

Burger run

A directed graph solution to a *New Scientist* puzzle

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2020-06-13

Introduction

Constructing the graph

The grid has 25 nodes and 40 edges (20 horizontal and 20 vertical). These form a directed graph because it is allowed to drive down or right only. Seven of the edges are defined as “Big Burger” edges.

Although it possible to construct the graph by creating 25 node objects explicitly, it is more compact to create a list of vertices in a loop construct. Indices $i = [1..5]$ and $j = [1..5]$ are used to identify grid intersections in the vertical and horizontal directions respectively. Each node is labelled as $N_{i,j}$ and the index of node $N_{i,j}$ in the list is $5(i - 1) + j$.

Similarly, edges (arrows) are constructed more compactly in a list, with horizontal edges being labelled H_{ij} (the horizontal edge joining node $N_{i,j}$ to node $N_{i,j+1}$) and the vertical edges similarly as $V_{i,j}$.

```
# create vertices
V <- list()
for (i in 1:5) {
  for (j in 1:5) {
    V <- c(V, Node$new(paste("N",i,j,sep="")))
  }
}
# create edges
E <- list()
for (i in 1:5) {
  for (j in 1:4) {
    E <- c(E, Arrow$new(V[[5*(i-1)+j]], V[[5*(i-1)+j+1]], paste("H",i,j,sep="")))
  }
}
for (i in 1:4) {
  for (j in 1:5) {
    E <- c(E, Arrow$new(V[[5*(i-1)+j]], V[[5*i+j]], paste("V",i,j,sep="")))
  }
}
# create graph
G <- Digraph$new(V,E)
```