

Automatic generation of diagrammatic subway maps for any date with Maple

Alberto Almech¹, Eugenio Roanes-Lozano²

The second author was one of the authors of a computer package written in Maple that could automatically generate railway maps of a network for any date. This package was presented at ACA'2008 and its design and implementation is described in [1]. Each section of the network was coloured accordingly to its characteristics (single / double track, electrified / non electrified, opened / closed / greenway,...). The position of the nodes (stations, junctions,...) was obtained from a list of geographical coordinates.

The work presented here deals with a similar although not identical case: subway networks are treated as graphs with the help of a computer algebra system in order to obtain the diagrammatic map for any date.

Most metro network plans follow more or less closely the ideas introduced by Harry Beck in his diagrammatic design of London subway map (the distances between stations and geographic orientation of the lines don't have to be respected, as the clarity and the number of stations between two stations is the key information to be visualized).

Therefore allocating nodes is far simpler, and we have decided to manually allocate the stations on a predefined grid.

The situation is also simpler because all lines are double track and electrified. For instance in Madrid subway there are minor differences between lines, such as the kind of catenary (classic or rigid), the gauge (narrow / broad),... that will not be considered here. Each node and edge of the graph has dates associated: inauguration date / closure date –the latter if applies.

The package takes advantage of the simplifications w.r.t. [1] mentioned above and the features of *Maple's Networks* package. This way the approach, although general, can be implemented in relatively few lines of code.

We know of no other similar works.

The work is illustrated with the case of Madrid subway network, one of the biggest ones in the world.

Keywords: Graph theory, Network models, Diagrammatic maps, Subways

Mathematics Subject Classification 2010: 68R10, 90B10, 90C35

References

- [1] E. ROANES-LOZANO, A. MARTÍNEZ-ZARZUELO, A. GARCÍA-ÁLVAREZ, M. J. WESTER, E. ROANES-MACÍAS Automatically Obtaining Railway Maps from a Set of Historical Events *RACSAM (Revista de la Real Academia de Ciencias Exactas, Físicas y Naturales, Serie A, Matemáticas)* **105**(1), 149–165 (2011). DOI 10.1007/s13398-011-0010-1

¹Facultad de CC. Matemáticas, Universidad Complutense de Madrid
Plaza de Ciencias s/n, 28040-Madrid, Spain
albermech@gmail.com

²Instituto de Matemática Interdisciplinar &
Depto. de Álgebra, Geometría y Topología
Facultad de Educación, Universidad Complutense de Madrid
c/ Rector Royo Villanova s/n, 28040-Madrid, Spain
eroanes@mat.ucm.es