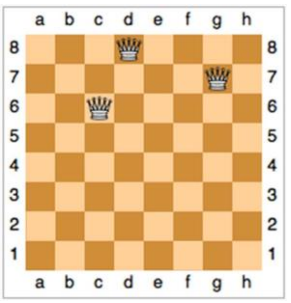
Hvor mange dronninger kan man plassere på et sjakkbrett uten at de truer hverandre og hvor mange løsninger fins det?



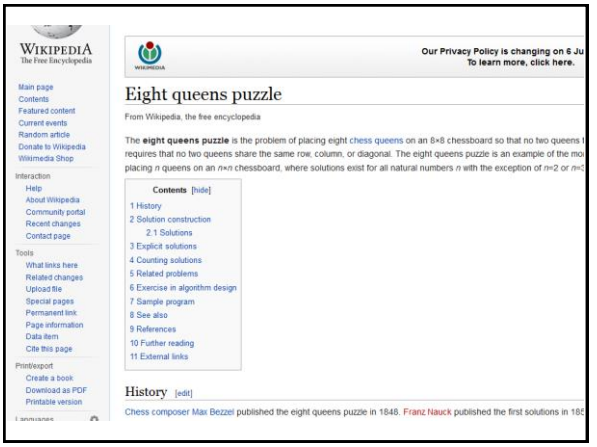
Program Development by Stepwise Refinement

N
E
Z

3. The 8-Queens Problem and an Approach to Its Solution[1]

Given are an 8 × 8 chessboard and 8 queens which are hostile to each other. Find a position for each queen (a configuration) such that no queen may be taken by any other queen (i.e. such that every row, column, and diagonal contains at most one queen).

Communications of the ACM -1971, nr 4



COMP
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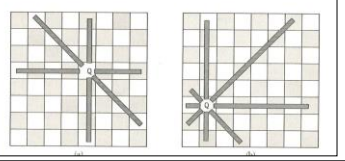
Projects and Study

NO. 4 THE EIGHT QUEENS PROBLEM

A famous problem of the fun-and-games category related to the game of chess is the eight-queens problem.* We shall first explain it for those not yet familiar with it. Our ultimate object is to develop an algorithm which when executed will not only produce one solution but will, in fact, generate all possible solutions (and there are many of them).

PROBLEM EXPLANATION

The name of the problem derives from the game of chess where the queen is a very special piece privileged to sweep across the board in a horizontal, vertical, or diagonal direction from any starting position, as illustrated in Figures 1(a) and 1(b). Any "hostile" piece lying in the path, or "sweep," of a queen is subject to capture. Because it covers so many squares in its "sweep" the queen is considered to be the most powerful piece on the board.



ML for the

```
> ["B", "BB", "BAB", "BBB", "BCB", "BAAB", "BBBB", "BCCB",
>  "BAAAB", "BABAB"] : string list
```

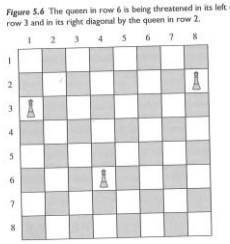
Again, we see the importance of a complete search strategy.

5.18 *The 8 Queens Problem*

A classic problem is to place 8 Queens on a chess board so that no Queen may attack another. No two Queens may share a row, column or diagonal. Solutions may be found by examining all safe ways of placing new Queens on successive columns. The root of the search tree contains an empty board. There are 8 positions for a Queen in the first column, so there are 8 branches from the root to boards holding one Queen. Once a Queen has been placed in the first column, there are fewer than 8 safe positions for a Queen

FOUNDATIONS OF ALGORITHMS

Figure 5.6 The queen in row 6 is being threatened in its left diagonal by the queen in row 3 and in its right diagonal by the queen in row 2.



Algorithm 5.1 The Backtracking Algorithm for the *n*-Queens Problem

Problem: Position *n* queens on a chessboard so that no two are in the same row, column, or diagonal.

STRUCTURED PROGRAMMING

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E. W. DIJKSTRA

17. THE PROBLEM OF THE EIGHT QUEENS

This last section is adapted from my lecture notes "Introduction into the Art of Programming". I owe the example—as many other good ones—to Niklaus Wirth. This last section is added for two reasons.

Firstly, it is a second effort to do more justice to the process of invention. (As a matter of fact I start where the student is not familiar with the concept of backtracking and aim at discovering it as I go along.)

NICKLAUS WIRTH

3.5. THE EIGHT QUEENS PROBLEM

The problem of the eight queens is a well-known example of the use of trial-and-error methods and of backtracking algorithms. It was investigated by C. F. Gauss in 1850, but he did not completely solve it. This should not surprise anyone. After all, the characteristic property of these problems is that they defy analytic solution. Instead, they require large amounts of exacting labor, patience, and accuracy. Such algorithms have therefore gained relevance almost exclusively through the automatic computer, which possesses these properties to a much higher degree than people, and even geniuses, do.

The eight queens problem is stated as follows (see also [3-4]): Eight queens are to be placed on a chess board in such a way that no queen checks against any other queen.

Using the schema of Eq. (3.29) as a template, we readily obtain the following crude version of a solution:

```
procedure try(i: integer);
begin
    initialize selection of positions for i-th queen;
    repeat make next selection;
        if safe then
        begin setqueen;
            if i < 8 then                                   (3.30)
            begin try(i+1);
```

MATHEMATICAL
RECREATIONS AND ESSAYS

W. W.
FELLOW OF TRI

THE EIGHT QUEENS PROBLEM†. One of the classical problems connected with a chess-board is the determination of the number of ways in which eight queens can be placed on a chess-board—or more generally, in which n queens can be placed on a board of n^2 cells—so that no queen can take any other. This was proposed originally by Franz Nauck in 1850.

In 1874 Dr S. Günther‡ suggested a method of solution by means of determinants. For, if each symbol represents the corresponding cell of the board, the possible solutions for a board of n^2 cells are given by those terms, if any, of the determinant

$$\begin{vmatrix} a_1 & b_2 & c_3 & d_4 & \dots & \dots & a_{2n-2} & b_{2n-1} \\ \dots & \dots & \dots & \dots & \dots & \dots & \beta_{2n-2} & b_{2n-1} \end{vmatrix}$$

vol. VIII, p. 140.

† On the history of this problem see W. Ahrens, *Mathematische Unterhaltungen und Spiele*, Leipzig, 1901, chap. ix.

‡ Grunert's *Archiv der Mathematik und Physik*, 1874, vol. LVI, pp. 281—292.

MACMILLAN
ST MARTIN'S
1922
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MATHEMATISCHE
UNTERHALTUNGEN UND S

Von

Dr. W. AHRENS

MIT 1 TAFEL UND VIELEN FIGUREN

LEIPZIG,
DRUCK UND VERLAG VON B. G.
1901.

Kapitel IX.

Das Achtkönigininnenproblem.

Ein guter Mathematiker ist ein guter Schachspieler.
JEAN PAUL. „Die unsichtbare Loge."
Erster Sektor.

§ 1. **Historische Einleitung.**

In der „Illustrierten Zeitung" vom 1. Juni 1850 findet sich unter der Rubrik „Schach" „Eine in das Gebiet der Mathe-
matik fallende Aufgabe von Herrn Dr. Nauck in Schleusingen".

1) Irrtümlicherweise wird diese Stelle stets als das erste Vorkommen unseres Problems citiert. Wie Herr E. Landau („Über das Achtdamenproblem und seine Verallgemeinerung", Naturw. Wochenschr. Bd. XI, 2. Aug. 1896) dagegen bemerkt hat, ist die Aufgabe vielmehr bereits in der Berliner Schachzeitung Bd. III, 1848, p. 363 von einem ungenannten „Schachfreund" gestellt worden. Catalan, der (Nouv. annales de mathém. 2ième série, t. XIII, 1864, p. 187) — jedenfalls infolge Druckfehlers — statt dessen Berl. Schachz. 1840 anführt, wird dieselbe Stelle gemeint haben. — Wenn wir trotzdem oben in der historischen Einleitung an jene Nauck'sche Behandlung anknüpfen, so bestimmt uns hierbei der Umstand, daß die Fragestellung in der „Schachzeitung" zunächst nur 2 spezielle Lösungen (s. Berl. Schachzeitung IV, 1849, p. 40) gezeitigt hat und anscheinend überhaupt kein sonderliches Interesse für unser Problem zu erregen vermocht hat, so daß jenes Blatt seine Leser noch 1854 mit einem Teil der Lösungen abspeisen durfte (s. Schachz. IX, 1854, p. 446), während dagegen in der „Illustr. Zeit." nicht nur alle 92 Lösungen zuerst richtig angegeben wurden, sondern auch von dort aus, wie oben dargestellt, die fruchtbarste Anregung ausging.

HISTORIA MATHEMATICA 4 (1977), 397-404

GAUSS AND THE EIGHT QUEENS PROBLEM: A STUDY IN MINIATURE OF THE PROPAGATION OF HISTORICAL ERROR

BY PAUL J. CAMPBELL,
BELOIT COLLEGE, BELOIT, WI 53511

Summaries

An 1874 article by J. W. L. Glaisher asserted that the eight queens problem of recreational mathematics originated in 1850 with Franz Nauck proposing it to Gauss, who then gave the complete

Dette var ett eksempel på hva du kan finne i biblioteket. Vi har mer!

til og med dette: