

Explanation of Homework 1 - IGA

1. This text explains in more detail the idea of homework 1.
2. It is preferable, but not mandatory if your work in homework 1 be related to one of robots in the lab that you use in your project. This will save you time devoted to the project as you can reuse your code.
3. The only requirements for homework 1 are the following:
 - a. It must be IGA in the sense that uses (any) “evolutionary programming” ideas **and** human-computer interaction.
 - b. It must use human interaction to find the value of fitness function for each solution candidate from a population.
 - c. Even if fitness function is calculated based on some simulation or some formulas, there must be a component of asking a human to give certain answer that is incorporated to the final value of the calculated fitness function (called also a cost function).
 - d. Your “IGA” can use not necessarily a GA, but also a GP, ES or any other variant of evolutionary programming. But must have interaction as described. And thus belong to the area of research called Interactive Evolutionary Computation.
 - e. It must evolve some behavior or motion of a real robot or a simulated robot or robotics problem (like evolving a smile based on elementary muscle motions in a simulated face).
4. The solution that would use a GA without interaction is not acceptable, even if it is related to robotics but if it has no “human in a loop”.

5. The solution that uses a human-computer interaction but human knows exactly the solution such as a number or a string, is also wrong, as it is not producing any new information. Human already knows this solutions and just checks one-to-one mapping.
6. In general the IGA from your homework should evolve (with human help) some new information that is not directly known to a human. For instance, evolving with human help “hello world” is a bad solution, because it evolves a solution that the human completely knows. It means that the human knows exactly the string “hello world”. Evolving however some kind of a smile of a robot, or dancing behavior (of a robot or simulated robot) or mobile robot behavior to avoid obstacle is good, if the human does not know the exact solution but only conditions of some behavior (motion, expression, data) that make it an acceptable solution.
7. The new information may be very simple, but must be a solution to a problem that is not known to the user. I may know what a smile is but I may not know the sequence of numbers given to few servos that control this smile.
8. In another example – evolving a string $\langle motion_1, motion_2, motion_3 \rangle$ where $motion_i$ are given characters is wrong. But evolving a string of mobile robot motions that avoid an obstacle in front of a robot, is a good solution.