ANALISIS, DISEÑO Y CONSTRUCCION DE UNA COLECCION DE COMPONENTES DE SOFTWARE PARA ALGORITMOS GENETICOS

Grupo de Investigación en Arquitecturas de Software - ARQUISOFT

Grupo de Investigación Laboratorio De Automática e Inteligencia Computacional – LAMIC

UNIVERSIDAD DISTRITAL "FRANCISCO JOSÉ DE CALDAS"
FACULTAD - INGENIERIA DE SISTEMAS

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[Self elaboration]

GOLDEMBERRY 2.0

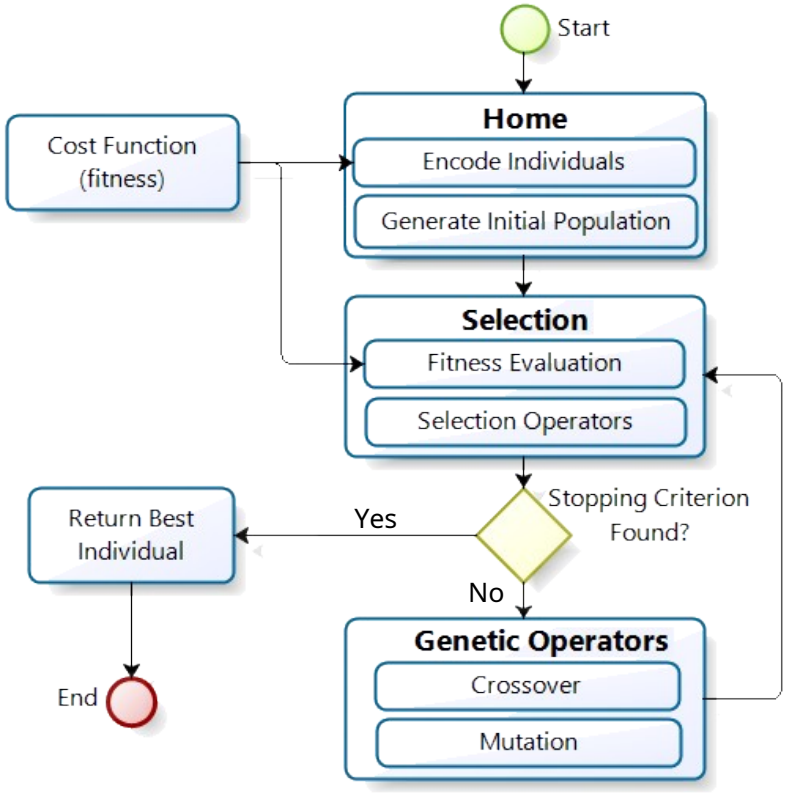
[Taken from [8]]

GOLDEMBERRY 1.0

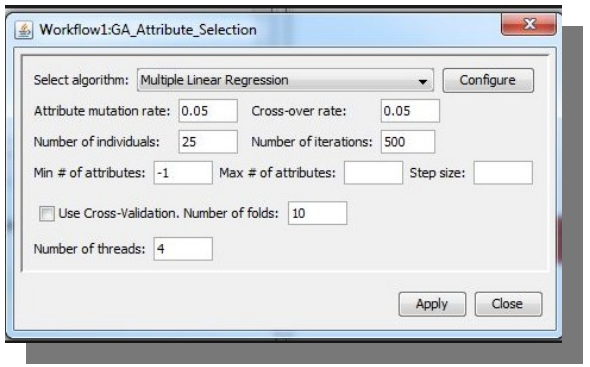
Agenda

- Introduction.
- Goals.
- Goldenberry 2.0.
- Software components.
- Methodology.
- Results.
- Conclusions.
- Future work.
- Questions.

Introduction - GA



Genetic Algorithms Flowchart [1,3]



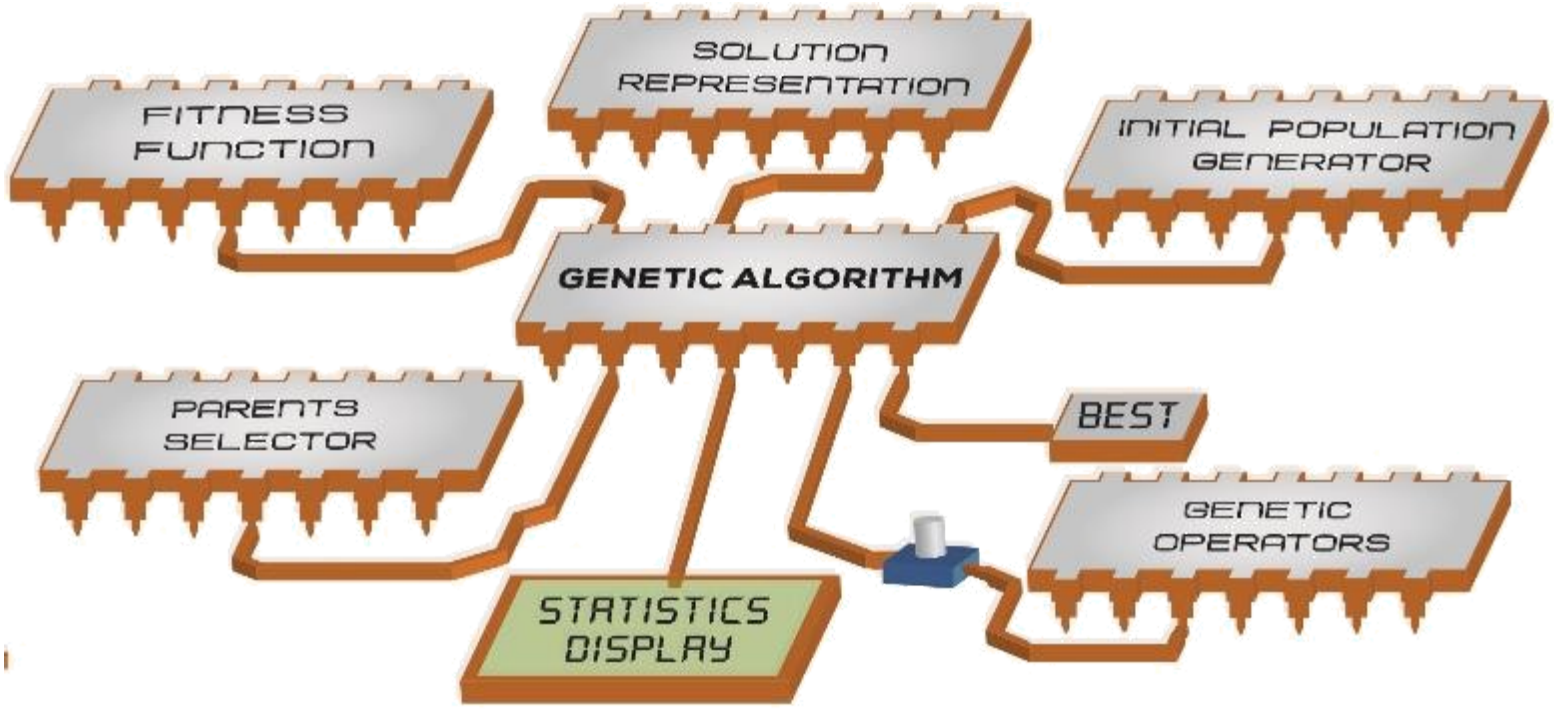

```
package examples;

import org.jgap.Chromosome;
import org.jgap.FitnessFunction;
```

```
virtual GaChromosomePtr operator ()(
    const GaChromosome* parent1,
    const GaChromosome* parent2) const;
```

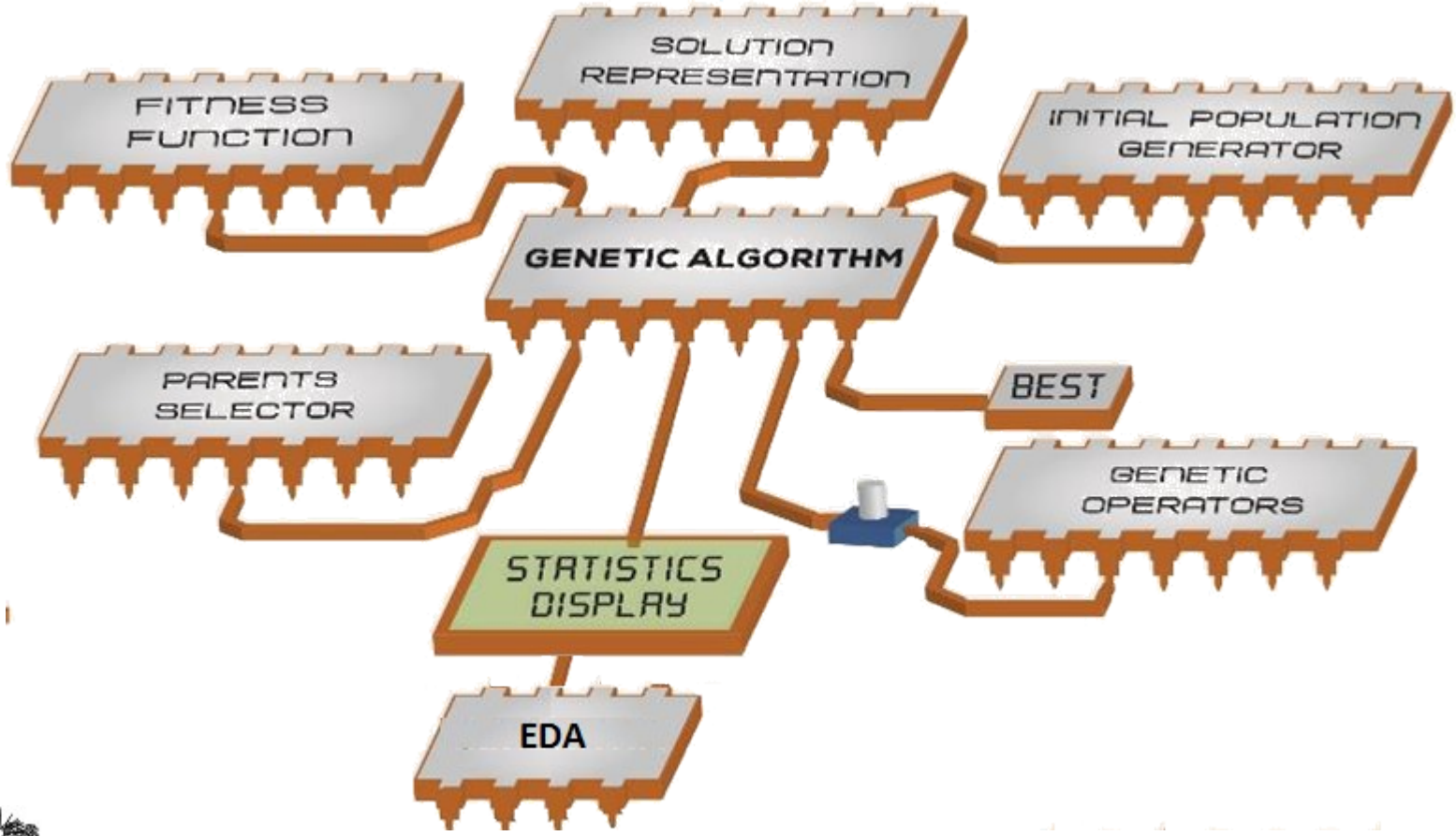
Taken from [9,11]

Introduction - GA



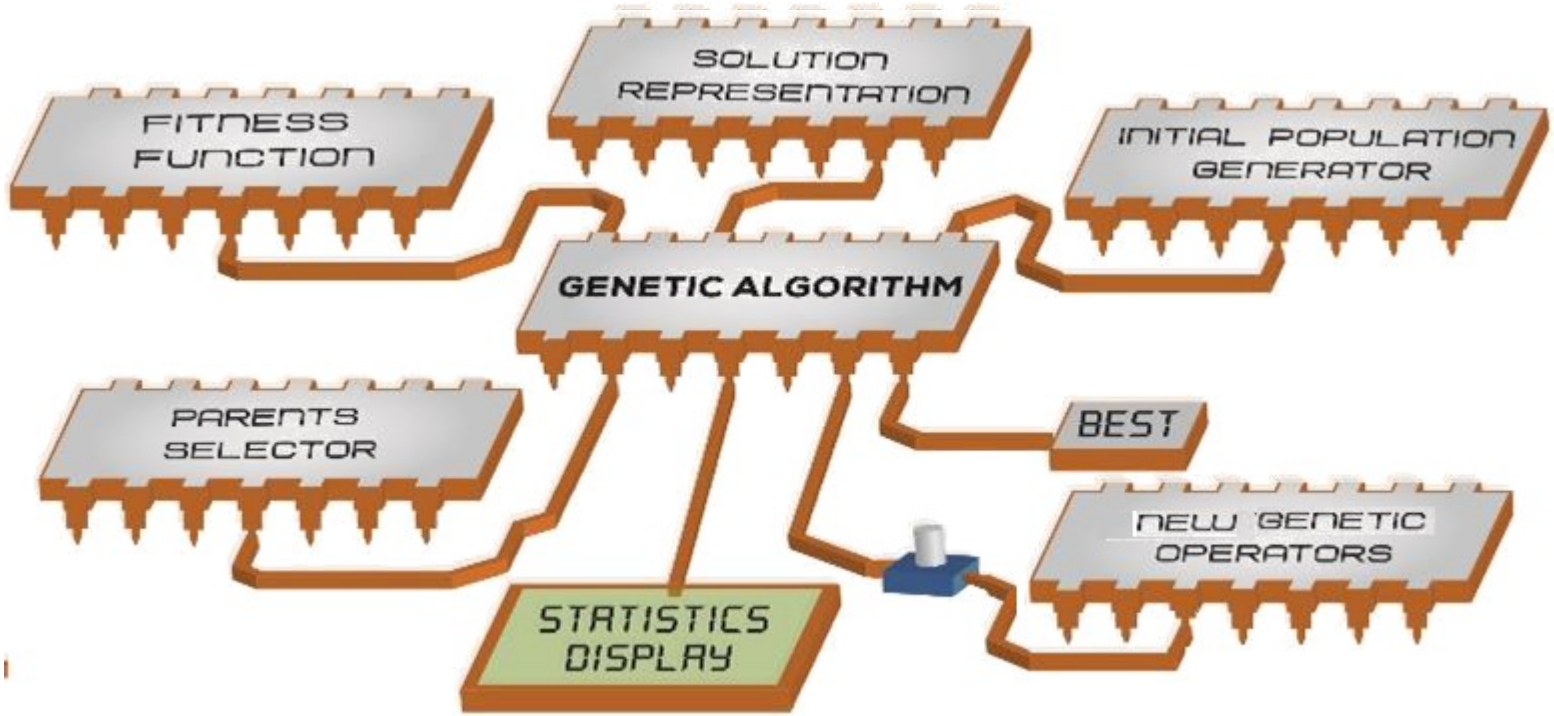
[Self elaboration]

Introduction - GA



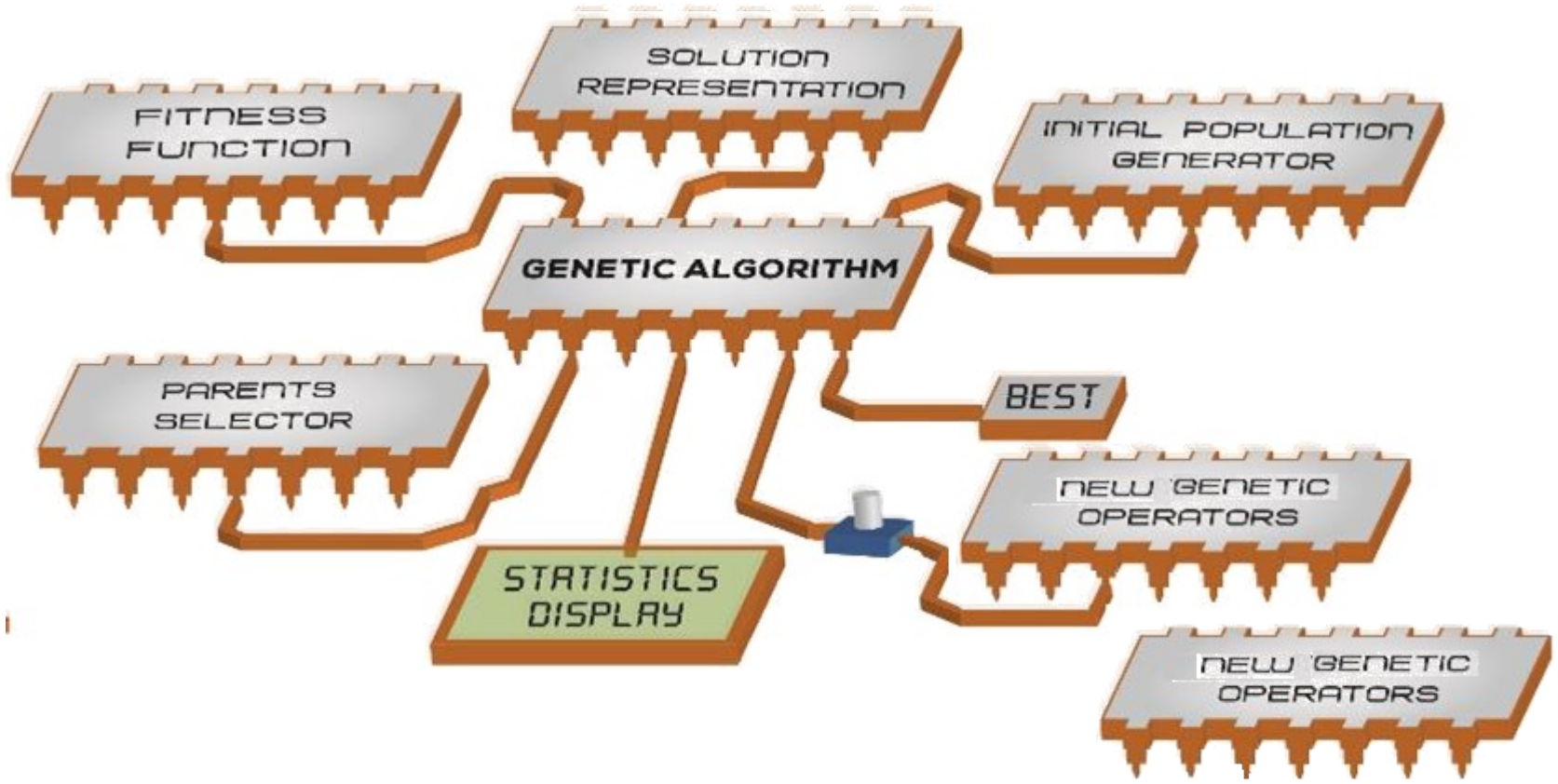
[Self elaboration]

Introduction - GA



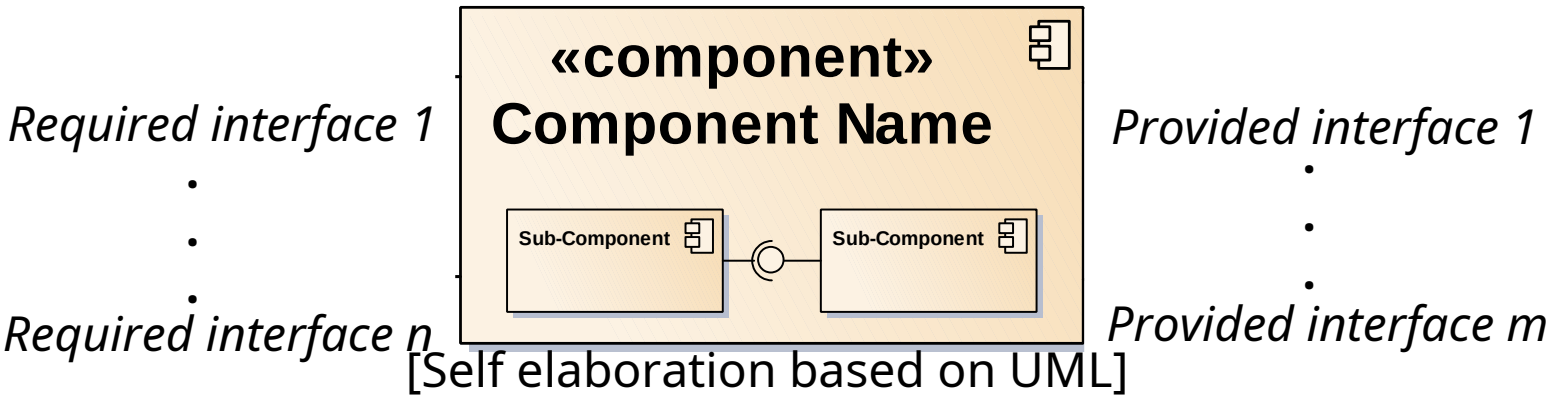
[Self elaboration]

Introduction - GA

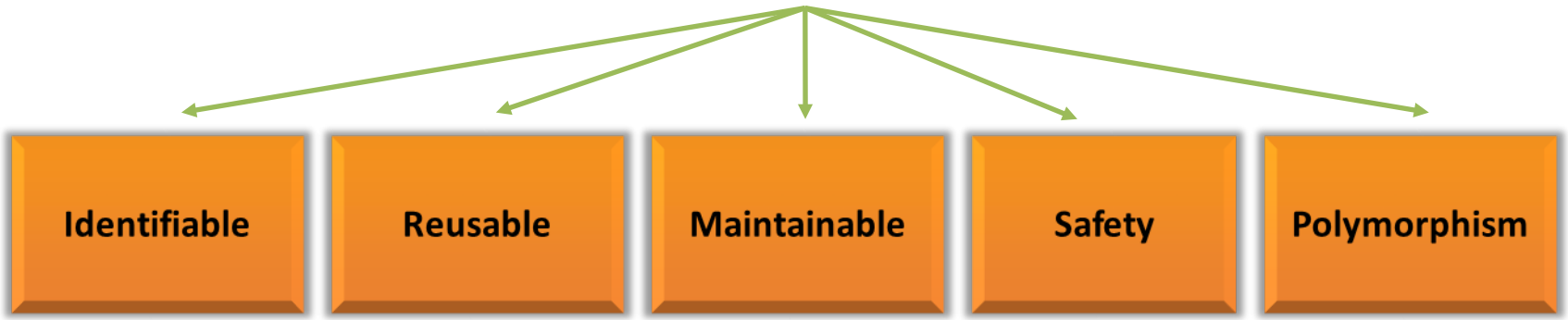


[Self elaboration]

Introduction - Software components



[Self elaboration based on UML]



Characteristics taken from [4,5]

General goal

Analysis, design and construction of a software components collection for genetic algorithms and make its implementation in an open source platform for visual programming .

Specific goals

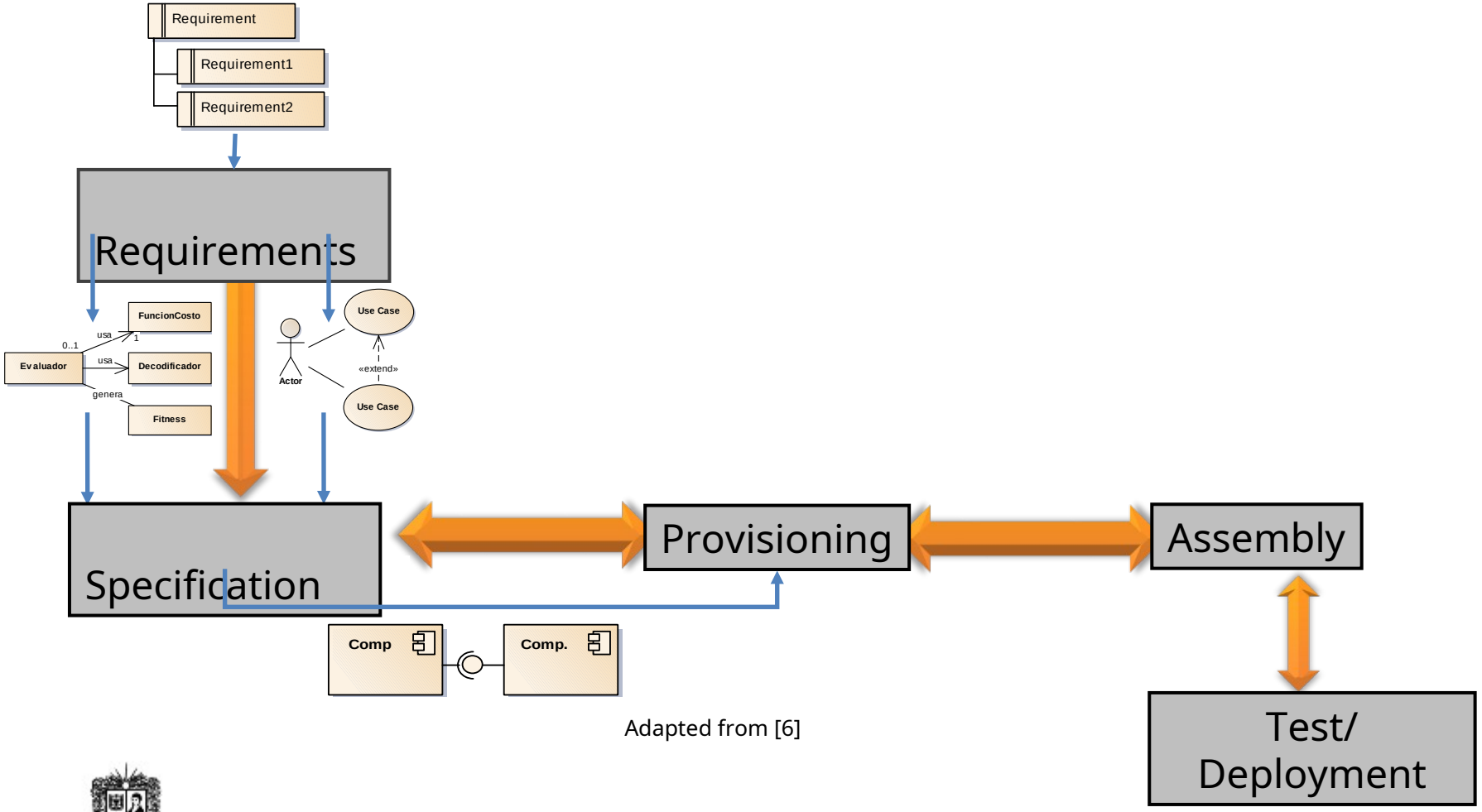
Establish	• The necessary components to build a genetic algorithm.
Analyse	• A open source framework to build the components stablished. • The functionalities that each component should offer.
Design	• The component-based software architecture, including the internal design for each component.
Implement	• The component-based software architecture proposed. • A Black box tester and calibrator component.
Distribute	• The components as add-ons from Orange, available to be downloaded from the ARQUISOFT web site (also available from the Goldenberry 1.0 web site).

Goldenberry

Acá va la demostración que consta de los siguientes pasos:

1.Ambientar sobre el canvas de orange, aclarando donde van los widgets, como están agrupados, como desplegarlos, alambrarlos, mostrando que tienen interfaces.
2.Aclarar que Orange no contaba con optimizadores y ambientar sobre GB1.
3.Mostrar los componentes de GB2 e ir uno a uno mostrando lo que se implemento, tipos de funciones de costo, mutadores, selectores, recombinadores.
4. Experimento con una función de costo de dominio binario y una continua No se si debo incluir una diapositiva con los resultados o simplemente hacer el ejercicio y nombrar los artículos usados en la experimentación.

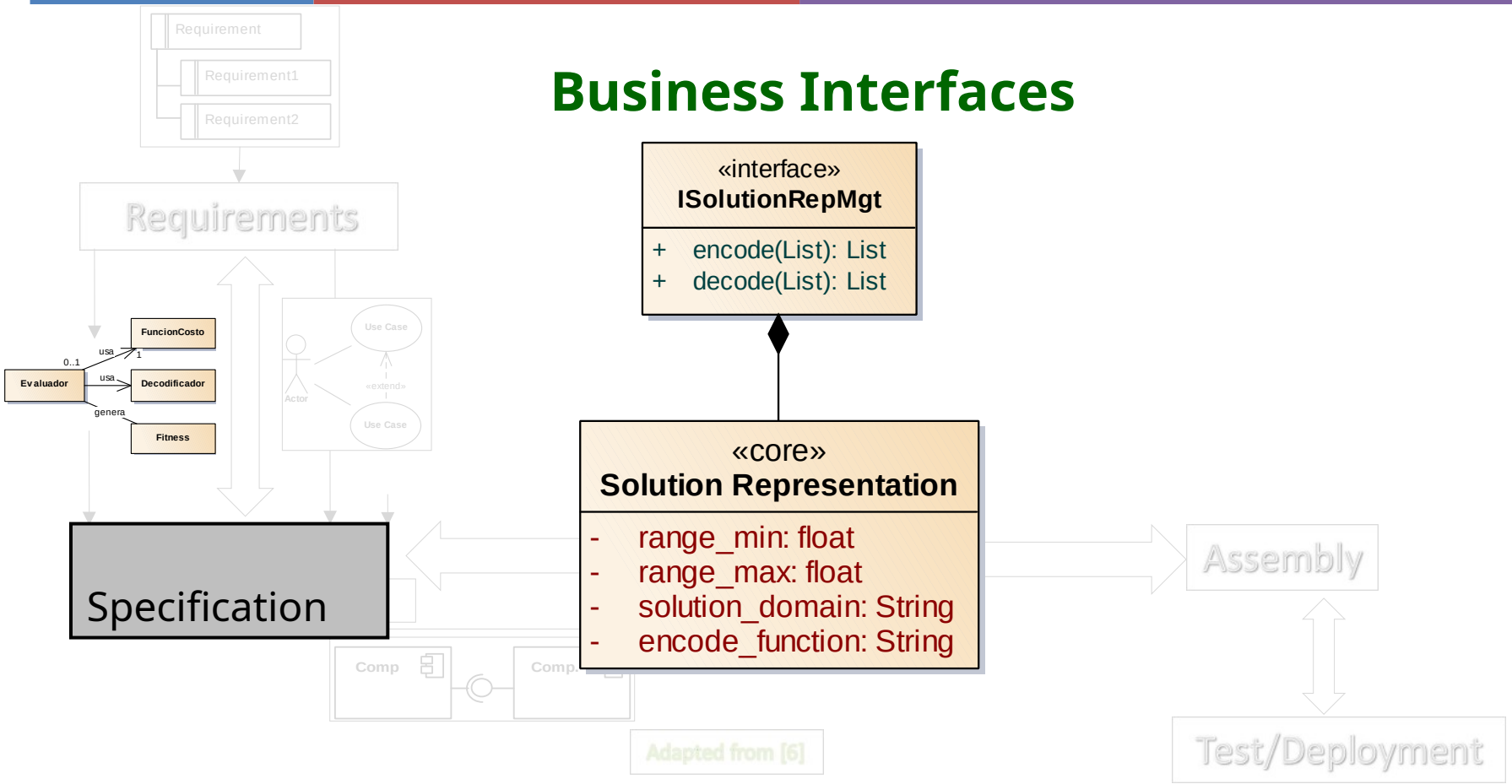
Methodology



Adapted from [6]

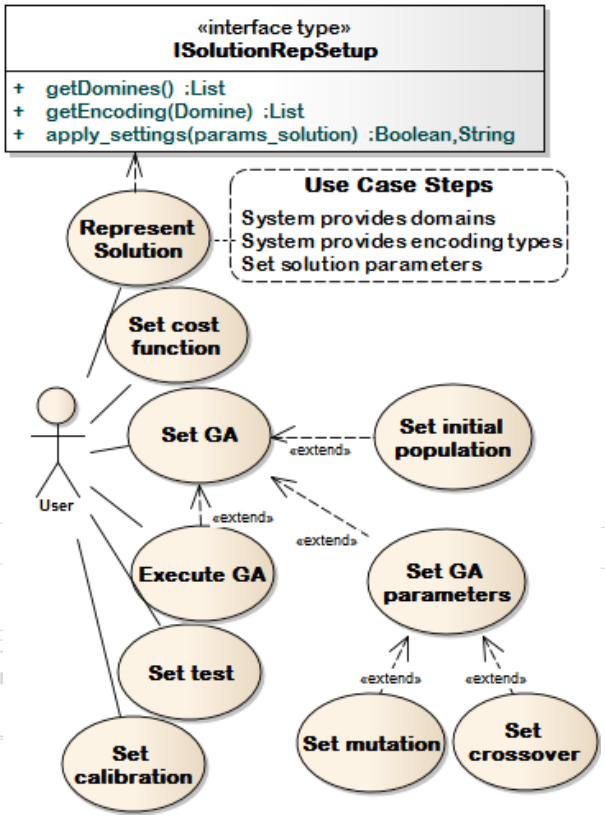
Methodology

Business Interfaces

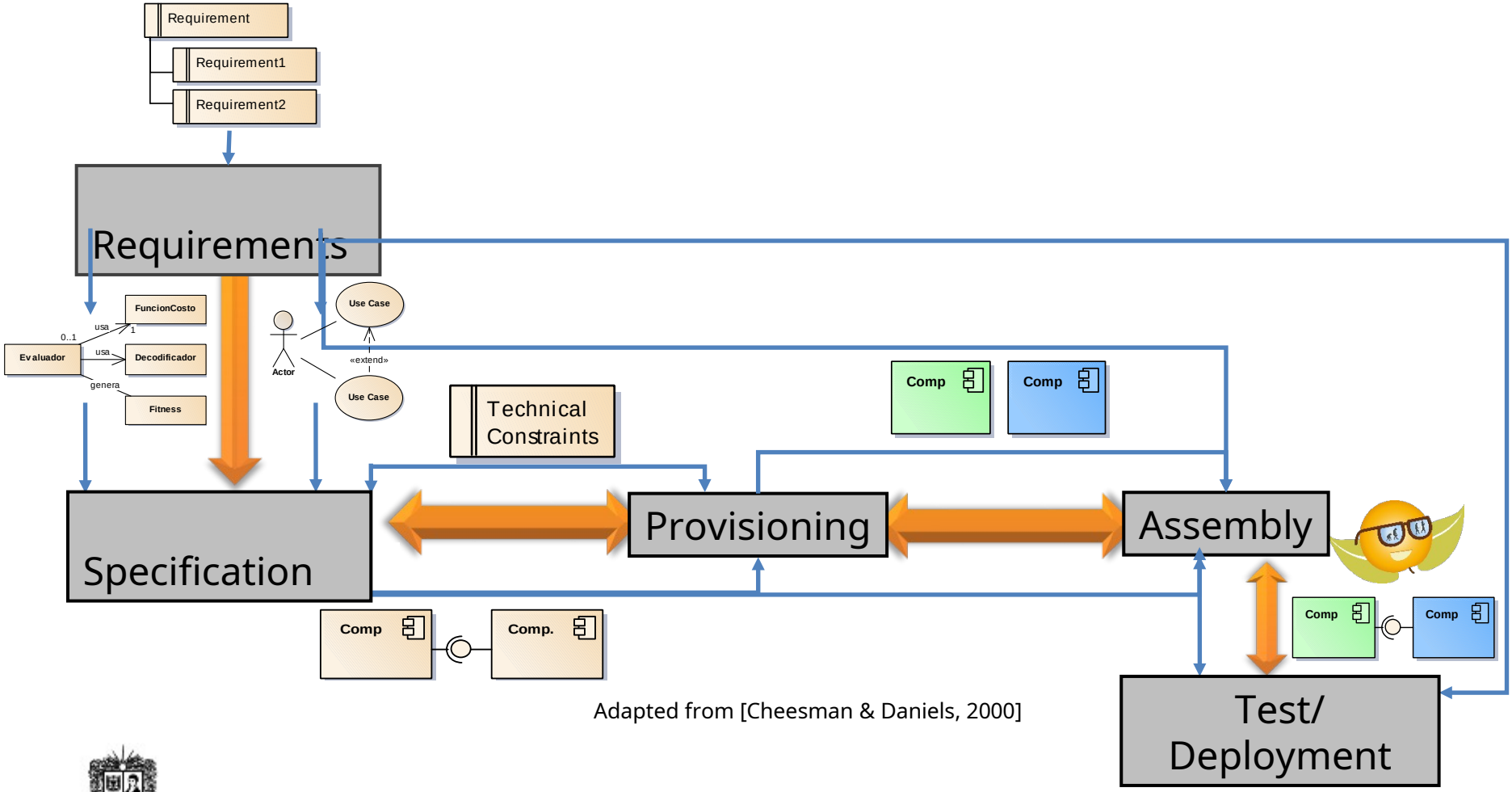


Methodology

System Interfaces



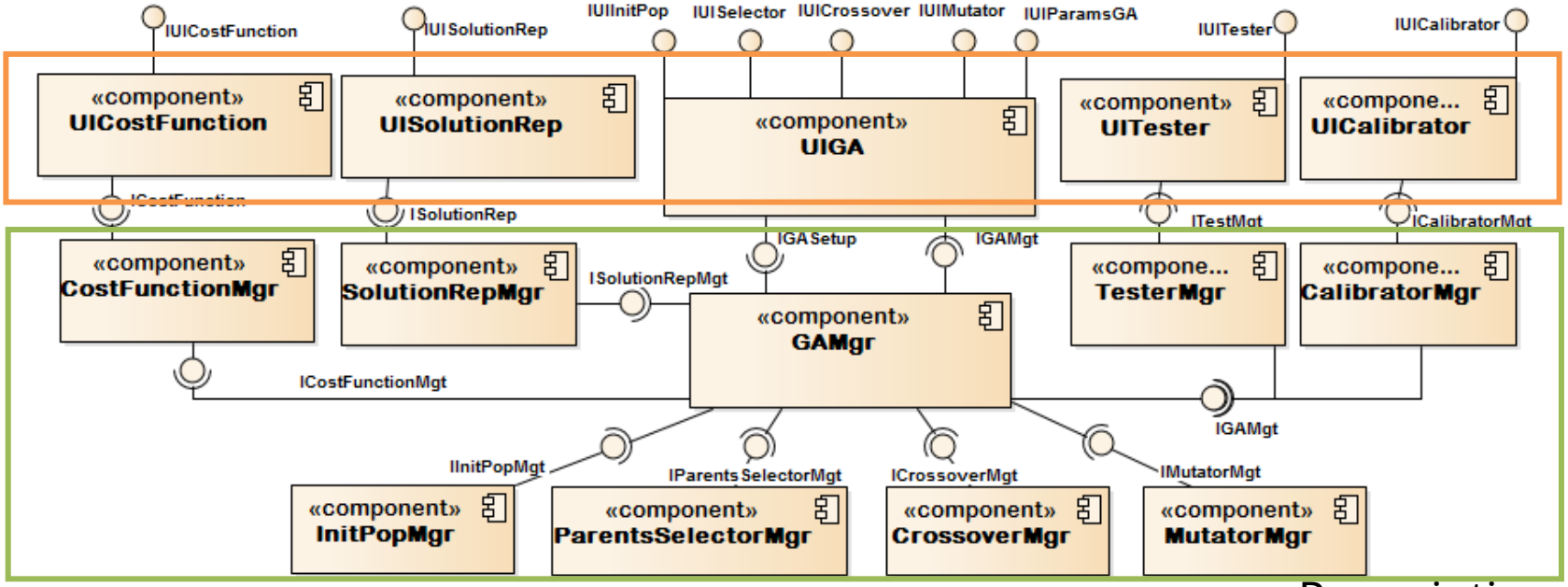
Methodology



Adapted from [Cheesman & Daniels, 2000]

Results I - Proposed Architecture

System Components

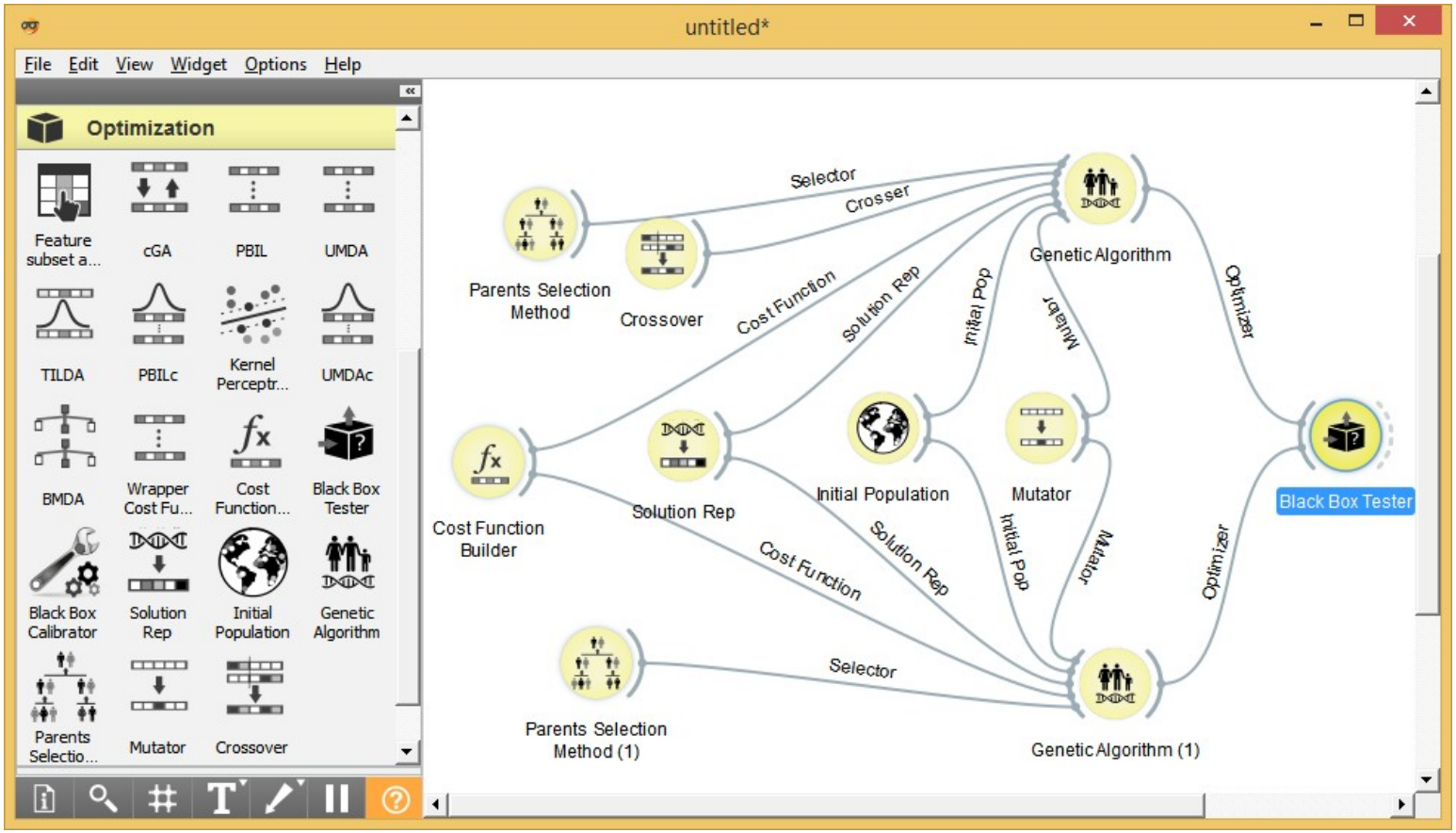


Prescriptive

Business Components

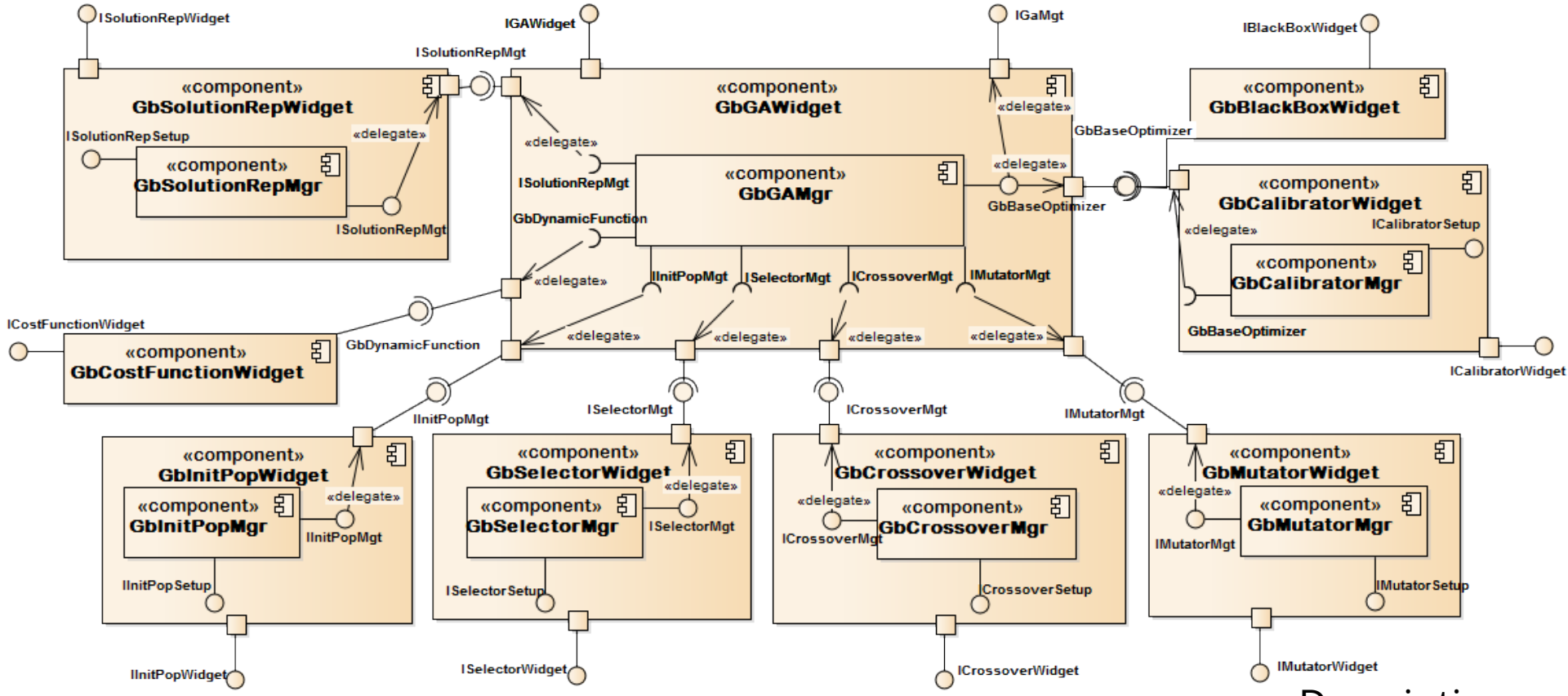
[Self elaboration based on UML]

Technical constrains



[Self elaboration]

Results II - Proposed Architecture



[Self elaboration based on UML]

Descriptive

Results – Models and Goldenberry

Requirements[58]

REQF 6.1El usuario debe contar con la opción de generar la población inicial de forma aleatoria.

REQF 6.2El usuario debe contar con la opción de generar la población inicial de forma sesgada.

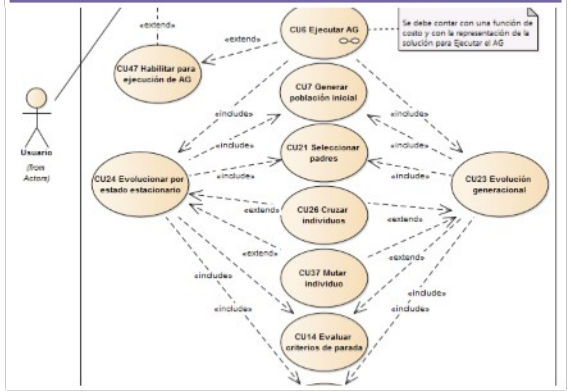
REQF 6.2.1 El usuario debe contar con un campo que le permita especificar el porcentaje de la población inicial a sesgar.

REQF 6.2.2 El usuario debe poder definir el número de sub-espacios de búsqueda e ingresar el límite máximo y mínimo de los sub-espacios; además, el valor de la media y varianza para cada sub-espacio

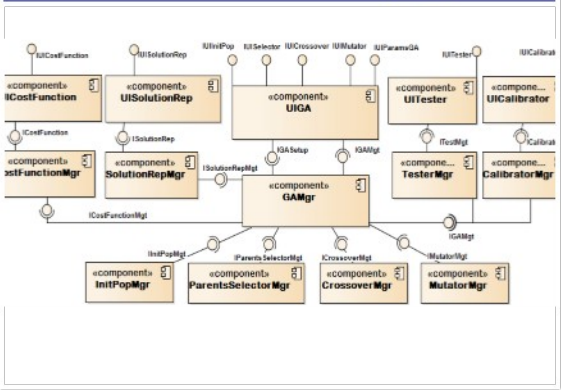
REQF 6.3El usuario debe contar con la opción de generar la población inicial introduciendo algunos individuos semilla.

REQF 6.3.1 El usuario debe contar con tres formas para el ingreso de semillas: a través de un campo que permita digitarlos, cargando un archivo plano que contenga los individuos o a través de la conexión de un componente que provea individuos

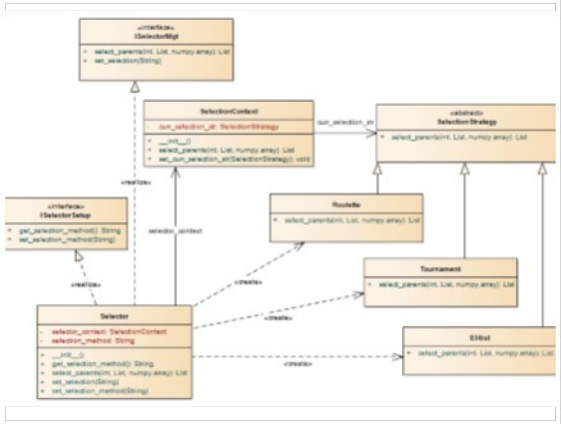
Use cases [55]



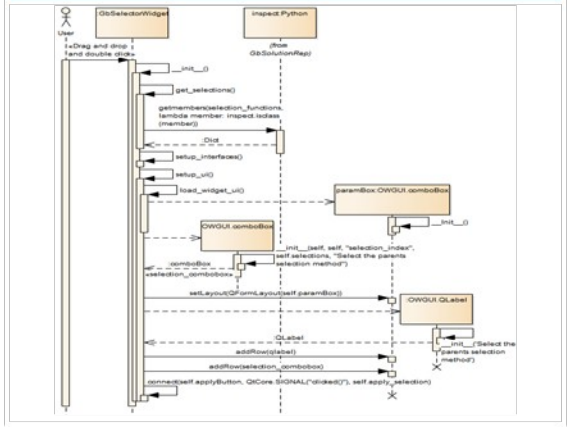
Architecture[2]



Estructural[8]



Dinamic



Goldenberry 2.0

Results

9CCC
Congreso Colombiano de Computación

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Towards a Component-based Software Architecture for Genetic Algorithms

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***Abstract*—We are motivated on the idea of whether a component-based software architecture for evolutionary algorithms would be feasible and advantageous. We believe that depending on the evolutionary computation model, software implementing these algorithms can be robustly built assembling loosely-coupled computational blocks, likewise hardware systems that are built gluing together prefabricated electronic components. We set about to develop an initial architecture with a focus on the genetic algorithm. The paper describes the analysis and design principles used, the obtained architecture, the resulting component specification and closes with a discussion about the benefits of this approach, as well as initial steps towards its implementation in a user-friendly platform for component-based visual programming. The complete portfolio of software models is available at:**

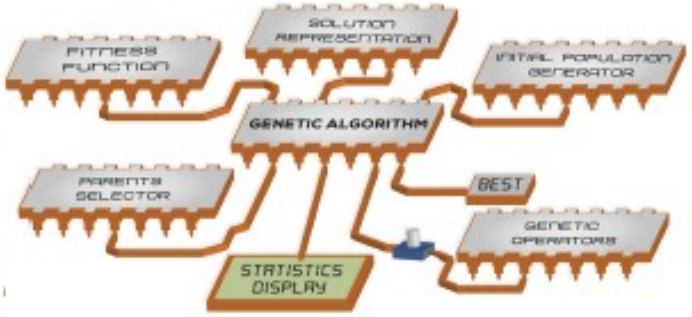

Figure 1. A fictitious depiction of an electronic component-based GA

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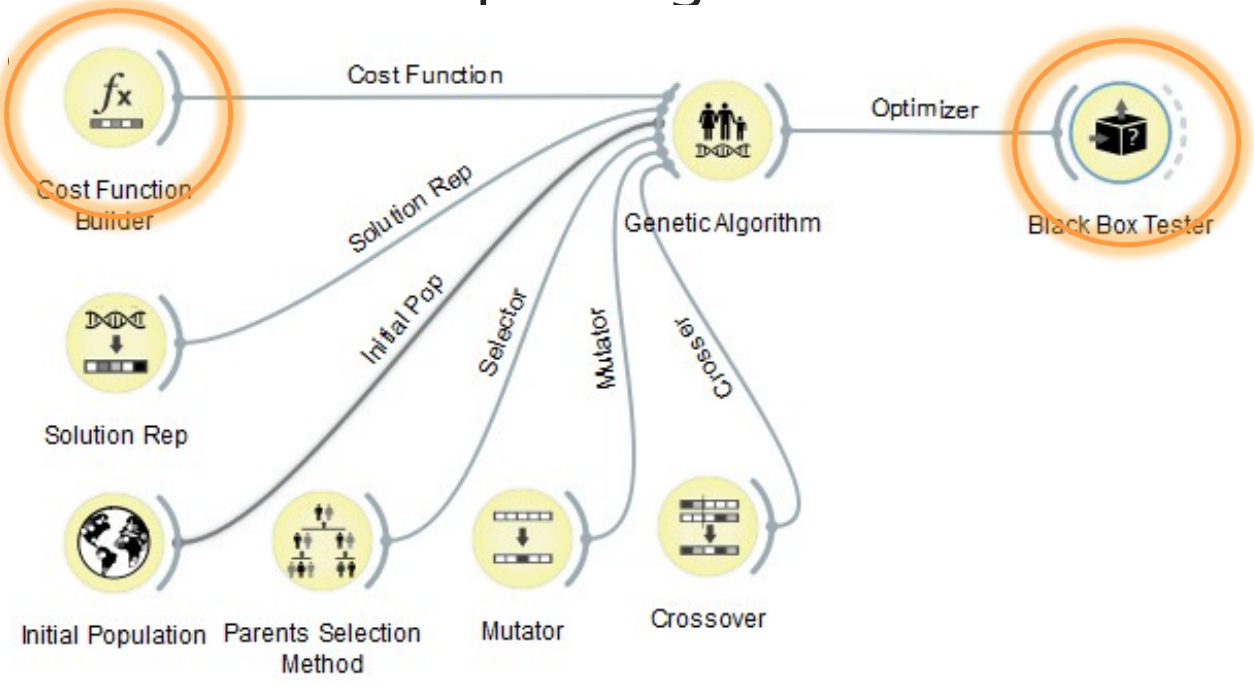
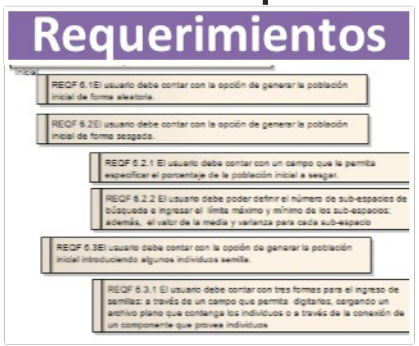
Conclusions

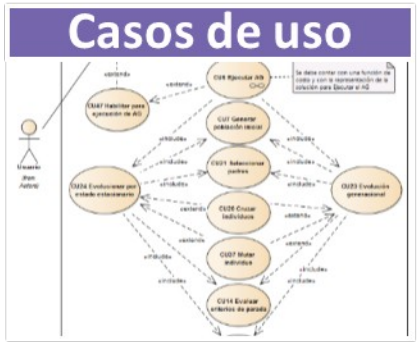
- Component-based software development is a suitable paradigm for extensible

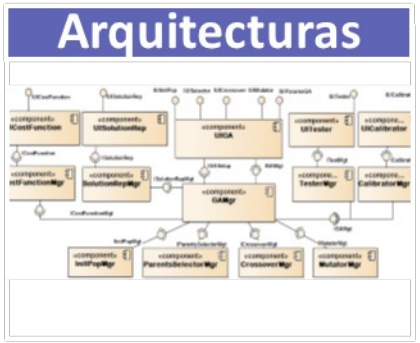


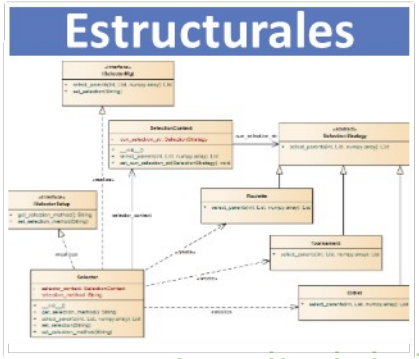
Conclusions

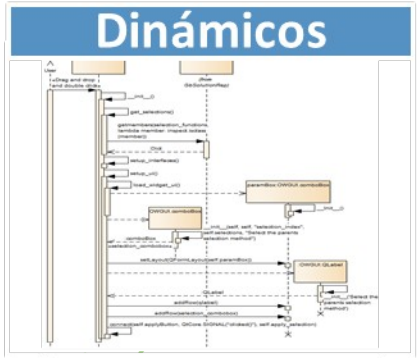
- We have described a feasible architecture for general purpose component-based GAs. The architecture is open!! and independent of runtime or implementation decisions .

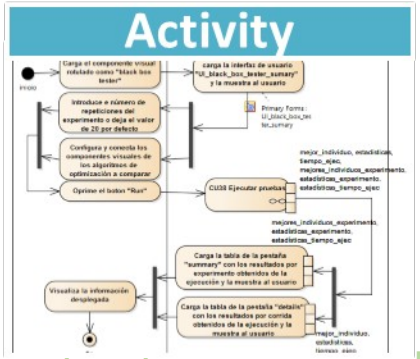












Conclusions

- The modularity and detail exhibited by this architecture makes it easily extensible to other kinds of stochastic search population-based optimization algorithms through the reuse of GB Components. And to other genetic operators due to the use of the strategy software design pattern.

Future Work

Extend the parent selector, crossover and mutation components

- Add new selection methods as range and truncate.
- Add uniform, MMAX and multipoint crossover.
- Add polynomial mutation.

Include the discrete solution domains

- Crossover PMX, CX, OX1, POS.
- Mutation EM, DM, ISM, IVM

New evolutive components

- Simulated annealing
- Hill climbing
- Diferential evolution
- Grid GA

Concurrence

References

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Questions?


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