Simple land battles using agent based modelling

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Model Introduction

- Agent based modelling
- We have taken example of Infinity war to explain our model .
- Agents:
  - Attackers - Thanos army
  - Defenders - Avengers army
- To predict outcome and suggest useful strategy in real life involving conflict between two parties. Eg 2006 Iraq war.

Side	Symbol	Definition
A : Avengers	A_0, A	Initial/Final avengers reserve
	ρ_A	Ratio of sites occupied by A
	a	Avengers force level
B : Thanos	B_0, B	Initial/Final Thanos reserves
	ρ_B	Ratio of sites occupied by B
	b	Thanos force level
	R	Search range for deployment
Lattice variables	L	Length of each side of lattice
	$h_{xy}(t)$	sum of a and d at position (x,y) in lattice at t time

TABLE I: Description of notations used

Assumptions and Initial conditions

- Symmetric battle
- ρA is constant throughout the battle, whereas ρB is dynamic.
- Thanos army can only deploy new agents from the sites they have occupied initially.
- Both army deploy their troop one after the other.

★ **Strength** : Avengers: a= {+1,+2} Thanos army: b={-1,-2}

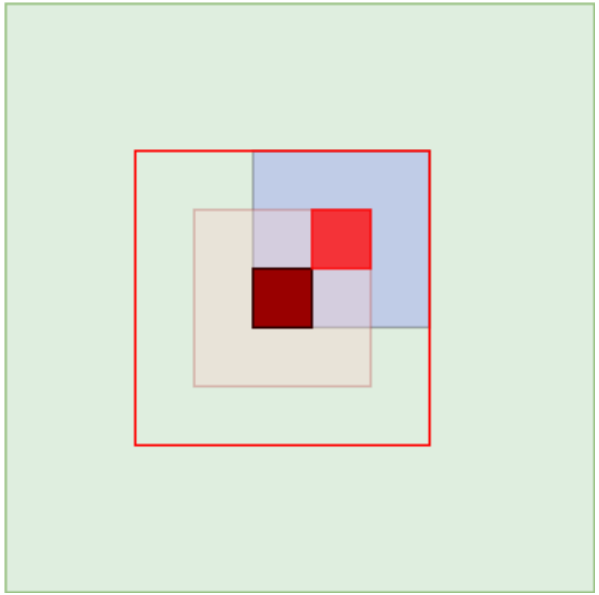
★ **Lattice** : 50x50

★ **Reserves** : Avengers: A_0=50,000 Thanos army: B_0=50,000

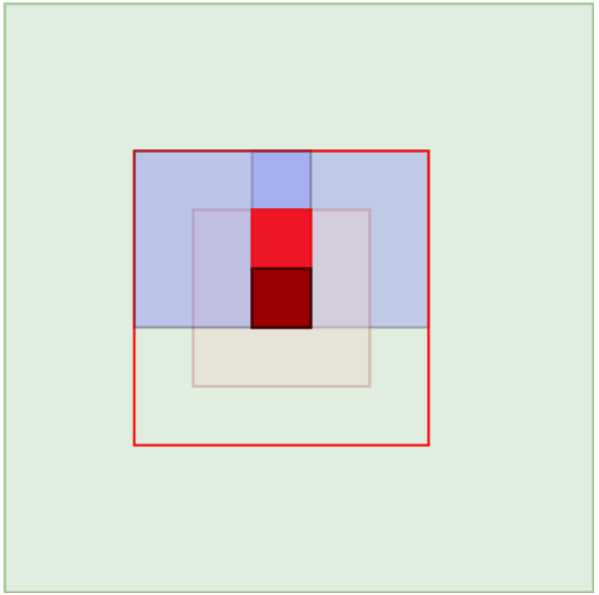
★ **Density** : Initially Avengers and Thanos army will be deployed randomly in the battlefield with density ρA and ρB.

Rules

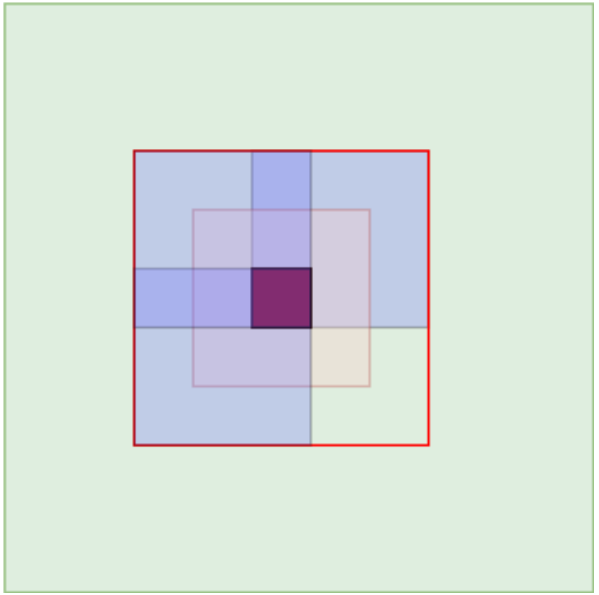
- ★ Aggressive strategy
- ★ Defensive strategy



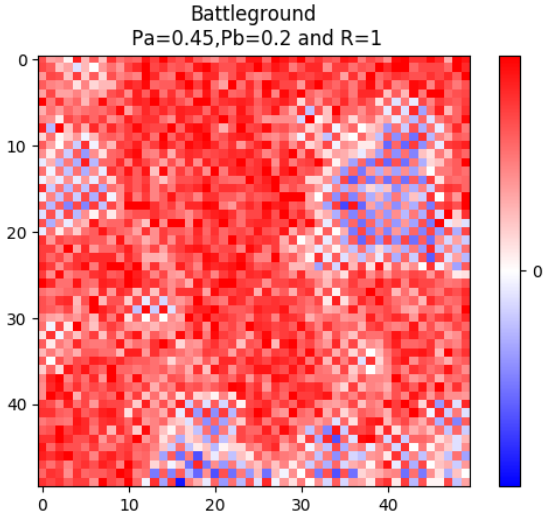
Diagonal Deployment

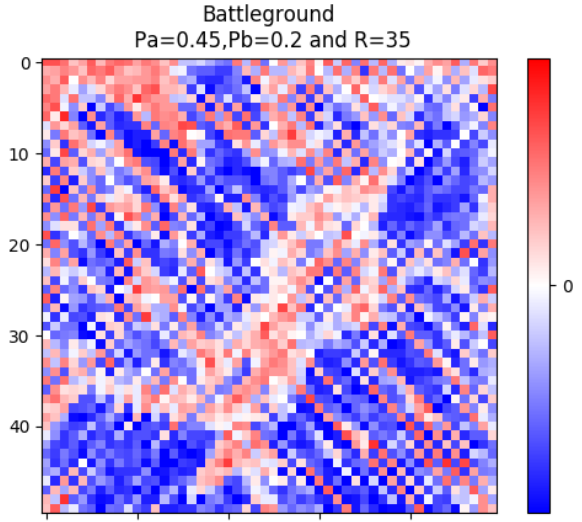


Adjacent Deployment



No Deployment


Battleground
Pa=0.45,Pb=0.2 and R=1
0
10
20
30
40
0
10
20
30
40
0


Battleground
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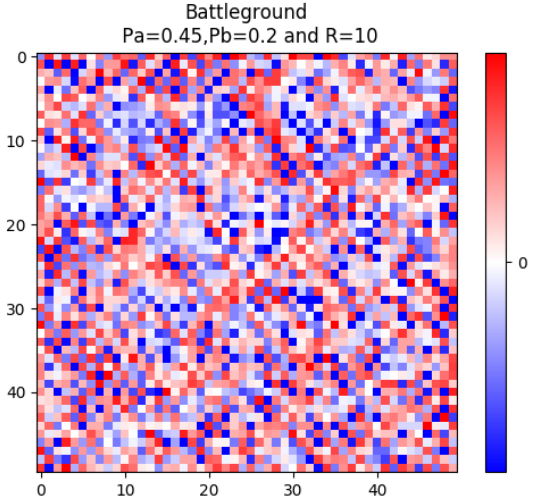
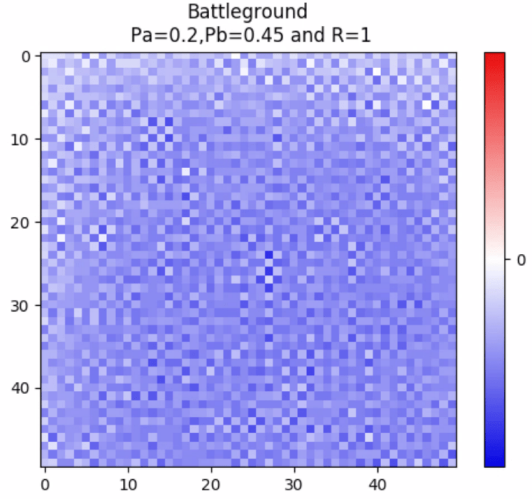
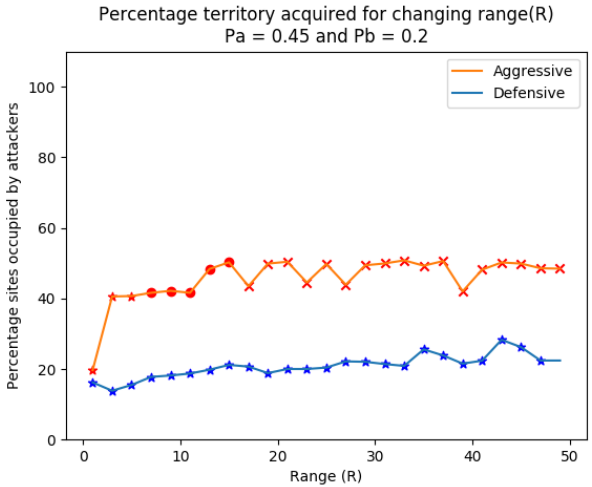
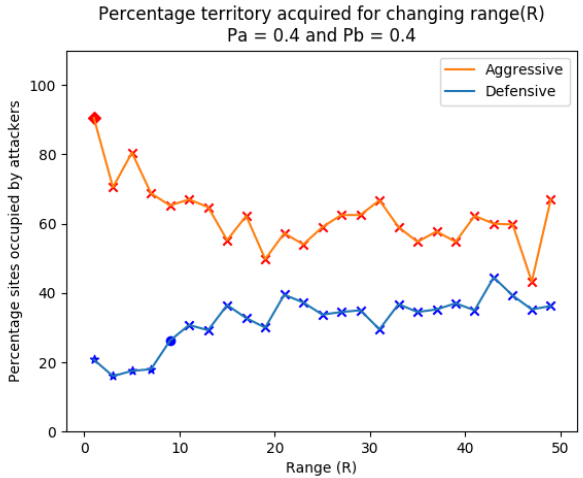
0
10
20
30
40
0

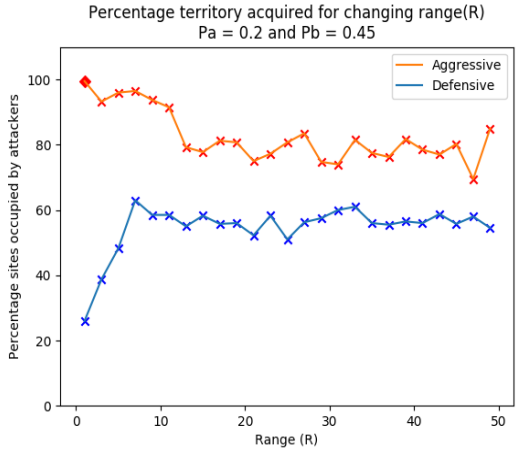

Battleground
Pa=0.45,Pb=0.2 and R=10
0
10
20
30
40
0
10
20
30
40
0


Battleground
Pa=0.2,Pb=0.45 and R=1
0
10
20
30
40
0
10
20
30
40
0

Results







Symbol Meanings :

1. ◆ - Thanos army have eradicated avengers, Thanos wins
2. × - Thanos army run out of resources, Avengers win
3. ● - Both army run out of resources, Match draws
4. ★ - Avengers army run out of resources, Thanos win.