



EVOLUTIONARY COMPUTING

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OVERVIEW

- Introduction
- Problem
- Assumptions
- Player's Performance
- Solution

INTRODUCTION

- Genetic algorithms (GAs) are numerical optimization algorithms inspired by both natural selection and natural genetics
- Introduced by John Holland
- Genetic Algorithm promises results in NP-Complete problems



PROBLEM

- A cricket team for Sri Lanka has to be selected via genetic algorithms without the human intervention. The team must comprise a captain, a wicket-keeper, one all-rounder, four batsmen, two spinners and two fast bowlers. Assume that the Sri Lankan cricket board has a pool of players of captains, wicket-keepers, all-Rounders, batsmen, spinners and fast bowlers. The GA's task is to pick the best cricket team (11 players) out of the pool.

ASSUMPTIONS

- Pools of Players are mutually exclusive
- Size of the Pool is not static
- There is record of each player's performance
- There is no correlation between players

PLAYER'S PERFORMANCES

○ Like ICC Ratings



Test Allrounders

ICC Player Rankings			
Rank	Name	Country	Rating
1	V.D. Philander	SA	366
2	Shakib Al Hasan	BAN	364
3	R. Ashwin	IND	358
4	M.G. Johnson	AUS	280
5	S.C.J. Broad	ENG	263
6	S.R. Watson	AUS	246
7	R.J. Harris	AUS	235
8	T.G. Southee	NZ	214
9	D.W. Steyn	SA	200
10	J-P. Duminy	SA	185
	Top 10		

CHROMOSOME REPRESENTATION

- Chromosome should be fixed size
- Size - 11

Captain	Wicket Keeper	All Rounder	Batsman 1	Batsman 2	Batsman 3	Batsman 4	Fast Bowler 1	Fast Bowler 2	Spin Bowler 1	Spin Bowler 2
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- 11-genes

BIT REPRESENTATION

- In java we can represent each bit by using object references
- We can use Player's pool index

FITNESS FUNCTION

- Summation of the player's performance

- Fitness=

Captain * 3	+
WicketKeeper	+
AllRounder	+
Batsman(1) * 2	+
Batsman(2) * 2	+
Batsman(3) * 2	+
Batsman(4) * 2	+
FBowler(1)	+
FBowler(2)	+
SBowler(1)	+
SBowler(2)	+

- Add Penalty for invalid chromosomes

SELECTION METHOD

- Tournament Selection method
 - It always neglect invalid chromosomes
 - This method is more efficient and leads to an optimal solution.
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- Winner from a larger tournament will on average have a higher fitness than the winner of a smaller tournament

CROSSOVER OPERATOR

- Single point Crossover



HOW TO TACKLE INVALID OFF SPRINGS

- Calculate the fitness of two off springs
- Then insert fittest off spring in to the new population

○ Eg:

1	23	46	55	65	75	90	2	5	8	9
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1	23	46	55	80	83	65	8	7	9	10
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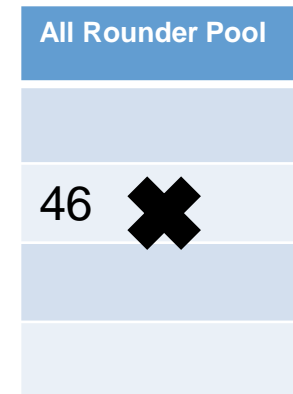
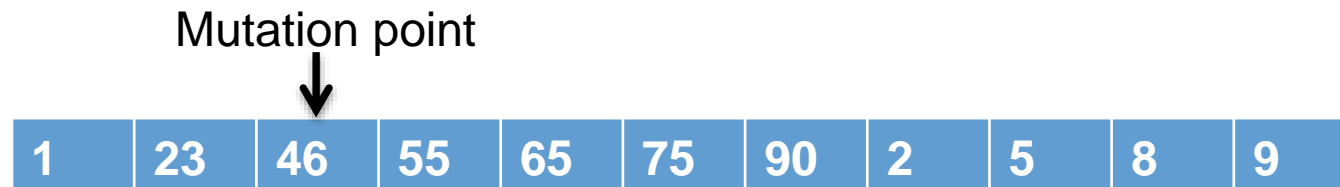
1	23	46	55	65	75	65	8	7	9	10
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1	23	46	55	80	83	90	2	5	8	9
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MUTATION OPERATOR

- Flipping Method
- Flipping of a bit involves changing value to available different value in the pool on a mutation chromosome generated



REPLACEMENT METHOD

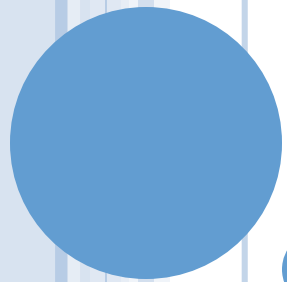
- Used Steady State Update method with replacing worst member in the current generation
- Increase the Genetic drift

ELITE PRESERVING OPERATOR

- Reserve current fittest team into next generation
- In this way, not only best solutions of the current population pass into the next generation, but they also participate with other members of the population in creating offspring

TUNING GENETIC ALGORITHM PARAMETERS

- Change Tournament size
- Change Crossover probability
- Change Mutation probability



IMPLEMENTATION

The left side of the slide features a series of vertical stripes in various shades of blue and grey. Overlaid on these stripes are several circles of different sizes in a medium blue color. One large circle is positioned near the top left, and several smaller circles are scattered below it, some overlapping the stripes.

THANK YOU

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