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## **Genetic Programming Notes**

In this document I keep my thoughts and design approaches for the creation of a genetic programming framework.

### **Summary**

At this point I am creating a genetic program that will convert the model creation to a completely automated process.

The environment is presented a specific set of variables that they can be combined to a decision tree having as leaf nodes the signal (BUY / SELL / DO NOTHING / FREE MARGIN etc) while each internal node will be an boolean expression based in the provided variables, functions and expressions.

### **Variables**

(1) Scalar : Any variable that can be represented in a single numeric format

Some examples might be CURRENT\_BID, CURRENT\_MINUTE etc

(2) Collection: A vector of doubles

An example might be the prices for the specific bar

### **Collection Functions**

A collection function receives as first argument a collection and returns a Scalar. Based in the nature of the function it might receive more parameters.

Examples of a collection function are the following:

Average(collection)

MinValue(collection)

MaxValue(collection)

MovingAverage(collection, duration: Scalar)

Length(collection)

GetValueAt(collection, index)

GetRandomValue(collection)

A more complicated example is the following:

Assuming that we need to select a random minute to trade, like we do in the fortieth minute strategy. In this case our logic will look like this:

- Provide a collection containing all the minutes of the hour:

AvailableMinutes = { 1, 2, 3, .. 59 }

- The genetic program can then create the following:

GetRandomValue(AvailableMinutes)

Which will later be used for the creation of an expression that will be used in the decision tree.

## Expressions

An expression is a binary function always returning a boolean

We have two types of expressions:

### (1) Comparisons

A comparison takes two arguments of type Scalar and returns TRUE / FALSE

Examples:

MORE

LESS

EQUAL

### (2) Logical Operations

A logical operation combines two expressions returning TRUE / FALSE

Examples:

AND

OR

# Random Expression Genetator

A function returning an expression using any of the variables of the environment

# Random Program Genetator

A function returning a complete program resembling a decision tree having as nodes expressions and leafs signals

# API for the genetic program

## Initial Design of the genetic program



