0SumBot

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Aly Shmahell
aly.shmahell@gmail.com

3rd Year Student
Department of Computer Science, University of L'Aquila
Computational Intelligence in Videogames and Virtual Reality
Prof. Antonio Mora Garcia

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Abstract

0SumBot can be described as a sum of two varied approaches to create a bot capable of playing, and sometimes, preferably most times, winning the PlanetWars contest.
In this effort The need to optimize parameters lead to the creation of 0SumBot, 1SumBot, G0Bot and G0GA.

General Description

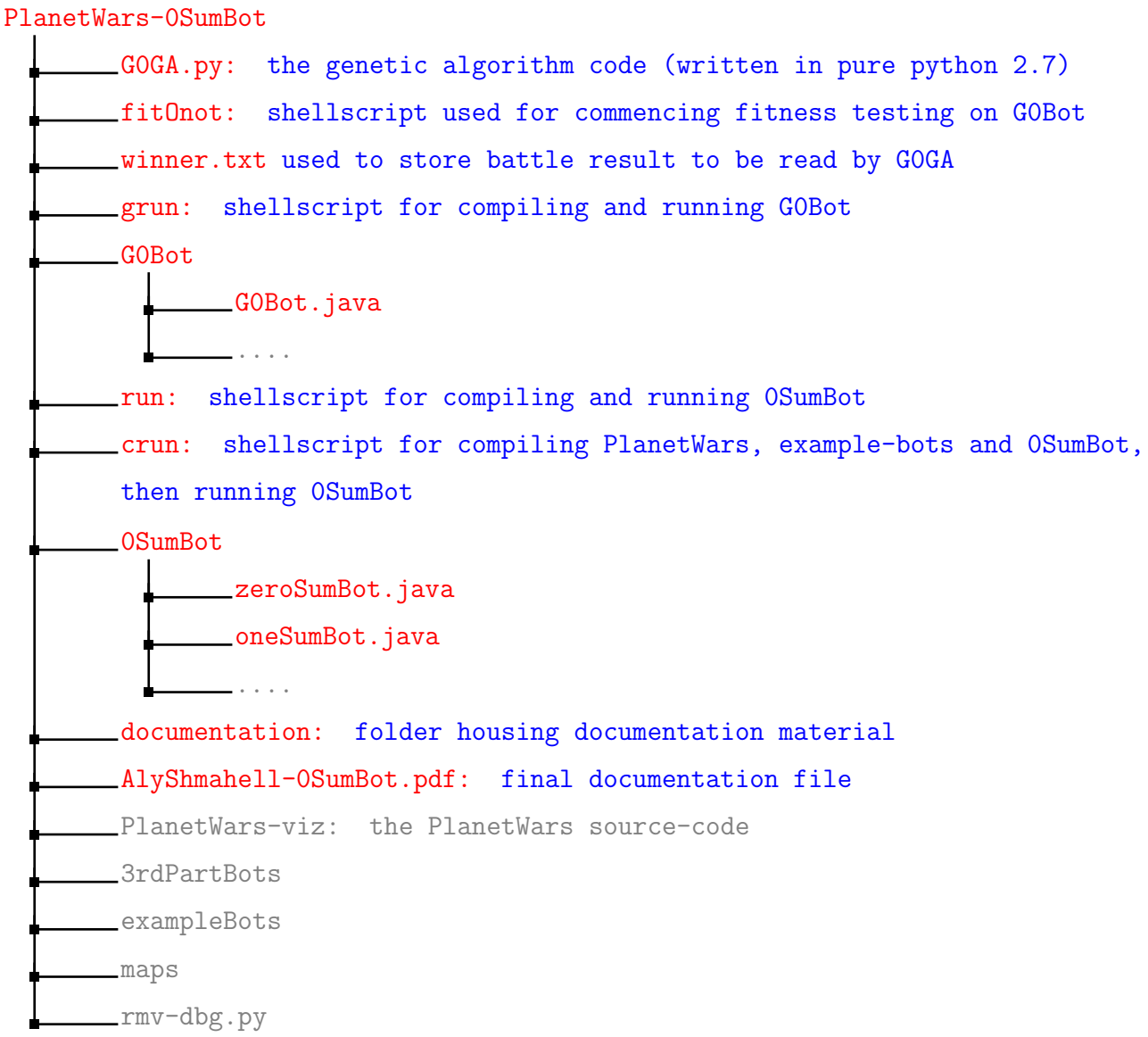
0SumBot depends on the following in-game variables: Planet.NumShips(), Planet.GrowthRate(), PlanetWars.Distance(Planet,otherPlanet).
In order to achieve victory first we set a series of optimized versions of these parameters and compare them to the in-game parameters and then we set (Base, Target, FleetSize) based on the results.
One way of comparison is by calculating the localMinima of distance between base and enemy planets, and basing our choice of target on the result.
Another method that is followed is comparing each planet directly to optimized parameters to formulate a plan of attack.
Methods of comparison are not totally exclusive, and we usually use them entwined.
1SumBot is an alteration of 0SumBot that includes a localMinima for (Base, Enemy), (Base, Neutral) and (Base, Ally), then changes the strategy to include these additional parameters.
G0Bot is a copy of 0SumBot used for the G0GA genetic algorithm.
G0GA is a genetic algorithm designed for the purpose of fine-tuning the parameters of G0Bot for a more efficient battle strategy.

Notes on the bots

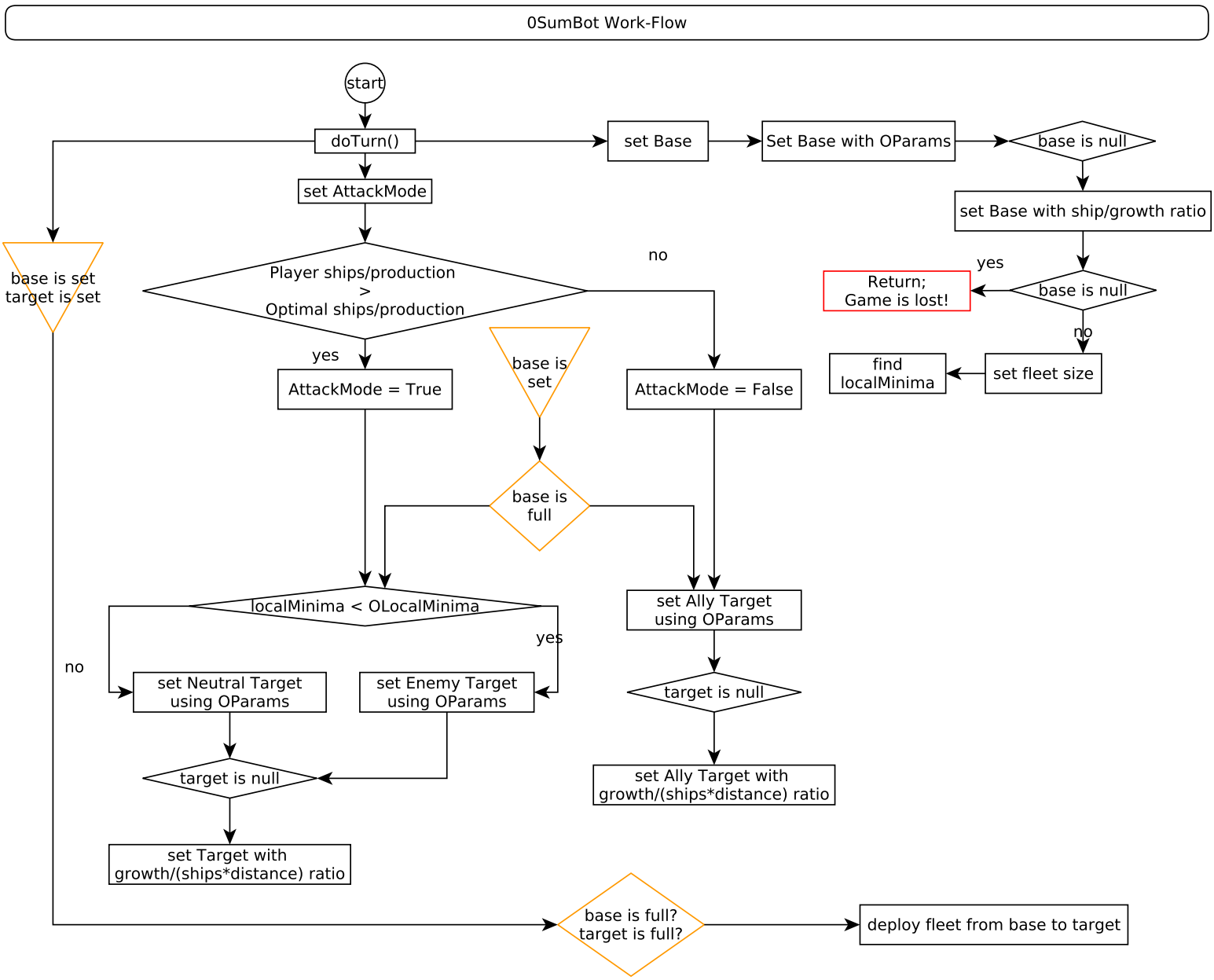
In order to avoid player timeout, make sure to check if planet is null before you make any operation involving that selected planet.
For example, when calculating local minima in 0SumBot it is essential to perform the following check beforehand:

```
if(closestEnemy==null)
        return;
localMinima =  pw.Distance(base,closestEnemy);
```

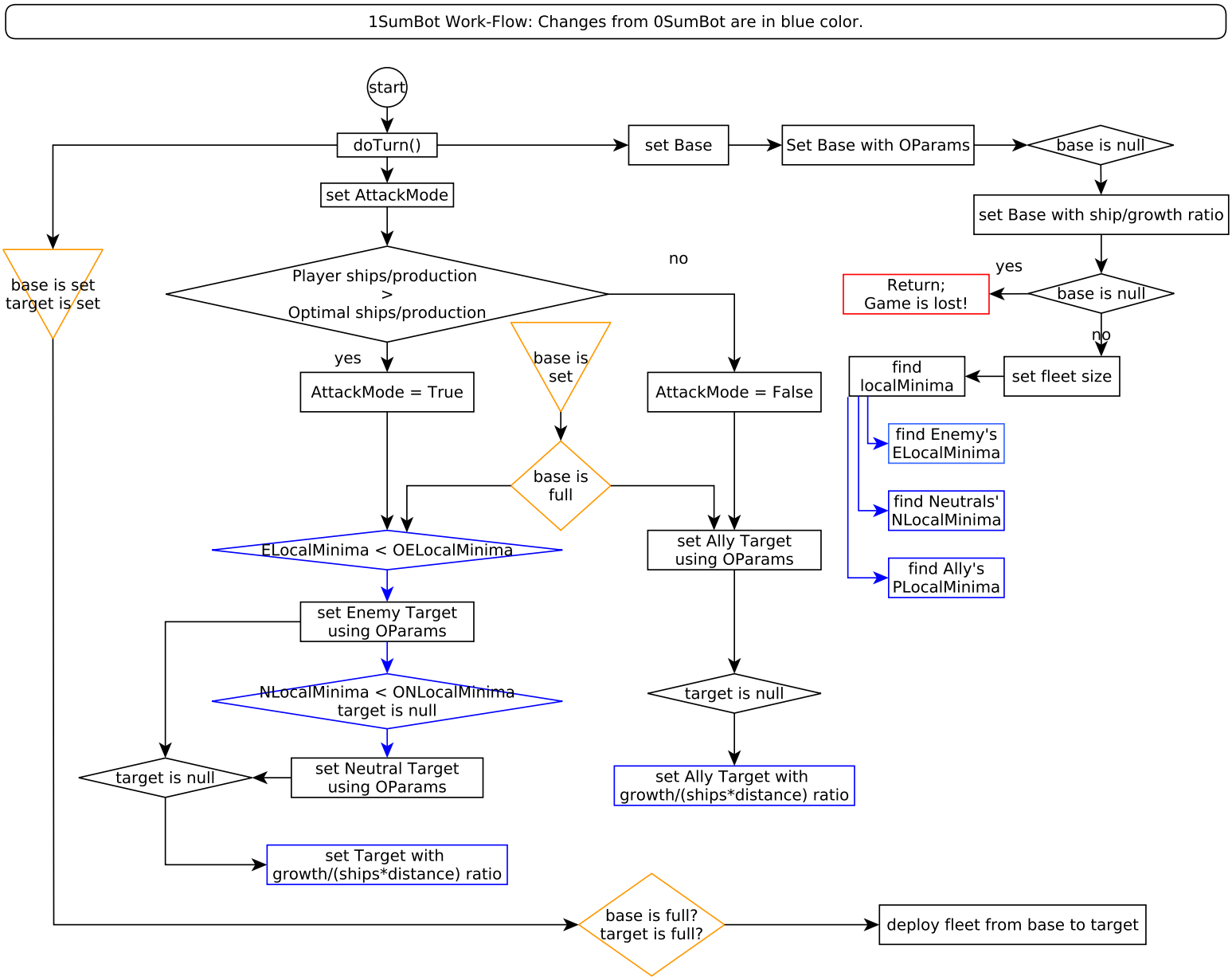
file description



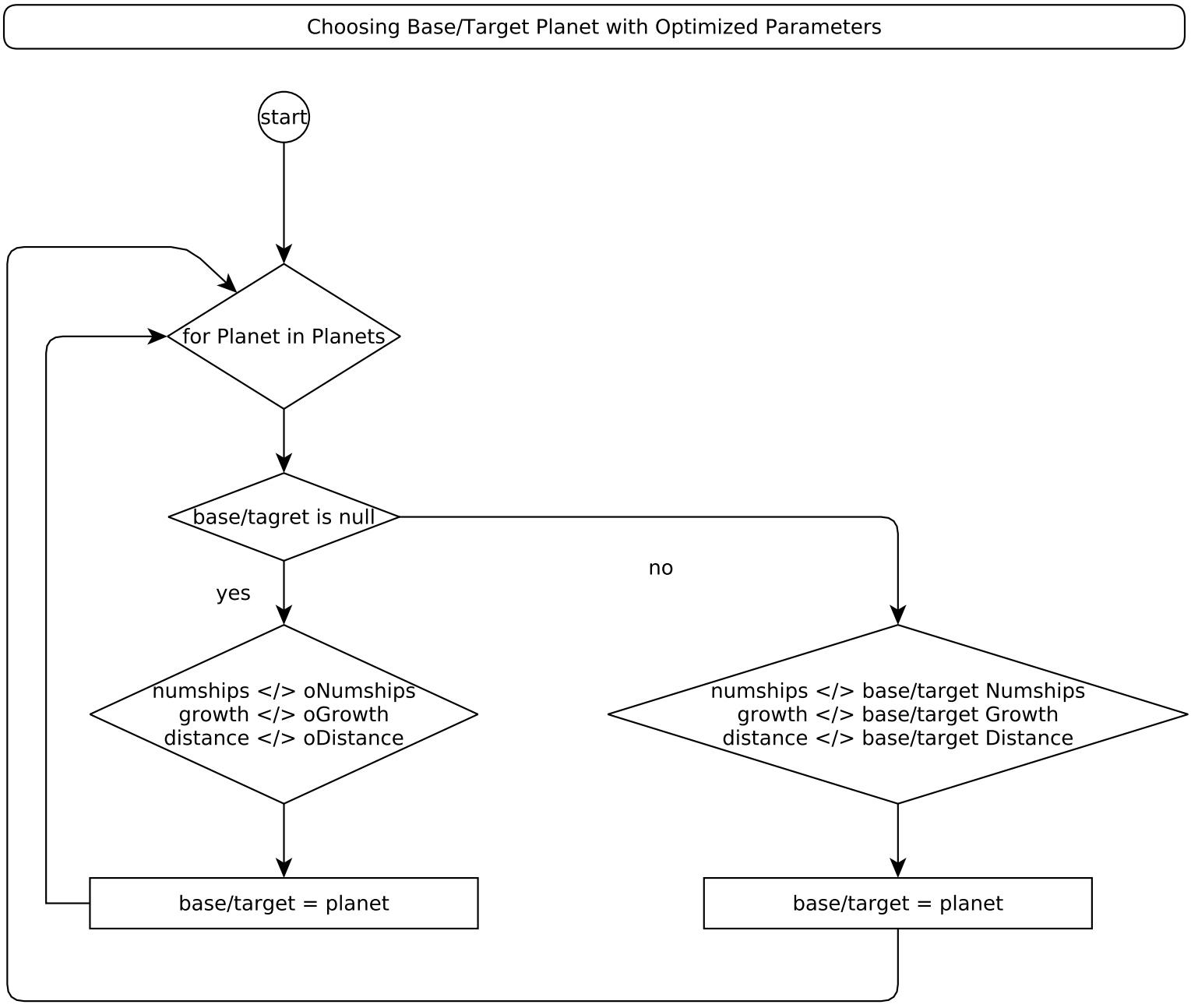
0SumBot


0SumBot Work-Flow
start
doTurn()
set Base
Set Base with OParams
base is null
set Base with ship/growth ratio
base is null
yes
Return;
Game is lost!
no
set fleet size
find
localMinima
set AttackMode
Player ships/production
>
Optimal ships/production
no
yes
AttackMode = True
AttackMode = False
base is
set
base is
full
base is set
target is set
localMinima < OLocalMinima
yes
no
set Neutral Target
using OParams
set Enemy Target
using OParams
target is null
set Target with
growth/(ships*distance) ratio
set Ally Target
using OParams
target is null
set Ally Target with
growth/(ships*distance) ratio
base is full?
target is full?
deploy fleet from base to target

1SumBot


1SumBot Work-Flow: Changes from 0SumBot are in blue color.
start
doTurn()
set Base
Set Base with OParams
base is null
set Base with ship/growth ratio
base is null
yes
Return;
Game is lost!
no
set fleet size
find
localMinima
find Enemy's
ELocalMinima
find Neutrals'
NLocalMinima
find Ally's
PLocalMinima
set AttackMode
Player ships/production
>
Optimal ships/production
no
yes
AttackMode = True
AttackMode = False
base is set
target is set
base is
set
base is
full
ELocalMinima < OELocalMinima
set Ally Target
using OParams
set Enemy Target
using OParams
NLocalMinima < ONLocalMinima
target is null
target is null
set Neutral Target
using OParams
set Ally Target with
growth/(ships*distance) ratio
set Target with
growth/(ships*distance) ratio
base is full?
target is full?
deploy fleet from base to target

Choosing planet according to optimized parameters



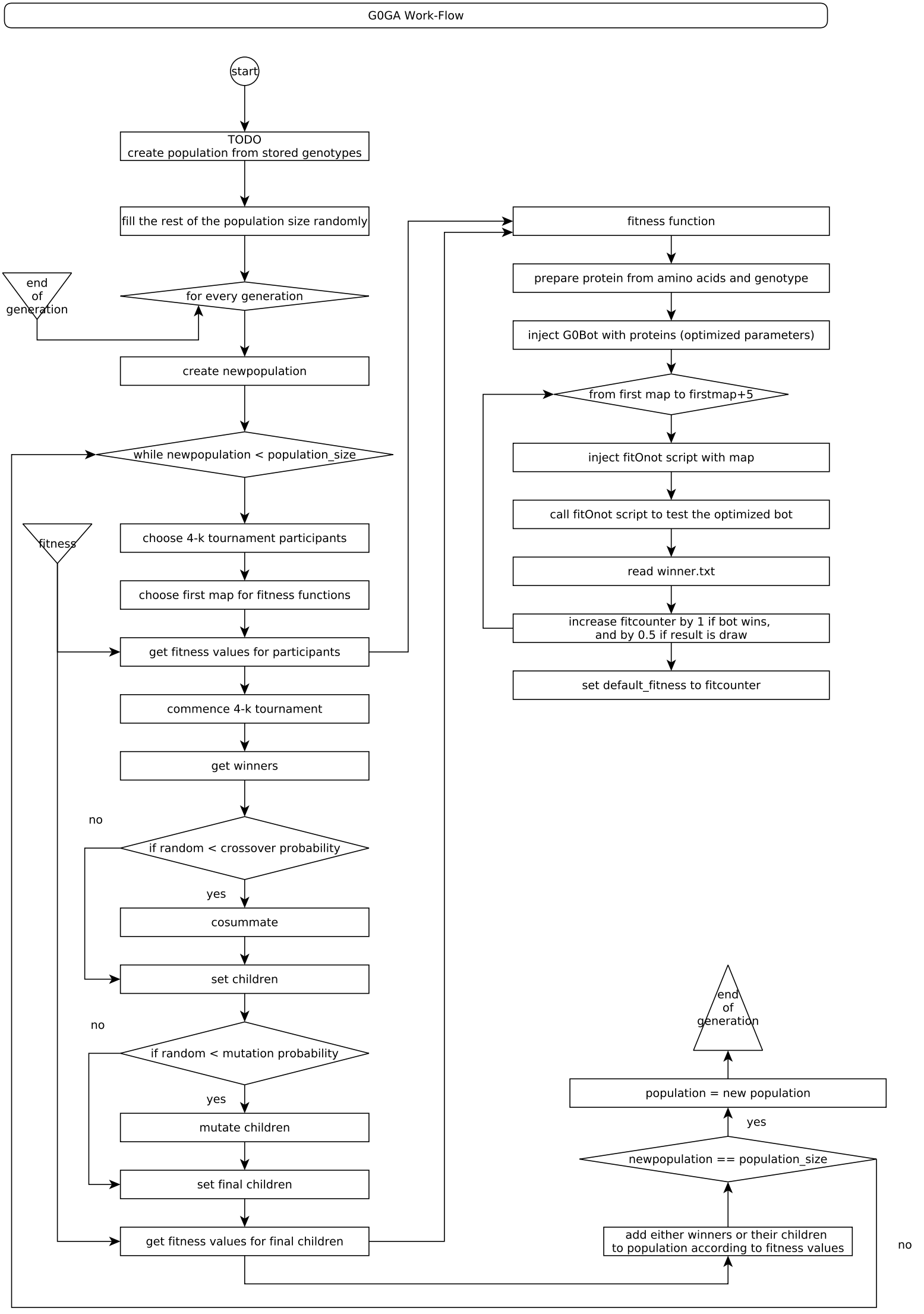
G0GA

G0GA is a steady-state 4-k tournament genetic algorithm improvised to evolve G0Bot.
Written in python 2.7, it performs fitness calculation by means of multiple bot simulations aided by helper bash scripts.
The GA performs parameter passing to the bot and to the helper scripts by means of line replacement directly on the target files (parameter injection).

Notes on the GA

Always make sure to run as few calls to fitness as possible, in order to reduce simulation time and therefor decrease computation time.
This can be achieved by:

- Inside the generation generator :
  - Assigning fitness values to fitness variables and reusing them.
  - Assigning fitness values only when needed.
  - Only assigning fitness values when no change on the genotype is due later.
- Inside the individual:
  - Assigning fitness value to internal default_fitness variable.


G0GA Work-Flow
start
TODO
create population from stored genotypes
fill the rest of the population size randomly
for every generation
end
of
generation
create newpopulation
while newpopulation < population_size
fitness
choose 4-k tournament participants
choose first map for fitness functions
get fitness values for participants
commence 4-k tournament
get winners
no
if random < crossover probability
yes
cosummate
set children
no
if random < mutation probability
yes
mutate children
set final children
get fitness values for final children
fitness function
prepare protein from amino acids and genotype
inject G0Bot with proteins (optimized parameters)
from first map to firstmap+5
inject fitOnot script with map
call fitOnot script to test the optimized bot
read winner.txt
increase fitcounter by 1 if bot wins,
and by 0.5 if result is draw
set default_fitness to fitcounter
end
of
generation
population = new population
yes
newpopulation == population_size
add either winners or their children
to population according to fitness values
no

What's next?

- Adding memory capability to G0GA, so that it records the best genotypes from the current run session in order for it to use them in creating individuals for future run sessions.
- Using Linear Regression in G0Bot and in G0GA to increase performance.
- Redefining battle strategy in G0Bot based on fuzzy functions.
- Improving the map shuffling process in G0GA.
- Accessing and use more in-game variables in G0Bot, like Fleet variables for example.

Code Repository

A Github repository exists for this project under:

`https://github.com/AlyShmahell/PlanetWars-0Sum`

CHALLONGE!

First L'Aquila International PLANET WARS Competition