(1)Topic 16 - Firefly Search and Cuckoo Search Wednesday, April 27

Announcements: -> HW 5 due the last day of class 11:59pm -> Final will be taketome, due Man, May 16. 11:59pm 16, 11:59pm

Frefly Search Fireflies use their lights to attract each other, and the level of attraction depends on the intensity of the light.

Population Metaheuristic, similar to PSO with different movement rules.

Each five fly represents a solution (a point in space). A firefly's movement in each step is toward every other brighter firefly (brighter = better solution), plus a random component (Lévy flight or Gaussian walk).

Suppose fivefly j is brighter than fivefly i (solution j is better than solution i) The attractiveness of i to j is: $A_{ij} = \beta e^{\left(-\gamma r_{ij}^{2}\right)}$ where ris is the Euclidean distance between the two fireflies, and B and & are parameters that you can set. * Attractiveness decays exponentially by the square of the distance. So, in each generation. We loop through all pairs of fireflies and more the dimmer one toward the brighter one: $x_i' = x_i + \beta e^{-\Im r_{ij}} \cdot (x_j - x_i) + \chi \cdot s \cdot L$ new old A: vector pointing in d-domens. pos. pos Ais tran xi to x; tunng parameter) = vectors 1.1 random vector

Ex: where each entry is +1 or -1 $x_1\beta_1\beta \in (0,1]$ Pseudocode N = # of fireflies while True: (each generation) for i from 1 to N: for j from 1 to N: If fivefly 5 is brighter than i: Move i toward j according to the tormyla Notes: * Maybe the attractiveness of a finefly Should also depend on the difference in store. * This never relied on the best solution ever seen, or personal bests. Cuckoo Search Cuckoos are birds and parasites - they lay their eggs in the nests of other birds, so that the other birds take

care of them. The other birds sometimes get mad and fly away to make new nests. Idea: N nests. Each nest contains one egg. eggs = solutions. Repeat: * pick a random nest. It's egg is a sol. * form a new solution by tweaking with a Lévy Flight. * pick a new random nest, and if the new solution is better than the egg in that nest, replace it (B) (New P) (B) Nest 3 (Nest 4) Nest 5 D | Ð nest 1 nest 2 * take the worst p% of eggs in any of the nests, and replace them cell by tweaking with a Levy flight.