

Performance Measure: Concurrent Genetic Algorithm with Island Migration

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Overview

- Set-up
- Experiments
- Conclusion

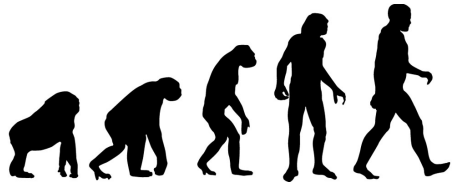
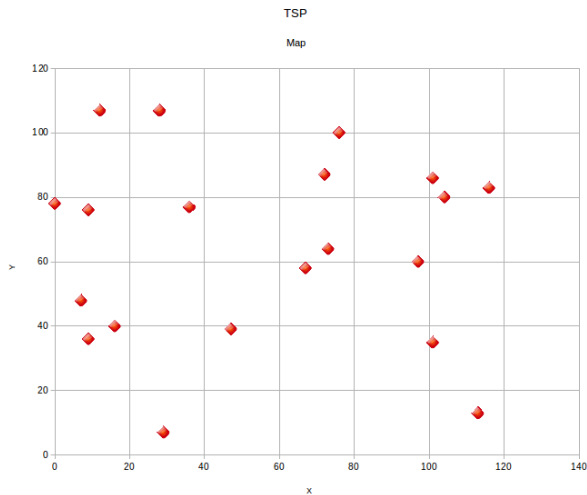


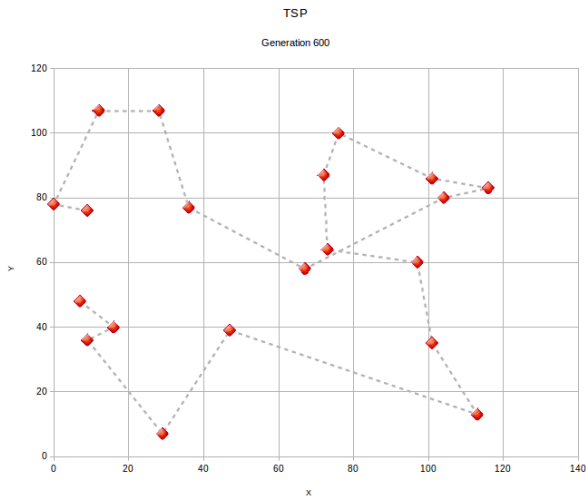
Figure :Evolution || *i.livescience.com* (Oct. 5. 15)

Recapitulation

Recapitulation



Recapitulation

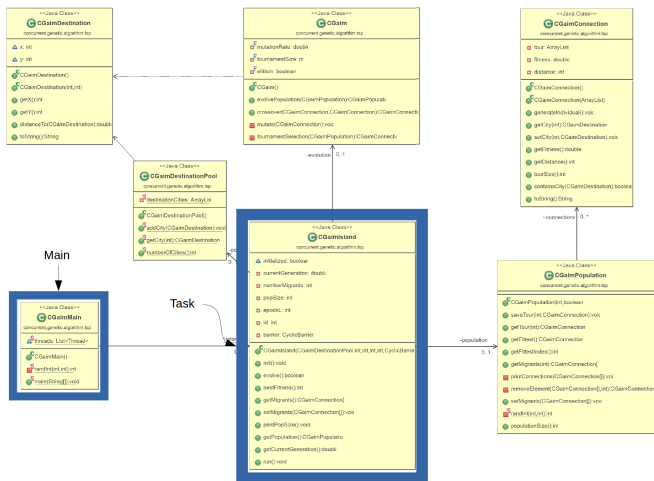


Set-up

- ▶ Intel's Manycore Testing Lab (MTL)
- ▶ Each node: 40 × Intel(R) Xeon(R) CPU E7- 4860 CPU
 - ▶ 2.27GHz normal clock
 - ▶ 1.06GHz under clocking
- ▶ Red Hat 4.1.2-55 (Linux-Kernel 2.6.18-406)
- ▶ Oracle's Java Runtime Environment 1.7.0 (64 Bit)
- ▶ server mode, 1GB Heap
- ▶ Each Experiment: 12 runs, average over last 10

Set-up

Main: *CGainMain* — Task: *CGainIsland*



Definition: Throughput

The quantity of raw material or information processed or communicated in a given period, esp. by a computer.¹

- ▶ *raw material*
 - ▶ Amount of processed Individuals
- ▶ *given period*
 - ▶ One second (hertz rate)

¹www.dictionary.com

Definition: Response Time

The time that elapses while waiting for a computer to respond to a command.²

- ▶ *computer*
 - ▶ Genetic Algorithm
- ▶ *command*
 - ▶ Optimize the path
 - Quality reach a certain fitness threshold
 - Quantity reach a certain amount of generations

²www.dictionary.com

Experiments

Experiments

All Experiments executed with 1, 9, 36, 72, 100 and 140 Threads

1. Number of Islands

- ▶ 500 Individuals
- ▶ 1000 Individuals
- ▶ **2000 Individuals**

2. Search Space

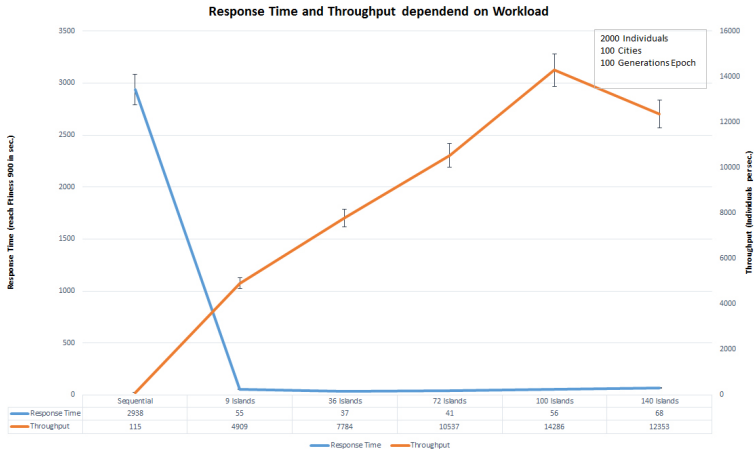
- ▶ 100 Cities
- ▶ **200 Cities**
- ▶ 500 Cities

3. Migration Rate

- ▶ 0.5% Migration
- ▶ 1.0% Migration
- ▶ ...
- ▶ 8.0% Migration

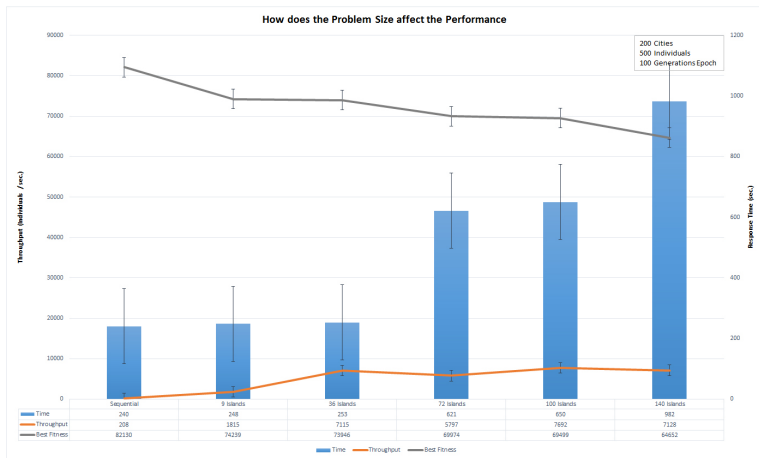
Number of Islands

How does the system scale? Response Time: Quality



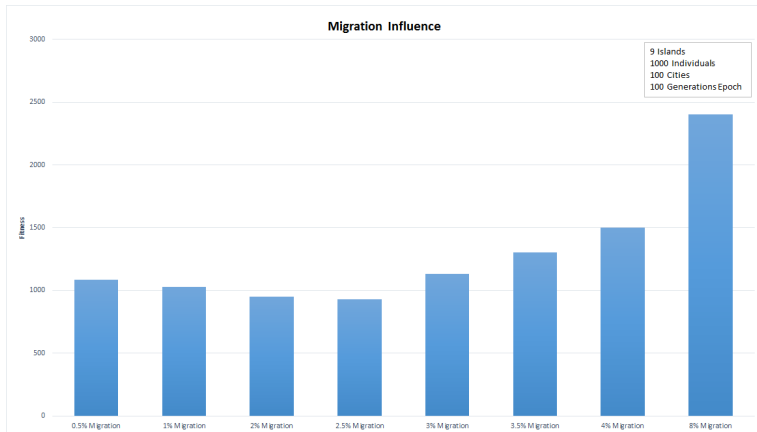
Search Space

Influence of the search space? Response Time: Quantity



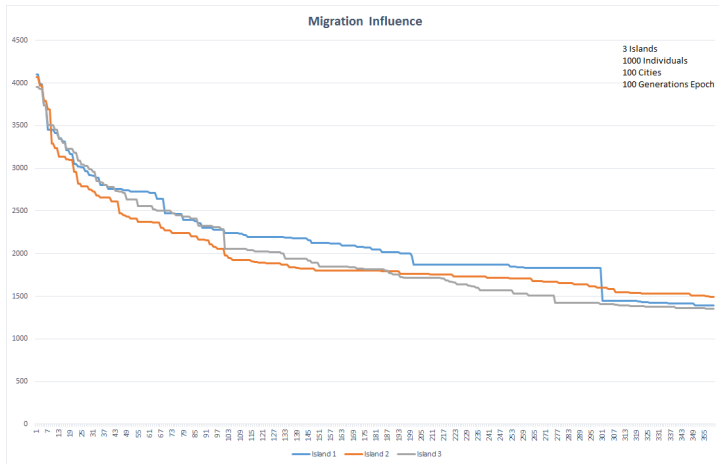
Migration Rate

Influence of the migration rate



Migration Rate

Influence of the migration rate



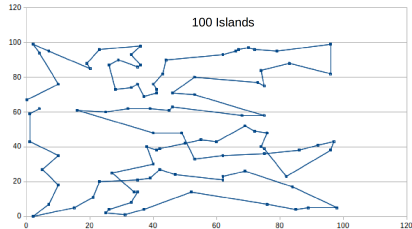
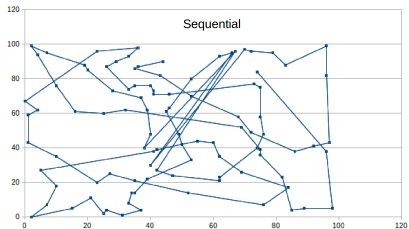
Conclusion

Conclusion

- ▶ **Island Migration extension has benefits**
 - ▶ Huge search spaces and up to number of available cores
 - ▶ Throughput
 - ▶ Response Time: Quality
 - ▶ Response Time: Quantity — it depends
- ▶ **Island Migration extension has drawbacks**
 - ▶ Smaller search spaces and beyond number of available cores
 - ▶ Response Time: Quantity — it depends
 - ▶ Sequential overhead of migration phase
- ▶ To be investigated
 - ▶ Other parameters (Crossover rate, Epoch length, ...)
 - ▶ Parameter were taken from initial paper and stayed untouched

Conclusion

To be left up to the reader:



Type	Sequential	Island Migration
# Threads	1	100
Cities	100	100
Individuals	1,000	1,000 (100,000 total)
Time (sec.)	190	101
Fitness	1050	897
Generations	1,000	4