Solving N Qeens Problem Using Multiple Paradigm

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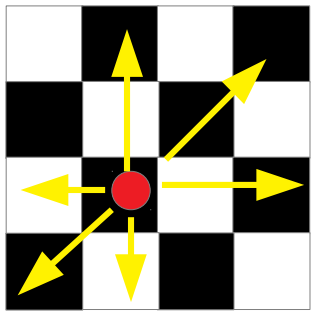
Outline

- Conbinatoric Problems.
- N Queen Problem.
- Backtracking Solution to 4-Queens Problem.
- N Qeen Implementation
  - Sol 1: C Programming
  - Sol 2: Java
  - Sol 3: Prolog
  - Sol 4: Haskell
- Final Discussion and Queries.

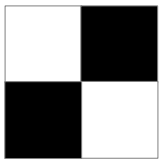
N Queen Problem

- Task: place ***N chess queens*** on an **N×N chessboard** so that no two queens attack each other.

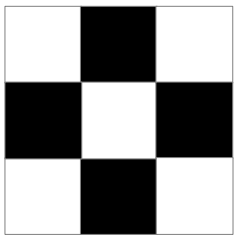
4 × 4



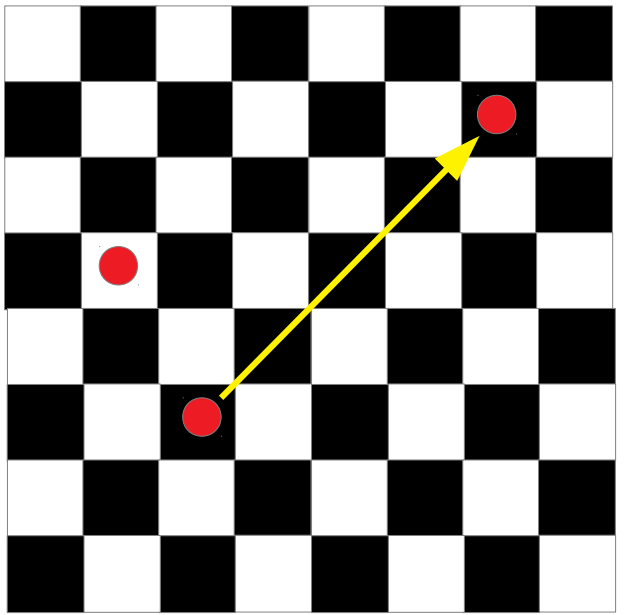
2 × 2



3 × 3



Standard Chess Board



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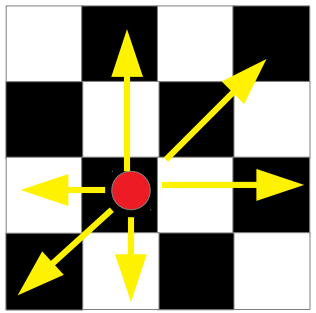

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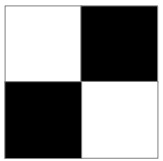

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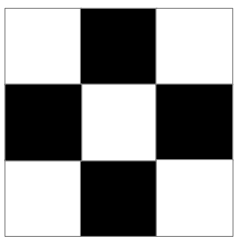

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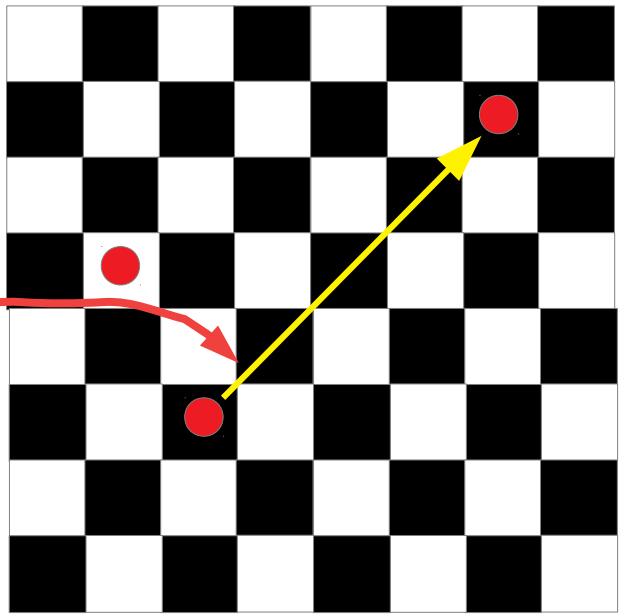
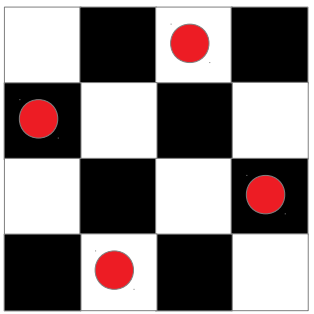


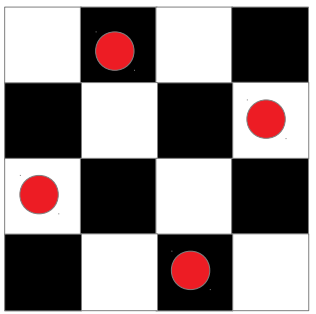
1 Queen pair attacking

4 Queen roblem Solutions

Solution Board configurations (4 × 4)

4 Queen roblem Solutions



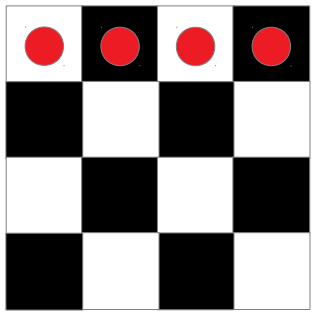


Solution Board configurations (4 × 4)

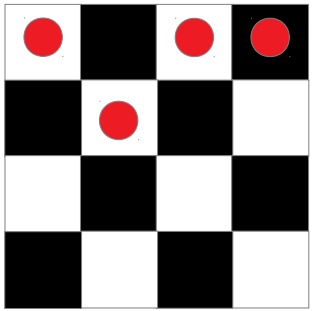
Generate and Test

- Generate and Test
  - Generate **Complete Placement of Q**
  - Test Validity
    - True got the solution
    - False Generate another **Complete Placement of Q**
  - Repeat above 2 steps until …..

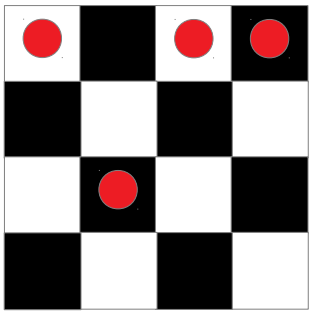
Generate and Test



1st Solution Generated



2nd Solution Generated



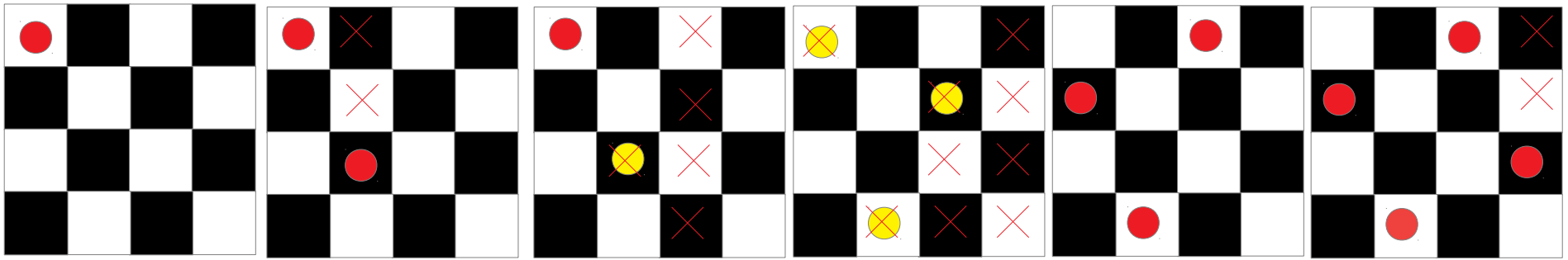
3rd Solution Generated

Backtracking Solution

1. Start Partial Placement of M<N Queens on N × N Board.
2. If currently placed Queens are **safe**

   then Place Next Queen in M+1 col and follow step 2
3. else **backtrack** ….. and continue with step 1

Backtracking Soultion



Step 1 Step 2 Step 3 Step 4 Step 5 Step 6

Reference

- Eight queens puzzle defnition, https://en.wikipedia.org/wiki/Eight_queens_puzzle
- Solving N-queens with Prolog , https://www.metalevel.at/queens/
- Video N-Queens in Prolog, https://www.youtube.com/watch?v=l_tbL9RjFdo
- N-Queens problem in Haskell, Christophe Delord, 24 May 2018, http://christophe.delord.free.fr/haskell/nqueens.html#source
- Solutions to N Queen in various Programming Paradigm, https://drive.google.com/drive/folders/1Tn9JDxWWmqQkRcRFvfNVPWAHVN1Q-e4V?usp=sharing

- Pre Lecture Quiz: https://forms.gle/L7e1i1kDmUi1Ugfz7
- Post Lecture Quiz: https://forms.gle/HcVub2McMtbnDnSg8