

Diseño de algoritmos matemáticos bioinspirados

(Grupo. 101)



**Tecnológico
de Monterrey**

Problema de partición de grafos

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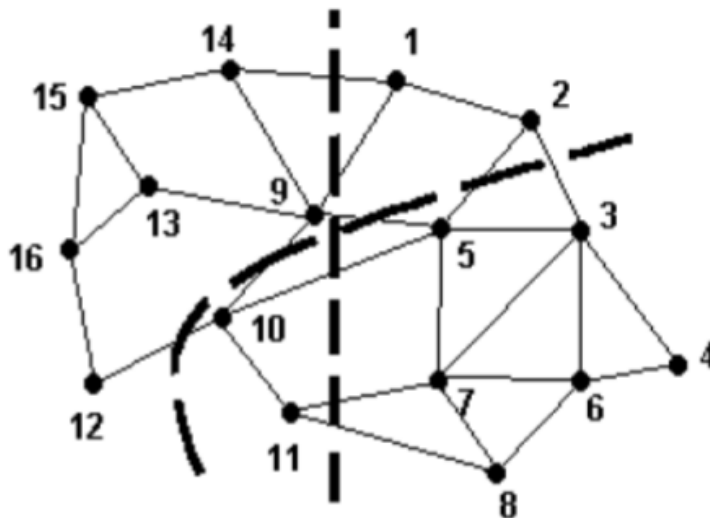
Ricardo Kaleb Flores Alfonso - A01198716

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Fecha:

26 de agosto de 2024

Dado el siguiente grafo:



- Para cada propuesta indiqué los parámetros utilizados:
 - Permitiendo infactibles:
 - a) Tipo de cromosoma: Binario.
 - b) Longitud: 16 genes
 - c) Criterio de inicialización: Se genera una lista de 50 soluciones factibles
 - d) Criterio de infactibilidad: Se tiene algún número de genes activos distinto a 8 y si al menos un nodo no tiene conexión con su mismo grupo se vuelve infactible.
 - e) Criterio de Paro: Después de 70 generaciones
 - f) Función fitness: El negativo del número de conexiones entre nodos
 - g) Criterio de selección: Se selecciona por torneo, lo cual hace que la mitad de la población se muera.
 - h) Tamaño de la población: 50 soluciones
 - i) Probabilidad de cruce: 0.8
 - j) Puntos de cruce: Se selecciona un punto de cruce al azar y se divide en 2
 - k) Lugar de cruce: Al azar
 - l) Probabilidad de mutación: 0.1
 - m) Criterio de reemplazo: Se junta la población anterior con la nueva y se toman los mejores 50 resultados posibles.

Ejemplo:

PADRE 1

Chromosome: [0, 1, 0, 1, 0, 1, 0, 1, 0, 1, 1, 1, 1, 0, 0, 0]

Creating groups

Group 1: [2, 4, 6, 8, 10, 11, 12, 13]

Group 2: [1, 3, 5, 7, 9, 14, 15, 16]

[(1, 2), (2, 3), (2, 5), (3, 4), (3, 6), (5, 10), (6, 7), (7, 8), (7, 11), (9, 10), (9, 13), (12, 16), (13, 15), (13, 16)]

Fitness: -14

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PADRE 2

Chromosome: [0, 1, 1, 0, 0, 1, 1, 1, 1, 1, 0, 0, 0, 1, 0, 0]

Creating groups

Group 1: [2, 3, 6, 7, 8, 9, 10, 14]

Group 2: [1, 4, 5, 11, 12, 13, 15, 16]

[(1, 2), (1, 9), (1, 14), (2, 5), (3, 4), (3, 5), (4, 6), (5, 7), (5, 9), (5, 10), (7, 11), (8, 11), (9, 13), (10, 11), (10, 12), (14, 15)]

Fitness: -16

+++++

PADRE 3

Chromosome: [1, 1, 1, 0, 0, 1, 0, 0, 0, 1, 0, 0, 1, 1, 1, 0]

Creating groups

Group 1: [1, 2, 3, 6, 10, 13, 14, 15]

Group 2: [4, 5, 7, 8, 9, 11, 12, 16]

[(1, 9), (2, 5), (3, 4), (3, 5), (3, 7), (4, 6), (5, 10), (6, 7), (6, 8), (9, 10), (9, 13), (9, 14), (10, 11), (10, 12), (13, 16), (15, 16)]

Fitness: -16

+++++

PADRE 4

Chromosome: [0, 1, 0, 1, 0, 1, 0, 0, 0, 0, 1, 1, 0, 1, 1, 1]

Creating groups

Group 1: [2, 4, 6, 11, 12, 14, 15, 16]

Group 2: [1, 3, 5, 7, 8, 9, 10, 13]

[(1, 2), (1, 14), (2, 3), (2, 5), (3, 4), (3, 6), (6, 7), (6, 8), (7, 11), (8, 11), (9, 14), (10, 11), (10, 12), (13, 15), (13, 16)]

Fitness: -15

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Selected: [[1, 1, 1, 0, 0, 1, 0, 0, 0, 1, 0, 0, 1, 1, 1, 0], [1, 1, 1, 0, 0, 1, 0, 0, 0, 1, 0, 0, 1, 1, 1, 0], [0, 1, 0, 1, 0, 1, 0, 0, 0, 0, 1, 1, 0, 1, 1, 1], [0, 1, 0, 1, 0, 1, 0, 0, 0, 0, 1, 1, 0, 1, 1, 1]]

TOMA POR PARES LOS PADRES EN EL ORDEN COMO FUERON AGREGADOS.

Parents: [1, 1, 1, 0, 0, 1, 0, 0, 0, 1, 0, 0, 1, 1, 1, 0] [1, 1, 1, 0, 0, 1, 0, 0, 0, 1, 0, 0, 1, 1, 1, 0]

Probabilidad: 0.7662314105161151

HIJO 1

Chromosome: [1, 0, 0, 0, 1, 1, 0, 1, 0, 0, 1, 1, 0, 1, 0, 1]

Creating groups

Group 1: [1, 5, 6, 8, 11, 12, 14, 16]

Group 2: [2, 3, 4, 7, 9, 10, 13, 15]

[(1, 2), (1, 9), (2, 5), (3, 5), (3, 6), (4, 6), (5, 7), (5, 9), (5, 10), (6, 7), (7, 8), (7, 11), (9, 14), (10, 11), (10, 12), (13, 16), (14, 15), (15, 16)]

Fitness: -18

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HIJO 2

Chromosome: [0, 1, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1, 1, 1]

Creating groups

Group 1: [2, 6, 8, 9, 10, 14, 15, 16]

Group 2: [1, 3, 4, 5, 7, 11, 12, 13]

[(1, 2), (1, 9), (1, 14), (2, 3), (2, 5), (3, 6), (4, 6), (5, 9), (5, 10), (6, 7), (7, 8), (8, 11), (9, 13), (10, 11), (10, 12), (12, 16), (13, 15), (13, 16)]

Fitness: -18

PADRE 1

Chromosome: [1, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1]

Creating groups

Group 1: [1, 2, 3, 8, 10, 11, 12, 16]

Group 2: [4, 5, 6, 7, 9, 13, 14, 15]

[(1, 9), (1, 14), (2, 5), (3, 4), (3, 5), (3, 6), (3, 7), (5, 10), (6, 8), (7, 8), (7, 11), (9, 10), (13, 16), (15, 16)]

Fitness: -14

+++++

PADRE 2

Chromosome: [1, 1, 0, 1, 1, 0, 0, 0, 1, 0, 0, 1, 0, 0, 1, 1]

Creating groups

Group 1: [1, 2, 4, 5, 9, 12, 15, 16]

Group 2: [3, 6, 7, 8, 10, 11, 13, 14]

[(1, 14), (2, 3), (3, 4), (3, 5), (4, 6), (5, 7), (5, 10), (9, 10), (9, 13), (9, 14), (10, 12), (13, 15), (13, 16), (14, 15)]

Fitness: -14

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PADRE 3

Chromosome: [0, 0, 1, 1, 1, 0, 0, 1, 1, 1, 0, 0, 1, 1, 0, 0]

Creating groups

Group 1: [3, 4, 5, 8, 9, 10, 13, 14]

Group 2: [1, 2, 6, 7, 11, 12, 15, 16]

[(1, 9), (1, 14), (2, 3), (2, 5), (3, 6), (3, 7), (4, 6), (5, 7), (6, 8), (7, 8), (8, 11), (10, 11), (10, 12), (13, 15), (13, 16), (14, 15)]

Fitness: -16

+++++

PADRE 4

Chromosome: [0, 1, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1, 0, 0, 1, 1]

Creating groups

Group 1: [2, 4, 6, 7, 8, 12, 15, 16]

Group 2: [1, 3, 5, 9, 10, 11, 13, 14]

[(1, 2), (2, 3), (2, 5), (3, 4), (3, 6), (3, 7), (5, 7), (7, 11), (8, 11), (10, 12), (13, 15), (13, 16), (14, 15)]

Fitness: -13

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SELECCION POR TORNEO. SE SELECCIONAN N PARES (CON REPETICION), EL MEJOR SE AGREGA A LA LISTA DE SELECTED.

Selected: [[1, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1], [1, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1], [1, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1], [1, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1]]

SELECCIONA EL PRIMER PAR DE PADRES EN ORDEN DE COMO SE AGREGARON

Parents: [1, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1] [1, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1]

Probabilidad: 0.41604376114127983

ES MENOR A 0.8, SI HAY CRUCE

Crossing over at point 13

Child 1

Child 1 chromosome: [1, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1]

Creating groups

Group 1: [1, 2, 3, 8, 10, 11, 12, 16]

Group 2: [4, 5, 6, 7, 9, 13, 14, 15]

[(1, 9), (1, 14), (2, 5), (3, 4), (3, 5), (3, 6), (3, 7), (5, 10), (6, 8), (7, 8), (7, 11), (9, 10), (13, 16), (15, 16)]

Child 2

Child 2 chromosome: [1, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1]

Creating groups

Group 1: [1, 2, 3, 8, 10, 11, 12, 16]

Group 2: [4, 5, 6, 7, 9, 13, 14, 15]

[(1, 9), (1, 14), (2, 5), (3, 4), (3, 5), (3, 6), (3, 7), (5, 10), (6, 8), (7, 8), (7, 11), (9, 10), (13, 16), (15, 16)]

SE SELECCIONA SIGUIENTE PAR DE PADRES

Parents: [1, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1] [1, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1]

Probabilidad: 0.6568197270159415

Crossing over at point 6

Child 1

Child 1 chromosome: [1, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1]

Creating groups

Group 1: [1, 2, 3, 8, 10, 11, 12, 16]

Group 2: [4, 5, 6, 7, 9, 13, 14, 15]

[(1, 9), (1, 14), (2, 5), (3, 4), (3, 5), (3, 6), (3, 7), (5, 10), (6, 8), (7, 8), (7, 11), (9, 10), (13, 16), (15, 16)]

Child 2

Child 2 chromosome: [1, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1]

Creating groups

Group 1: [1, 2, 3, 8, 10, 11, 12, 16]

Group 2: [4, 5, 6, 7, 9, 13, 14, 15]

[(1, 9), (1, 14), (2, 5), (3, 4), (3, 5), (3, 6), (3, 7), (5, 10), (6, 8), (7, 8), (7, 11), (9, 10), (13, 16), (15, 16)]

Probabilidad de mutación: 0.45378839779020175

