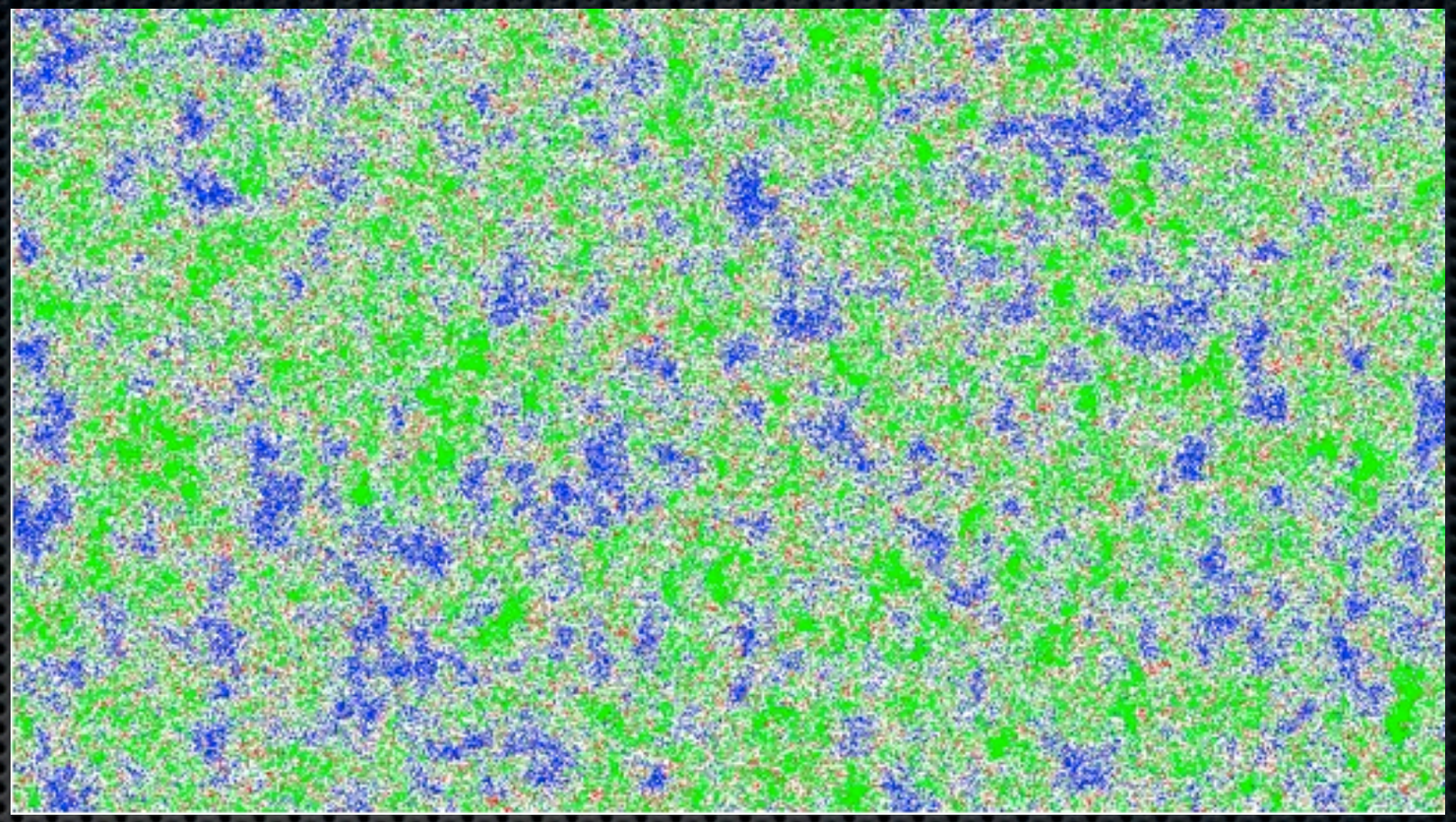
The Predators‘ Guide

A parallelized prey-predator-simulation

Structure

- Game concept
- Birth
- Death mechanics
- Animal behaviour
- World composition
- Implementation
- Parallelization
- Speedup

Game concept



- 2-dimensional world
- plants, herbivore and carnivore
- carnivore look for herbivore and eat them
- herbivore look for plants and eat them

Birth

- Plants spawn randomly
- Animals bear children, independent from any other animals nearby
- Herbivore bear a child every two rounds (50% rate)
- Carnivore bear a child every five rounds (20% rate)

Death mechanics

- Old age
- natural death rate (e.g. accidents)
- Animals lose two energy points each round
- Fights decrease the energy level even further
- An energy level of zero means death
- Eating a plant or herbivore restores the energy level to the maximum value ten

Animal behaviour

- Animals look for food in the adjacent fields
- If they find food, they will move towards it
- If a carnivore encounters a herbivore, they will fight
- Their strength equals their energy level (+5 bonus for predators)
- Strong herbivores can defeat weak carnivores
- The other animals will move randomly

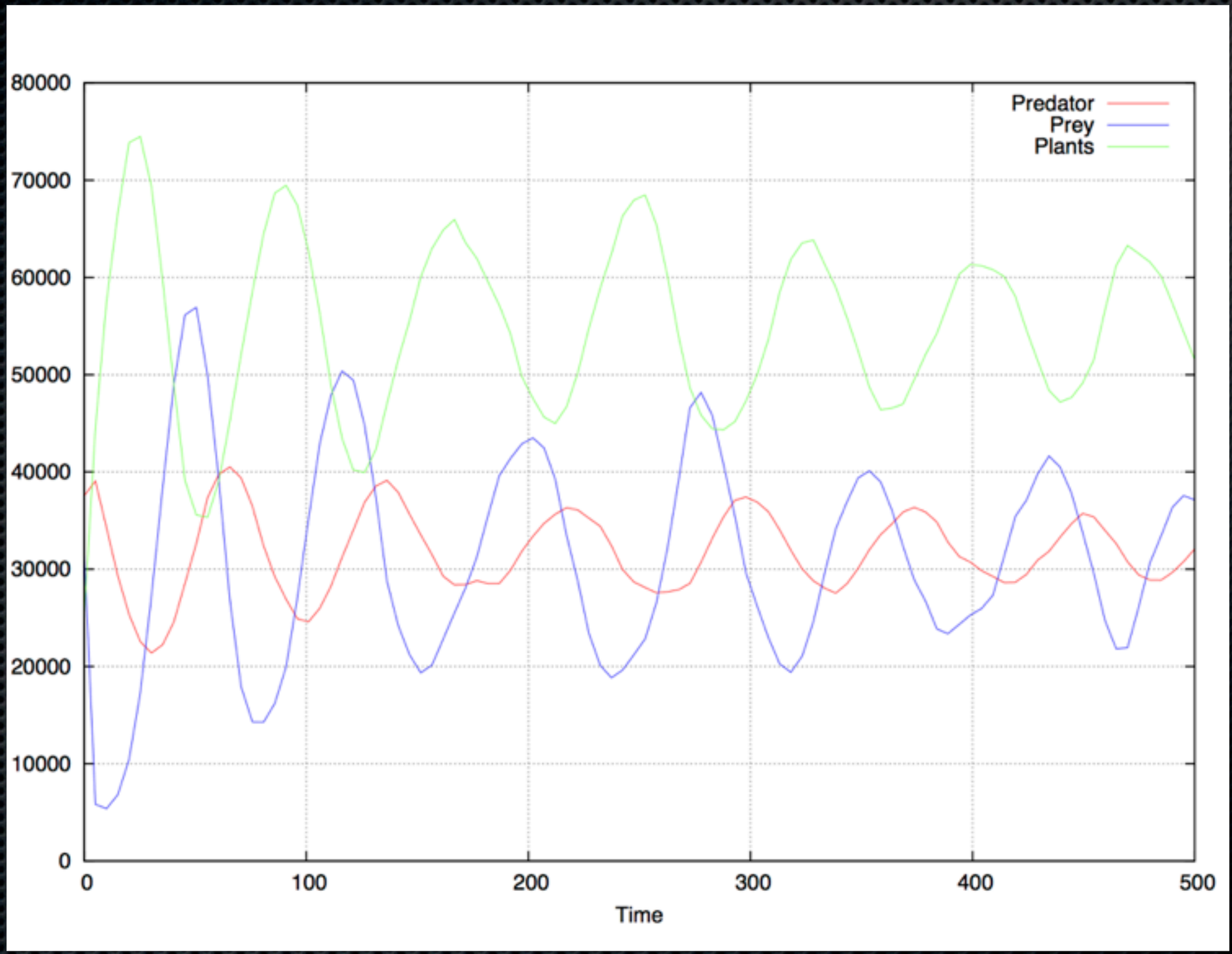
World composition

- Rectangular world, divided into segments of the same size
- Each segment contains square fields
- On a field there can be either a herbivore or a canivore

- Additionally, there can grow a plant
- The size and number of segments is determined by the number of processors available

UP_LEFT	UP	UP_RIGHT
LEFT	processor‘s segment	RIGHT
DOWN_LEFT	DOWN	DOWN_RIGHT

Results

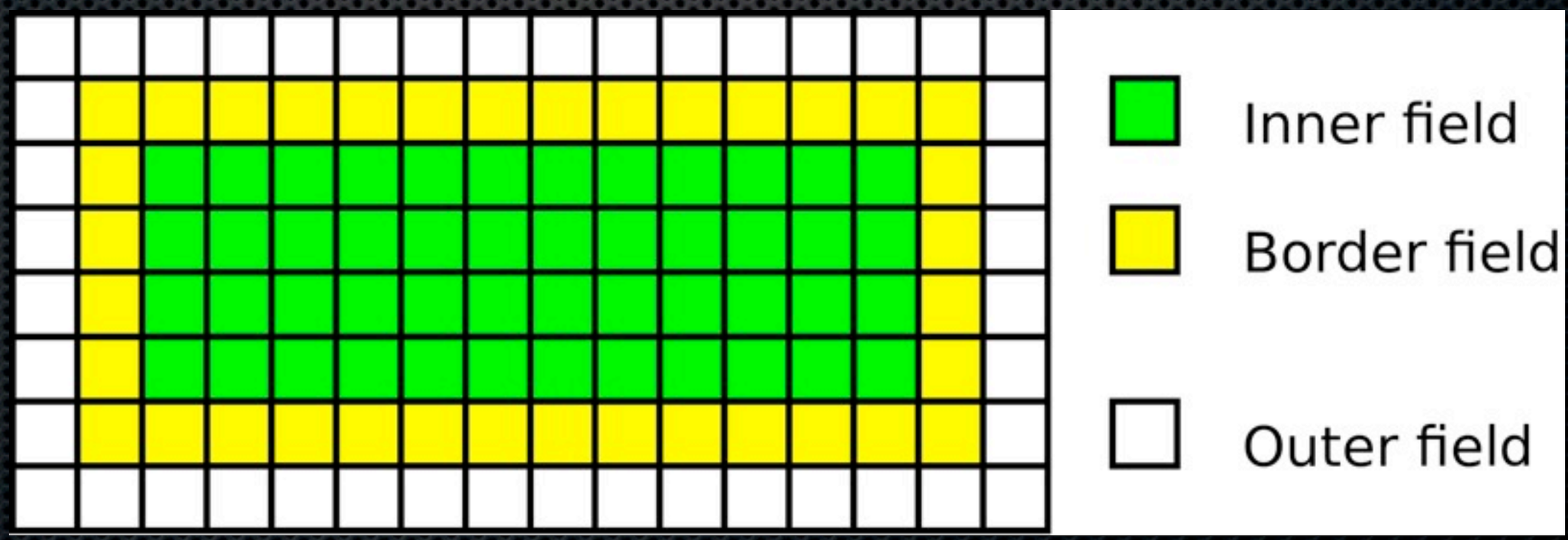

80000
70000
60000
50000
40000
30000
20000
10000
0
0
100
200
300
400
500
Time
Predator
Prey
Plants

Implementation

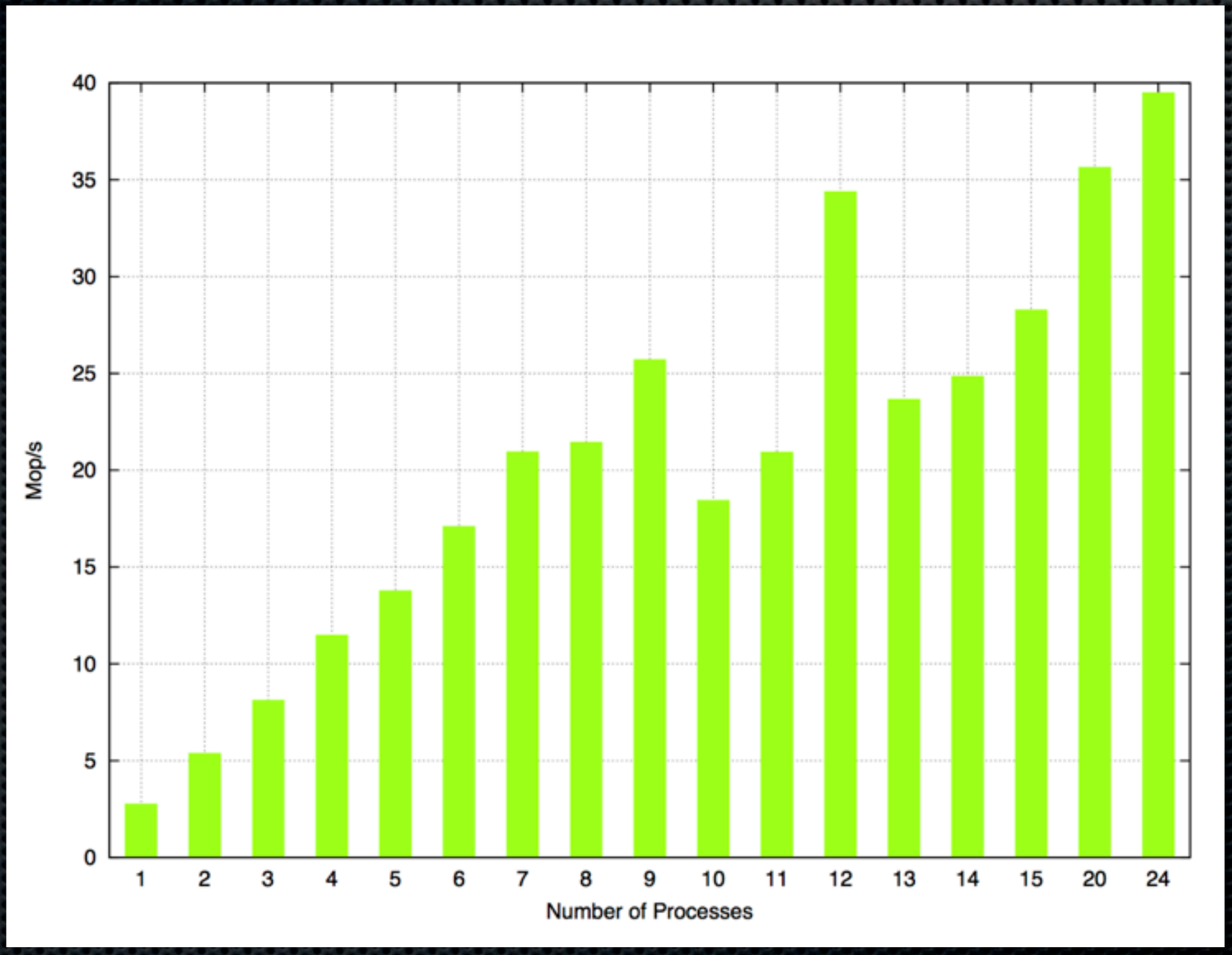
- fields store the main part of the information: coordinates, populations and plants residing on it and their age and energy level
- fully-customizable configuration

Parallelization

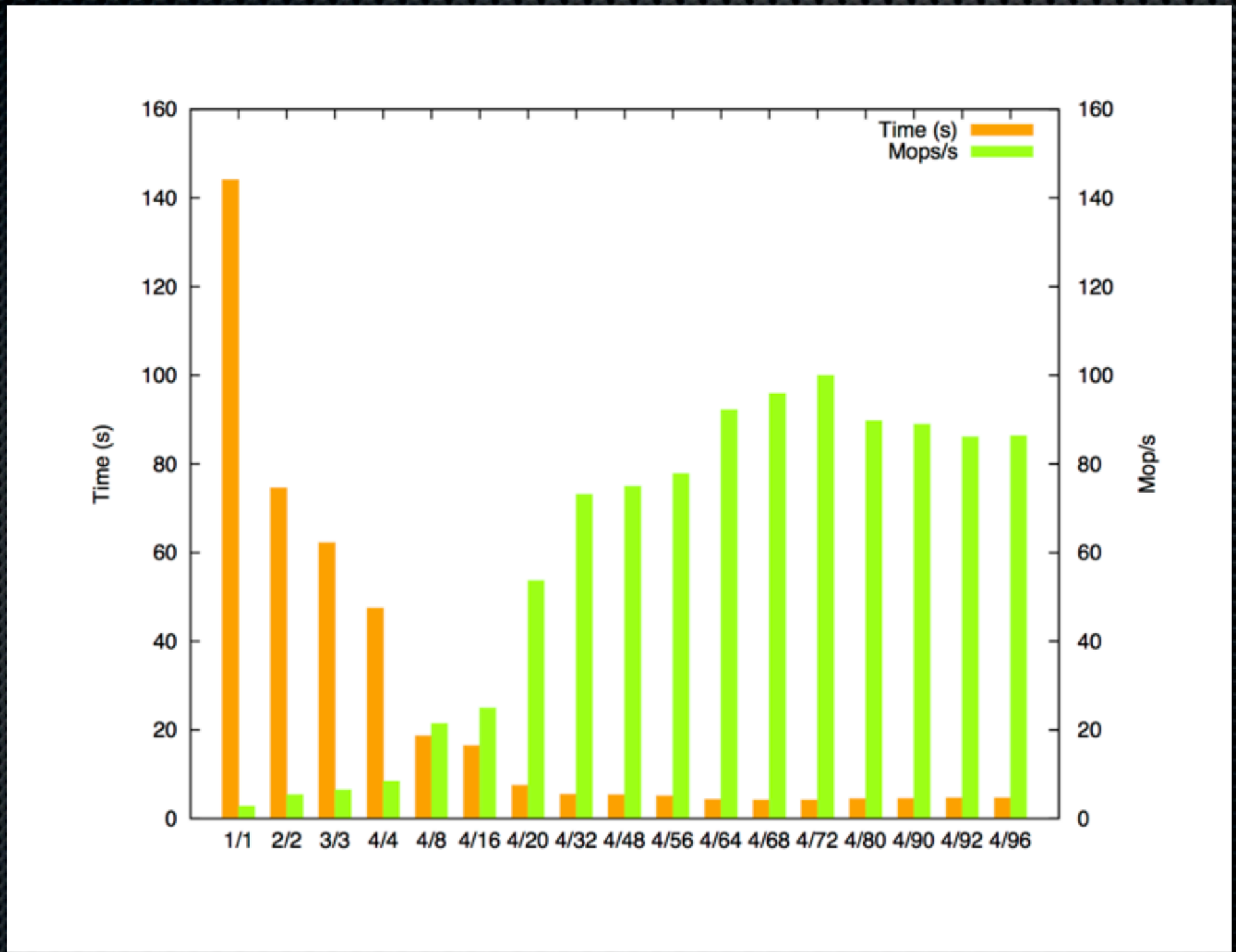
- segmentation on startup by prime factorization
- a processor stores all of its segments fields as well as all directly adjacent fields, so-called border fields
- when a border or outer field changes, the appropriate processores are notified



Speedup with 1 node



Speedup with 4 nodes



Thank you for your attention.