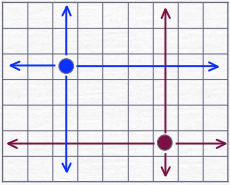


**Games Special-Session
SIGCSE-03**

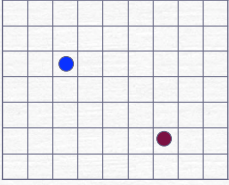
**David Ginat
Tel-Aviv University**

Laser War



Matrix $M \times N$, Robots – Red, Blue
Each move - horizontal / vertical
Fire-lines - horizontal & vertical
Crossing of fire-line – game ends

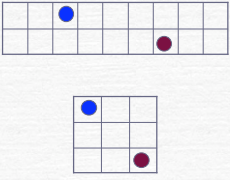
Laser War



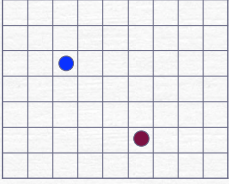
1. **Backtracking** through all the possible game scenarios
2. **Dynamic Programming** – up to $(M-1) \times (N-1)$ different-size rectangles between the robots

Laser War

Look for a playing strategy, by simplification

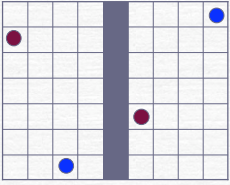


Laser War



Invariant property:
Horiz-distance = Vert-distance

Laser War



Two rooms, concurrently

Wyt Rooks

Each player chooses a rook and moves it any number of vertical xor horizontal spaces toward the X. Last to move wins (normal form).

Pawn on a Board

Each player moves the pawn, horizontally or vertically, to an adjacent square, which was not-yet-visited. Last to move wins (normal form).

Pawn on a Board

Invariant
+ Auxiliary coloring

Multiple by 2..9

Starting at $N=1$, two players multiply N by one of the integers $2, 3, \dots, 9$, in alternating turns. Free choice of one of these integers in each turn. The first to cross 1000 wins.

Example:
 $1 \square 5 \square 45 \square 90 \square 270 \square$

Multiple by 2..9

Backward reasoning:

1000+
 112 - 999
 56 - 111
 7 - 55
 4 - 6
 1

Application in Class

Motivate, Illustrate, Exercise:

- Invariance
- Design techniques, recursion
- Auxiliary elements
- Lookup table, pre-processing
- Mathematical patterns
- Problem solving heuristics