Programming Languages Programming

School of Applied Sciences and Engineering - EAFIT University

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Oct 2025

FINAL PROJECT - SYNTACTIC ANALYZER "PARSER" OF FEN POSITIONS FEN

VALUE: 16% OF THE FINAL GRADE OF THE COURSE.

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Notation FEN (Forsyth-Edwards): is a notation that allows you to obtain a snapshot (a specific position) of a chess game or problem.
It consists of a string of ASCII characters representing each of the rows on the board, separated from each other by the meta character '/'. Look at the following FEN string

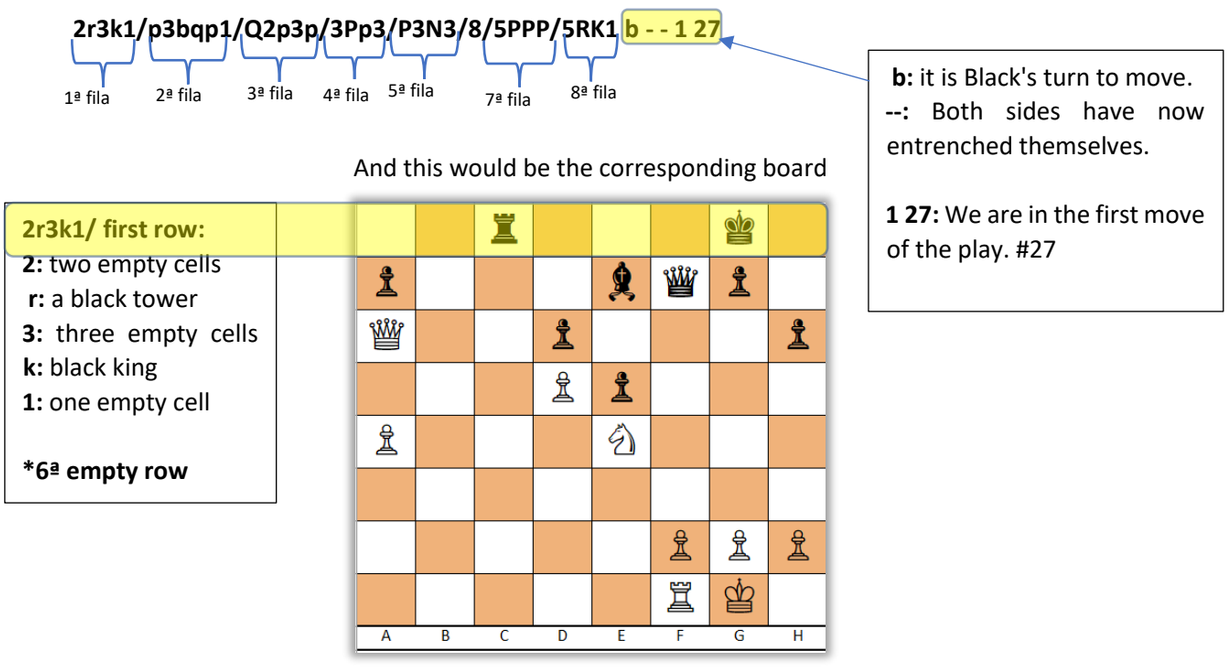

Fig1. Board generated from a FEN string

Chess pieces in characters UNICODE

♜ ♞ ♝ ♛ ♚ ♝ ♞ ♜ ♟ ♟ ♟ ♟ ♟ ♟ ♟ ♟

♙ ♙ ♙ ♙ ♙ ♙ ♙ ♙ ♖ ♘ ♗ ♕ ♔ ♗ ♘ ♖

FEN is governed by the following grammar in BNF[1]:

<FEN> ::= <Piece Placement>
' ' <Side to move>
' ' <Castling ability>
' ' <En passant target square>

[1] BNF para FEN tomado de: https://www.chessprogramming.org/Forsyth-Edwards_Notation

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' ' <Halfmove clock>
' ' <Fullmove counter>

A digit [1-7] between 1 and 7 represents consecutive empty squares.
Each piece is identified by a single letter: pawn = p, knight = n, bishop = b, rook = r, queen = q, and king = k. Capital letters [PNBRQK] are used to represent white pieces, while lowercase letters are used to represent black pieces [pnbrqk].

<Piece Placement> ::=
<rank8>'/'<rank7>'/'<rank6>'/'<rank5>'/'<rank4>'/'<rank3>'/'<rank2>'/'<rank1>
<ranki> :: = [<digit17>]<piece> {[<digit17>]<piece>} [<digit17>] | '8'
<piece> :: = <white Piece> | <black Piece>
<digit17> ::= '1' | '2' | '3' | '4' | '5' | '6' | '7'
<white Piece> ::= 'P' | 'N' | 'B' | 'R' | 'Q' | 'K'
<black Piece> ::= 'p' | 'n' | 'b' | 'r' | 'q' | 'k'

The move is indicated by a lowercase letter for White. ('w') or black ('b').
<Side to move> ::= {'w' | 'b'}

If neither side can castle, the symbol “-” is used; otherwise, each of the possible individual castles for the king and queen for both sides is indicated by a sequence of one to four letters.

<Castling ability> ::= '-' | ['K'] ['Q'] ['k'] ['q'] (1..4)

The box indicating en passant capture is specified after a double pawn advance, regardless of whether an en passant capture is actually possible or not [2] [3] [4]. Moves other than double pawn advances involve the symbol “-” for this FEN field..

<En passant target square> ::= '-' | <epsquare>
<epsquare> ::= <fileLetter>
<eprank>
<fileLetter> ::= 'a' | 'b' | 'c' | 'd' | 'e' | 'f' | 'g' | 'h'
<eprank> ::= '3' | '6'

The half-move clock specifies a decimal number of half-moves with respect to the 50-move draw rule. It is reset to zero after a capture or a pawn move and increases otherwise.

<Halfmove Clock> ::= <digit> {<digit>}
<digit> ::= '0' | '1' | '2' | '3' | '4' | '5' | '6' | '7' | '8' | '9'

The number of complete moves in a game. It starts at 1 and increases after each move by Black.

<Fullmove counter> ::= <digit19> {<digit>}
<digit19> ::= '1' | '2' | '3' | '4' | '5' | '6' | '7' | '8' | '9'
<digit> ::= '0' | <digit19>

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Instructions:

Create a parser for FEN strings, according to the specified grammar (see https://www.chessprogramming.org/Forsyth-Edwards_Notation) in your preferred language. The program should request a FEN string and validate whether it is a string allowed within the grammar, in which case it should be reflected by painting the board (graphical interface), otherwise it should display the message "Invalid FEN string" and indicate the type of error thrown by the parser when processing the tokens (lexer) of the entered string. For example, the following string would not comply:

2r3k7/p3bqp1/Q2p3p/3Pp3/P3C3/8/5PPP/5RK1

"The first row has more squares than allowed in a row on a chessboard."

Assessment:

- Program running with all requirements (30%)
- Presentation of the project in person (70%)

Note 1: You can use Unicode characters to paint the board, but it is an added value to generate png images for the chess pieces.
Please share the project through the GitHub repository, including a 'Readme.md' file (Markdown format) with the names of the members, a description of the project, the programming language used, and the minimum operating requirements.

Note 2: This project can be developed by one or two students. Deadline for submission Week 16 of the course (see calendar in Interactiva).
Coordinate with the teacher regarding the presentation of the project.

Support material:

• Excel file created and provided by the instructor for processing FEN strings.

• Sample code, material on regular expressions, and repositories shared by the course instructor in class.

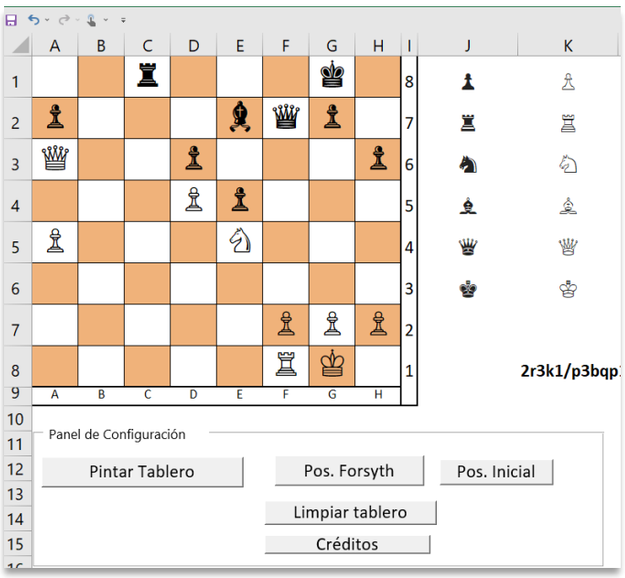

Fig2. Chessboard in Excel generated from a FEN string, by Alexander Narváez

" Men must once have been demigods; otherwise, they would not have created chess.".

Alexander Alekhine