

ENVIRONMENTAL ADAPTION

Using Genetic Algorithms



I D E A



Desert



Grasslands



Bushlands



Coniferous Forest



Tropical Rainforest



Tundra

- An individual is able to explore different bioms.
- Every biom should have an impact to the individual.
- The individual may learn to adapt to the given biom in time.

INDIVIDUAL DESCRIPTION

- An individual can be represented in relation to the medium as:

A series of genes for each environment aspect that describe his optimal environment

- Defining the environment aspects as (Temperature, Humidity, AtmPressure), we can view a individual as ([Temperature_Min, Temperature_Max], [Humidity_Min, Humidity_Max], [AtmPressure_Min, AtmPressure_Max])

ADAPTATION

- The goal is to fit every playstyle. Therefore a more exploring playstyle should result in a more large ranges for the individuals optimal environment.
- For a given mutation rate, the individual will change its range values in respect to the environment he is currently located in.
- This process is achieved by generating a population of new individuals (each individual representing a gene) and choosing the best / a mutation of the best.

MUTATION

- At a given time a gene will be mutate
in raport to its maximum range
with a value of 10% of the the max range

CROSS OVER

- Because of the nature of the problem, the mask 01010101 is preferred to 00001111

SELECTION

- No important difference occurred due to the selection method

FITNESS

- To observe what the fitness value of a individual is in a certain biom it is important to take into account for every gene type:
 - The inclusion of the environment aspect in the optimal range
 - The difference between the two optimal range ends and the environment aspect value
 - The difference between the two optimal range ends
- In this manner the Selection based on this fitness function will mostly prefer the genes that include the environment aspect value, and will tend to widen the optimal range in order to fit this value. When the value is included, the range will narrow, converging towards the environment value.

REMARKS

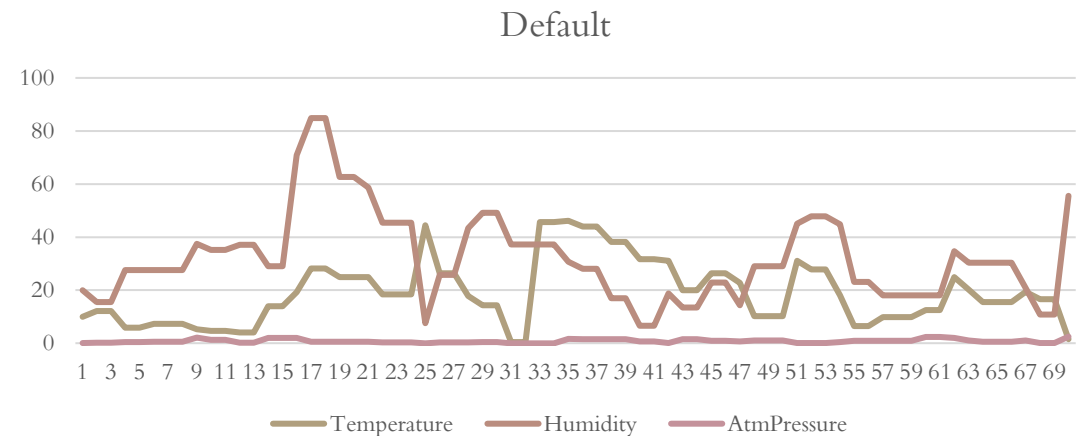
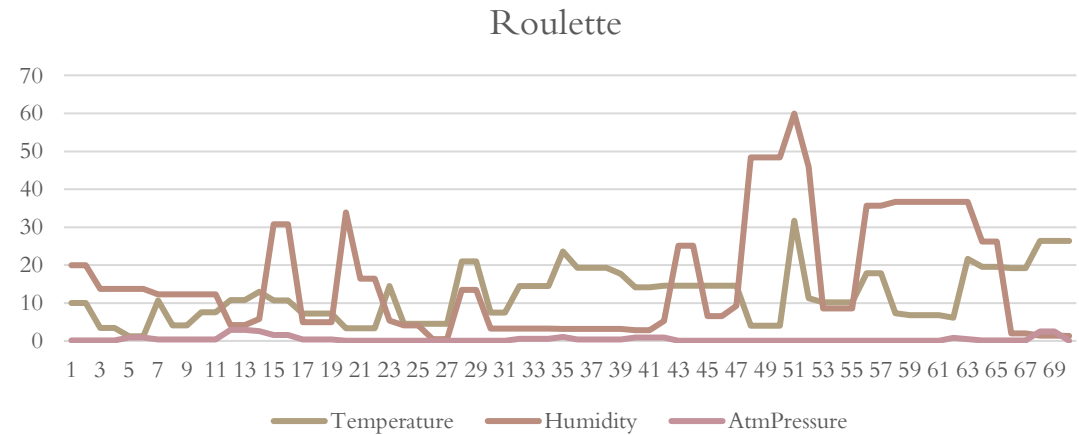
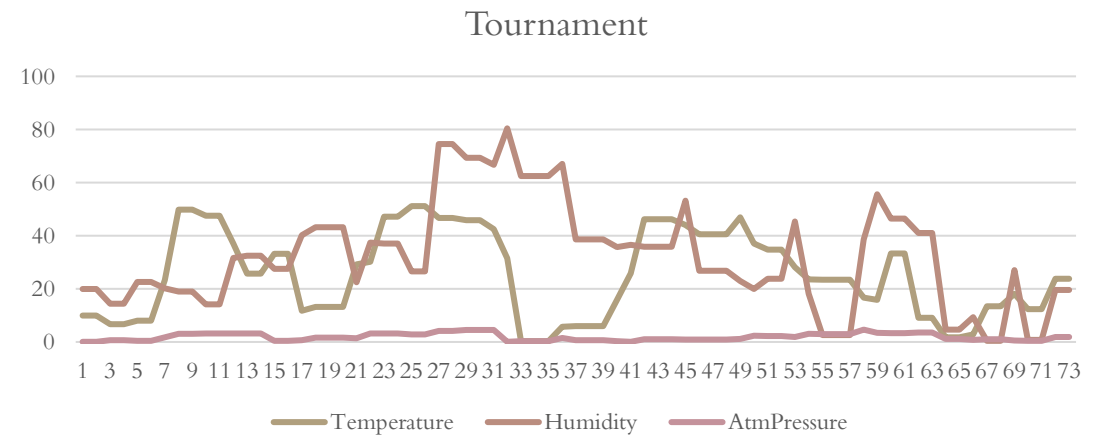
- This mutation system considers the equipment of the player. Considering its buffs.
- The health is affected in relation to the difference of the optimal environment range of each gene. It is not taken into account during evaluation because, in a real scenario, the player will take measures if his life is in peril due to environmental adaptation.

RESULTS

- Testing setup: 4 bioms
 - Mountains (Temp 0, Hum 50, Atm 3); Desert (Temp 40, Hum 20, Atm 1)
 - Forrest (Temp 28, Hum 80, Atm 1); Neutoral (Temp 28, Hum 50, Atm 1)
- The used metric is the difference of the optimal environment range's ends
- All ranges converge to the environment's aspect value
 - => when the metric value is 0, the optimal range has both ends equal to the env. value
 - ★ The default selection method is a tournament selection with $Tour = n / 2$

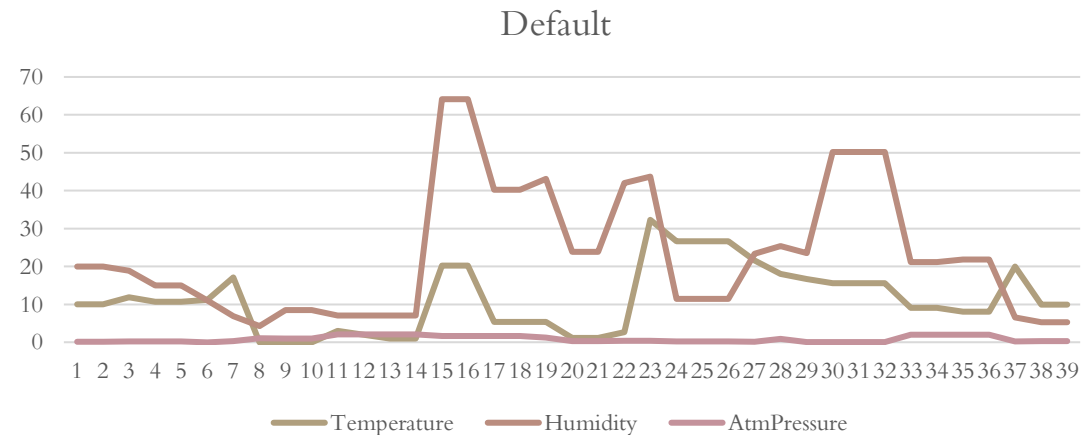
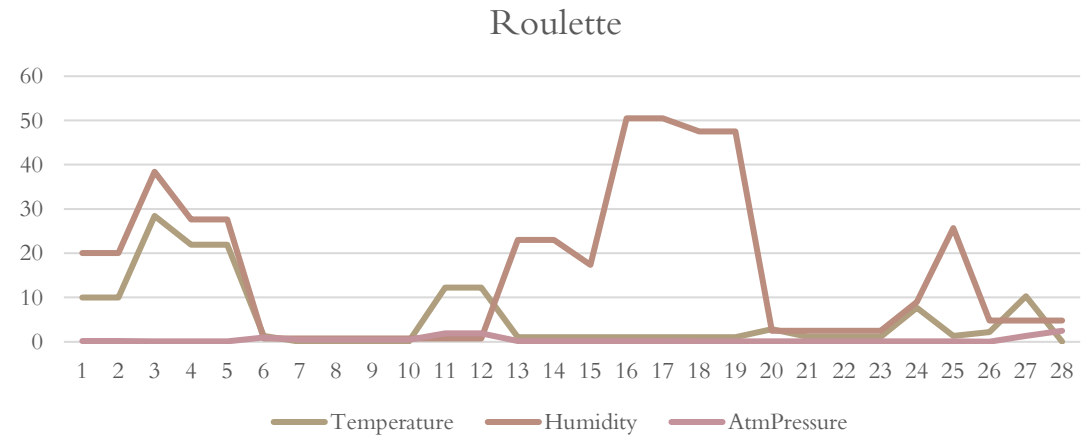
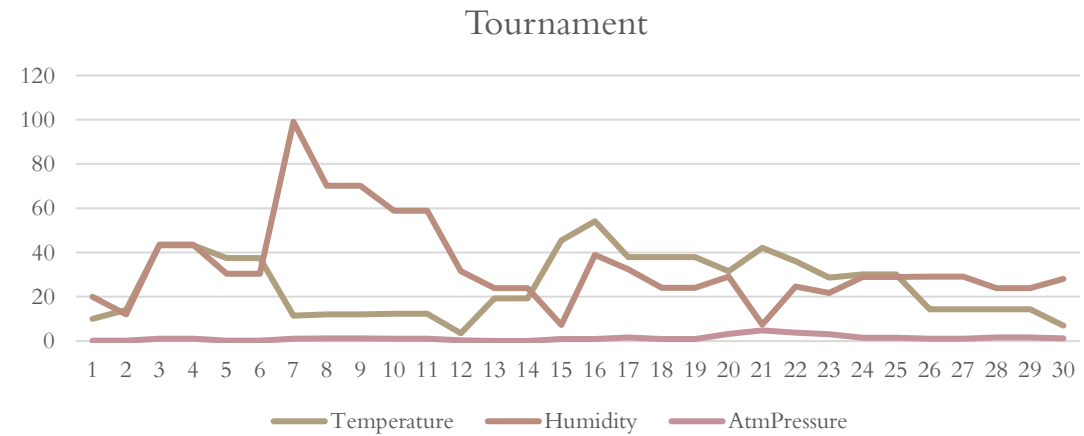
EVALUATION

- Population size of 8
- Cross-over mask 110000011
- Selected population size 2
- Mutations per environment 2
- There are local minimums due to similarities in the adjacent bioms



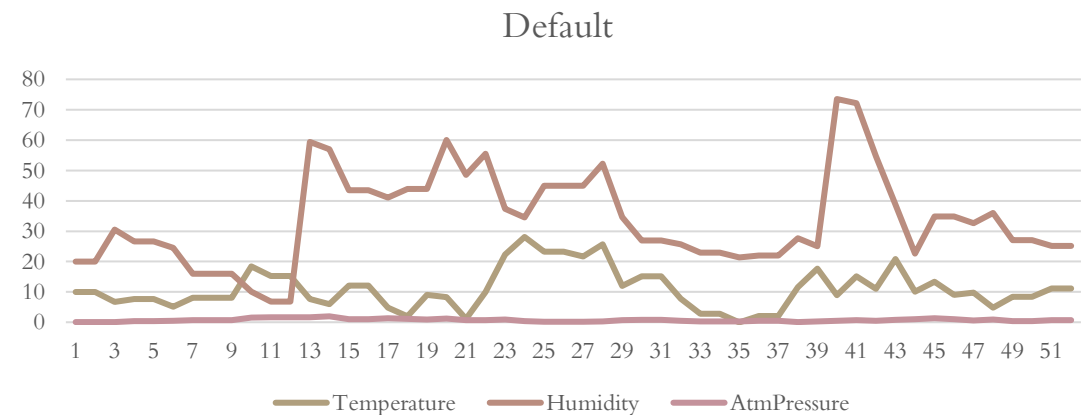
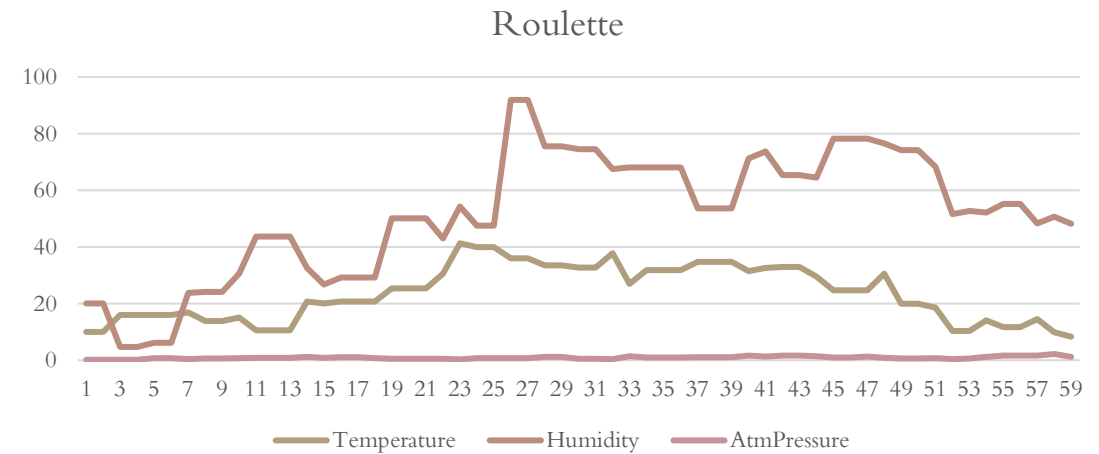
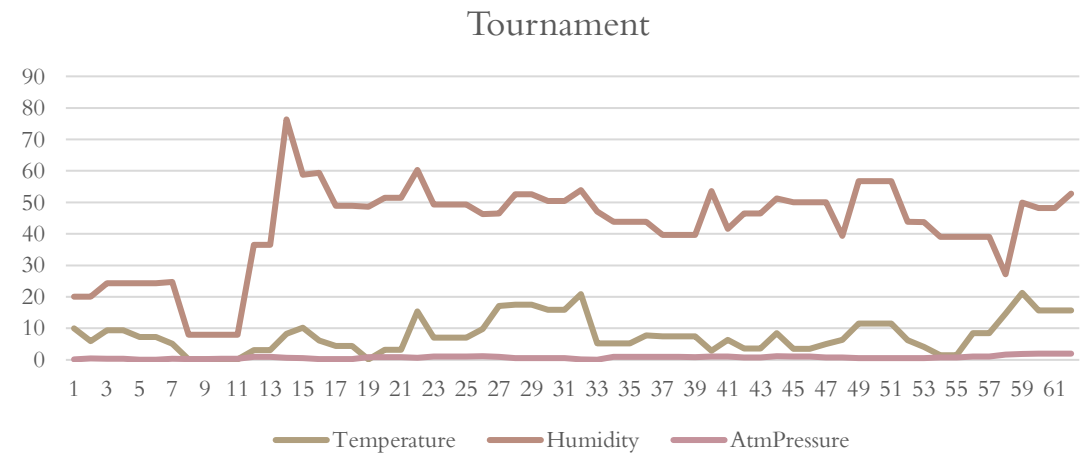
EVALUATION

- Population size of 8
- Cross-over mask 110000011
- Selected population size 2
- Mutations per environment 20
- The high values are meaning the mutation is widening the range in order to include the env value



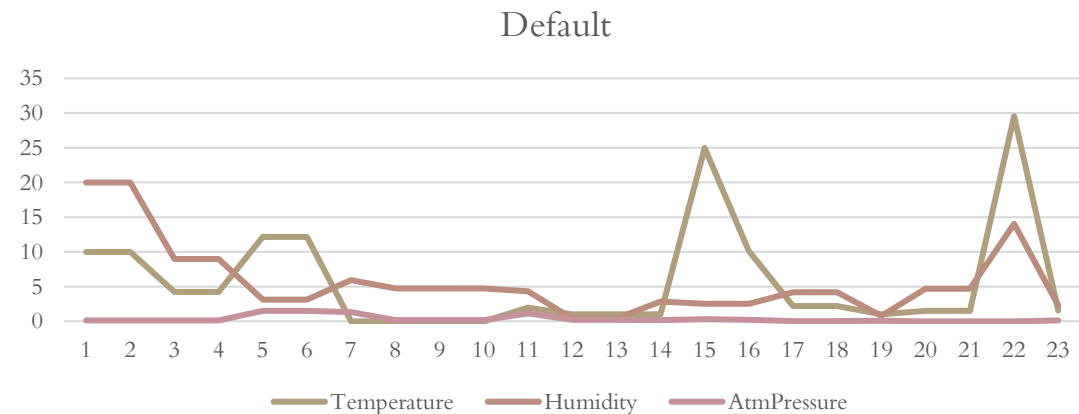
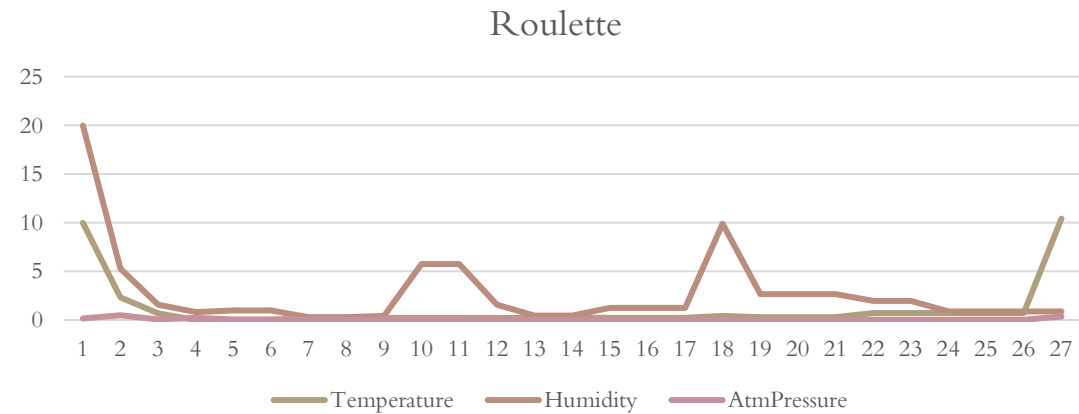
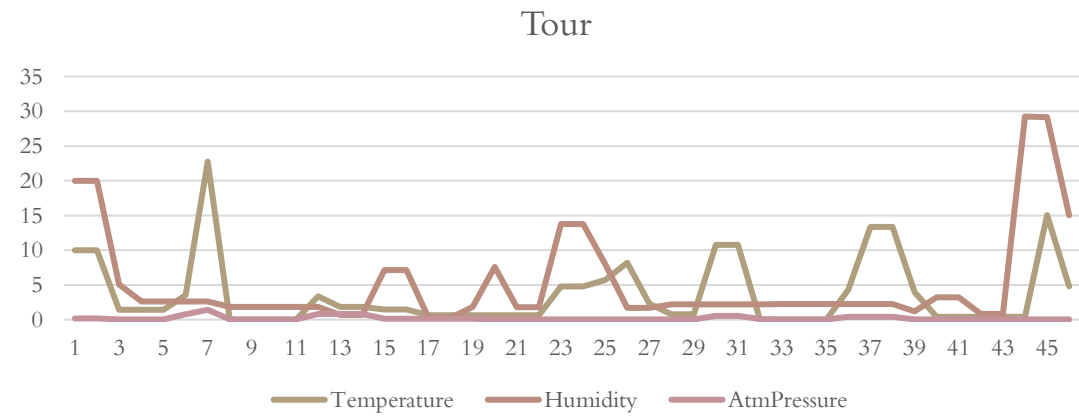
EVALUATION

- Population size of 8
- Cross-over mask 10101010
- Selected population size 4
- Mutations per environment 2
- Less local minimums



EVALUATION

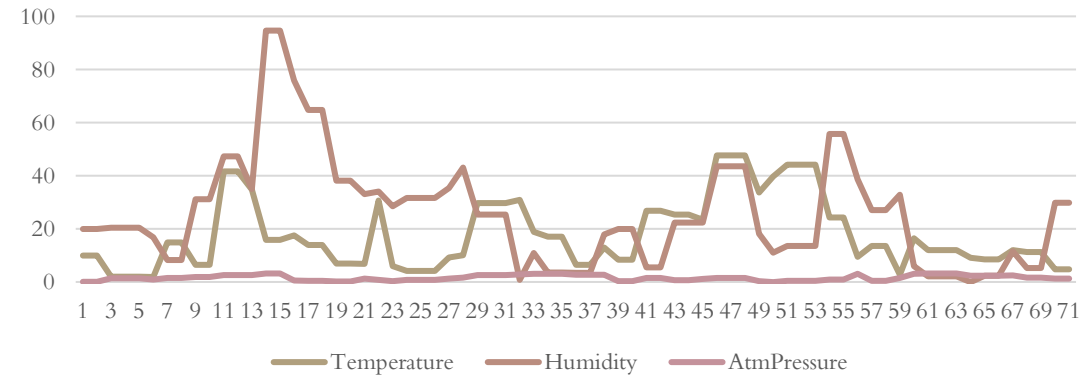
- Population size of 8
- Cross-over mask 10101010
- Selected population size 4
- Mutations per environment 2
- Very few peak points



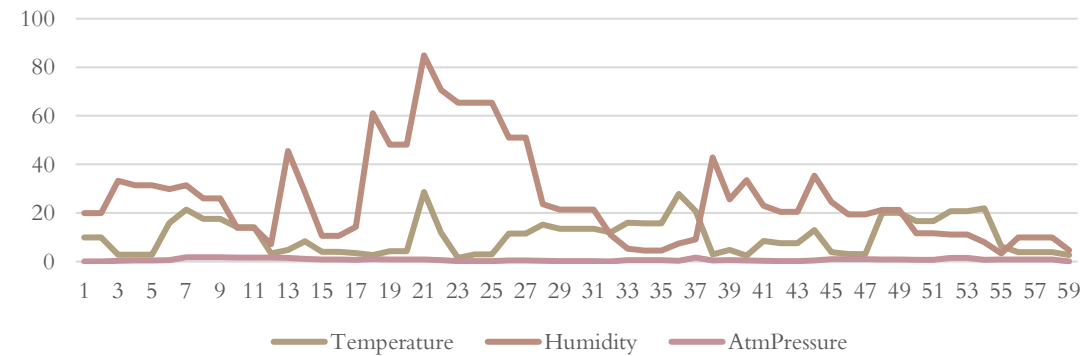
EVALUATION

- Population size of 32
 - Cross-over mask 10101010
 - Selected population size 4
 - Mutations per environment 2
- Converges to a narrow range
due to the generated population size
which gives the probability of a more
fitted gene to be mutated

Tournament



Roulette



Default

