



Este estudo tem por objectivo facilitar a implementação de um algoritmo funcional capaz de gerar grelhas *sudoku*. Como tal será pouco extenso e sucinto. Aqui estão as regras do jogo:

Regras:

- A grelha é composta por uma matriz 9x9.
- A cada matriz 3x3 contida na grelha chamamos caixa.
- Existem 9 caixas que serão designadas por letras maiúsculas de A a I.
- Cada caixa deve conter todos os números entre um e nove.
- Cada linha deve conter todos os números entre um e nove.
- Cada coluna deve conter todos os números entre um e nove.
- Cada elemento será identificado pela maiúscula correspondente à sua caixa e à minúscula correspondente à sua posição na caixa conforme a seguinte figura:

A _a	A _b	A _c						
A _d	A _e	A _f		B			C	
A _g	A _h	A _i						
	D			E			F	
	G			H			I	

Parece razoável admitir que sorteando aleatoriamente a caixa A não perdemos possibilidades de grelhas já que todas as combinações de números continuam a ser possíveis. Iremos então adoptar esta estratégia:

1. Sortear a caixa A.



Seguimos para preencher o quadrado B e D visto ambos serem directamente condicionados pelos elementos de A. Temos que nos certificar em B (e em D) que nenhum elemento é repetido na mesma linha/coluna.

Qualquer número contido na primeira linha de A deve aparecer na segunda ou terceira linha de B. Qualquer número contido na segunda linha de A deve aparecer na primeira ou terceira linha de B. Qualquer número contido na terceira linha de A deve aparecer na primeira ou segunda linha de B. O mecanismo repete-se para a caixa D com a diferença de ser relativo a colunas.

A _a	A _b	A _c						
A _d	A _e	A _f		B			C	
A _g	A _h	A _i						
	D			E			F	
	G			H			I	

2^a, 3^a linha/coluna
1^a, 3^a linha/coluna
1^a, 2^a linha/coluna

São muitas as combinações agora possíveis, para isso basta que nos certifiquemos que não se repetem elementos na mesma linha.

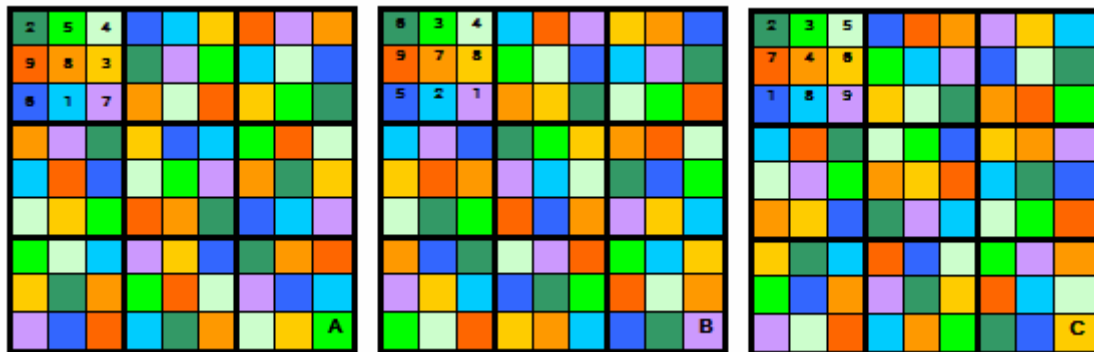
2. Evitar elementos repetidos nas mesma linhas nas caixas adjacentes a A.



Estamos agora perante uma situação de fácil resolução. Basta:

3. Preencher as restantes linhas/columnas com elementos entre 1 e 9 em falta.

Perante a aparente complexidade do seguimento da nossa tarefa pesquisamos algumas revistas/jornais donde obtemos estas 3 grelhas solução:



Da análise destas grelhas retiramos algumas pistas, que confirmaram o que dissemos anteriormente:

- A criação da grelha pode, de facto, seguir as normas que estabelecemos até aqui.
- Existe mais do que uma grelha solução para o *sudoku*.

Contudo, pelo menos à primeira vista, não existem outras formas (que não as matemáticas) de resolver o problema. Procuramos em vão similitudes ou falhas, mas aparentemente não existem. Este facto parece-nos coerente já que se houvesse um “truque” para jogar *sudoku* o jogo seria forçosamente menos popular.

Seria fácil usando as matrizes solução a resolução do problema, mas essa não vai ser a nossa estratégia já que tornaria o jogo “viciado”.

Após muitas tentativas chegamos à conclusão que é possível, através de uma estruturação cuidada, elaborar o algoritmo criador de grelhas de *sudoku*. Depois de termos criado as caixas A, B, C, D, G existem bastantes soluções possíveis para as restantes caixas. Queremos criá-las o mais aleatoriamente possível, sendo assim fieis ao jogo e evitando truques de utilizadores mais experientes. Estas tentativas mostram-nos a razão pela qual o código de cores que tentamos usar para análise não resultou.

Iremos agora demonstrar a criação duma tabela *sudoku* passo a passo elaborando seguidamente o respectivo algoritmo. Tentaremos simular as



circunstâncias de aleatoriedade que seriam características do algoritmo. Para tal usaremos como base a grelha solução retirada da revista que chamamos A e mostraremos que E, F, H e I podem ter de facto outras soluções para os mesmos A, B, C, D, G.

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Sortear os dois restantes elementos e inseri-los aleatoriamente num dos 5 quadrados restantes.

Pegar na terceira linha de A.

Sorteá-los e inserir o primeiro aleatoriamente num dos quadrados superiores restantes da grelha B.

Sortear os dois restantes elementos e inseri-los aleatoriamente num dos quadrados restantes.

Pegar na segunda linha de A.

Sorteá-los e inserir o primeiro aleatoriamente num dos quadrados sem ser os da fila central.

Sortear os dois restantes elementos e inseri-los aleatoriamente num dos quadrados restantes.

(Do mesmo modo se cria D com a particularidade de nesse caso se falar de colunas)

Pegar na primeira linha do nosso *sudoku* e avaliar quais os números entre 1 e 9 em falta.

Sorteá-los e inseri-los na primeira linha de C.

Pegar na segunda linha do nosso *sudoku* e avaliar quais os números entre 1 e 9 em falta.

Sorteá-los e inseri-los na segunda linha de C.

Pegar na terceira linha do nosso *sudoku* e avaliar quais os números entre 1 e 9 em falta.

Sorteá-los e inseri-los na terceira linha de C.

(Do mesmo modo se cria G com a particularidade de nesse caso se falar de colunas)

Pegamos no primeiro elemento da caixa E e analisa-mos que valores ele pode tomar.

(Fazemos isto para todos os elementos restantes da caixa E assim como da F, H, I.)

Fixamos no primeiro elemento de E.

Enquanto a grelha não tiver preenchida:

| Sorteamos uma das soluções desse elemento.

| Analisamos todos os elementos nessa linha, coluna e caixa e retiramos esse valor das soluções.

| Passa-mos ao próximo elemento dessa linha. (Se não houver mudamos de coluna)