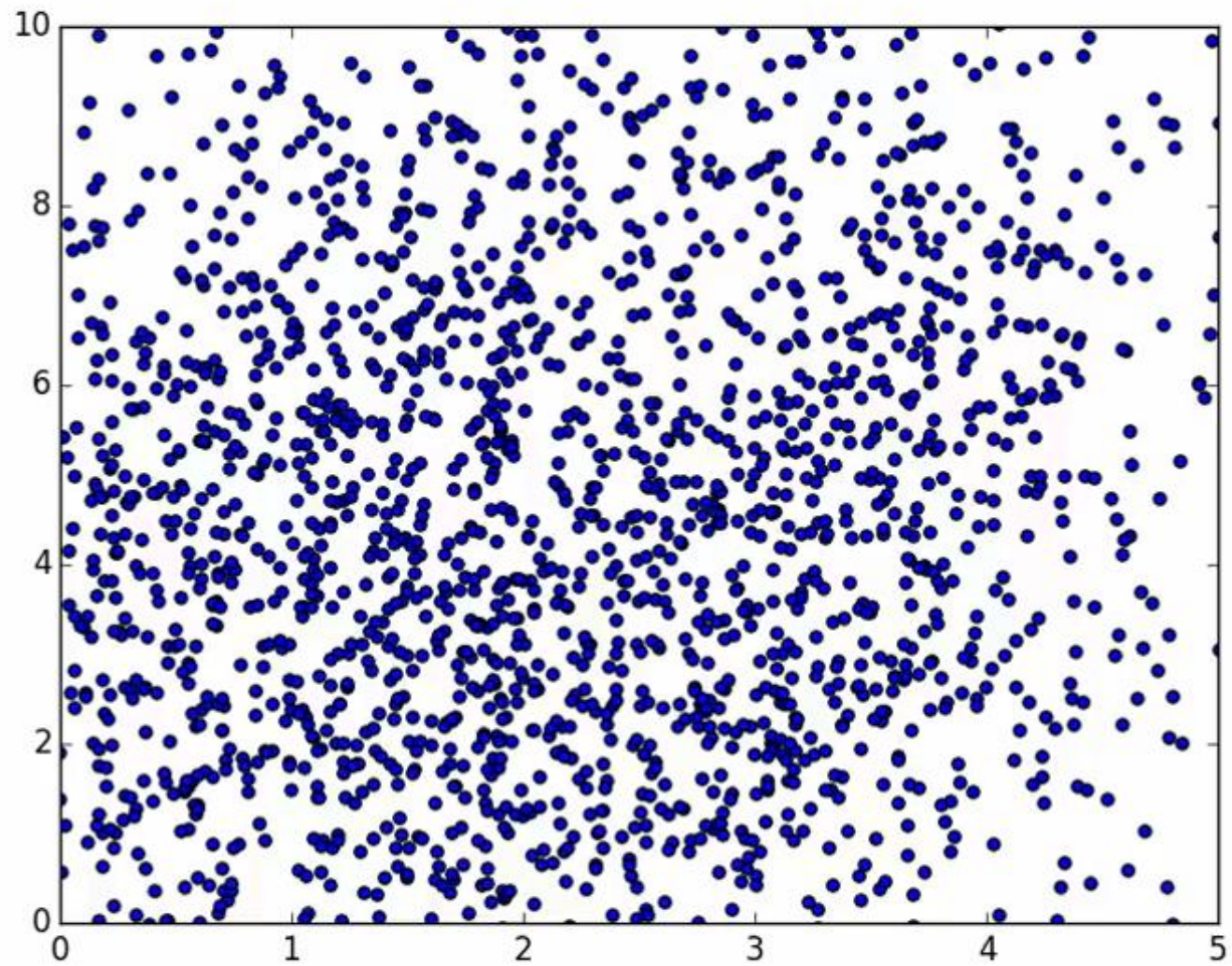$$force_{gbest} = 4, force_{pbest} = 1, |\vec{v}| \approx 7$$

Noto, M., et al. (2013). Agent-based Social Simulation Model for Analyzing Human Behaviours using Particle Swarm Optimization.
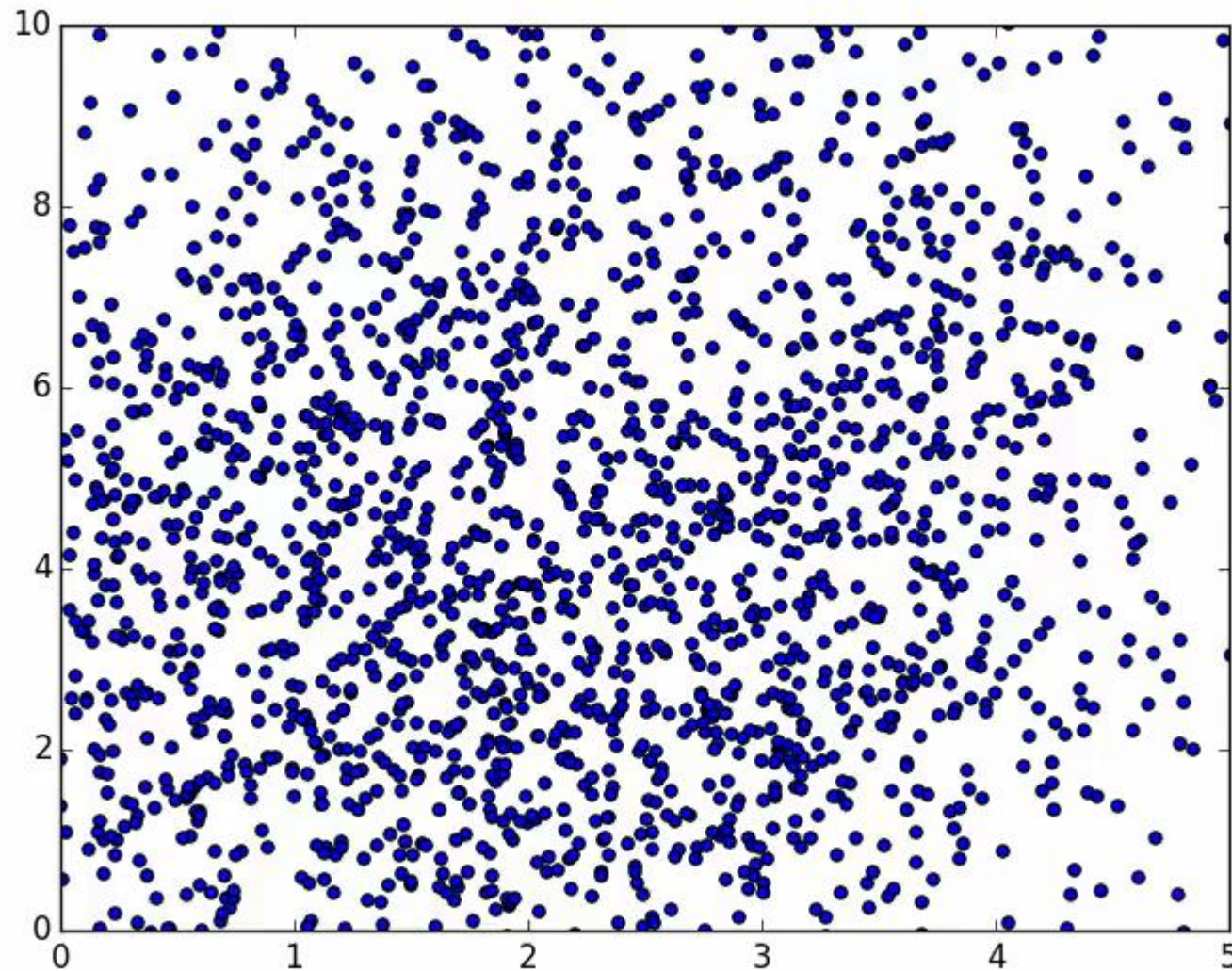
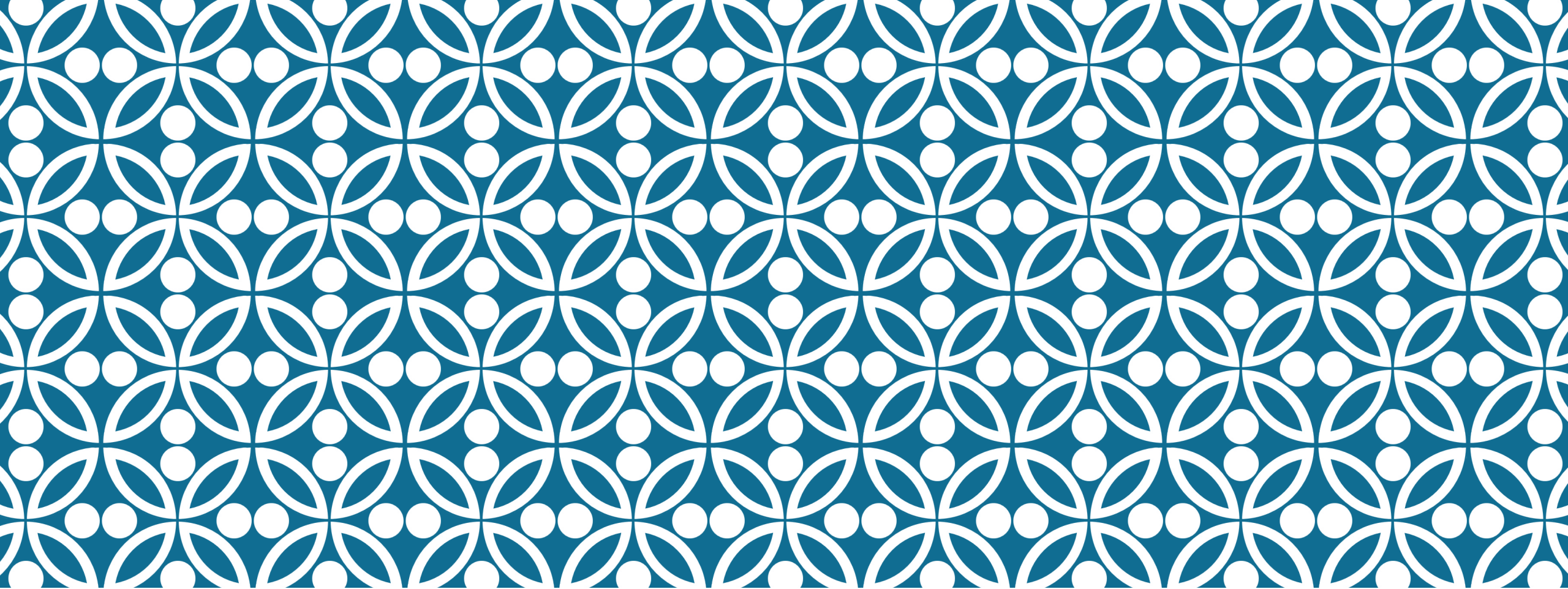# PARTICLE SWARM OPTIMIZATION

$$x^2 = y$$

PARTICLE SWARM OPTIMIZATION

$$f(x, y) = -|x^2 - y|$$

PARTICLE SWARM OPTIMIZATION

$f(x, y) = -|x^2 - y|$

UNDERSTANDING REFERENTIAL COORDINATION AS A PARTICLE SWARM OPTIMIZATION TASK

Questions?