

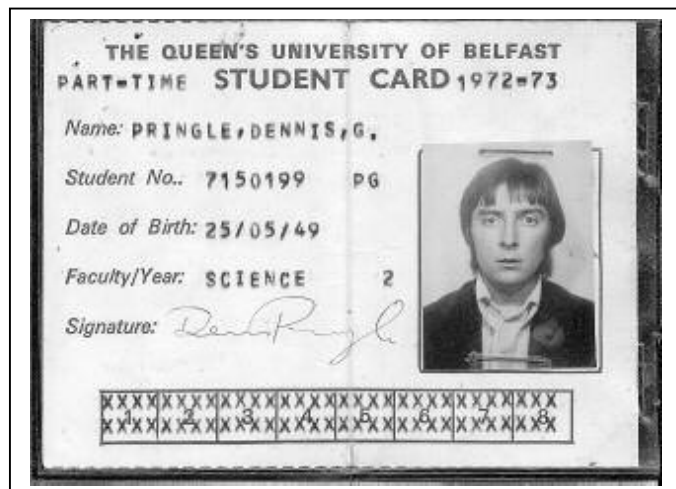
WAS THE QSMS IRELAND'S FIRST GIS?

The Northern Ireland Community Relations Commission was established during the early stages of the Troubles in the North. When it began its field operations in 1970, there was a serious shortage of the sort of information that was required to plan the Commission's programme of community development. Dr. Fred Boal, in the Department of Geography, Queen's University, was therefore invited to carry out an investigation into the spatial distribution of 'social malaise' (i.e. social deprivation) in the Greater Belfast area, based on similar studies which were then ongoing in Liverpool, Leeds and Glasgow. The Community Relations Commission provided the funding for one research assistant (myself), whilst the University provided the funding for a second recent graduate (Paul Doherty). Paul and myself started work on the project in the summer of 1971 under the direction of Fred Boal. The project finished in the summer of 1973.

The Social Malaise project was similar to many of the social indicator studies which came into vogue in the Republic in the 1990s – i.e. information on the spatial distribution of a number of individual indicators was combined into a composite index using Principal Components

Analysis. The main difference was that instead of using area census counts, the Social Malaise project collected information on individuals experiencing social deprivation or, in some cases, exhibiting 'deviant'

behaviour. Information was therefore collected at an individual level on male, female and juvenile unemployment, children taken in care by the welfare authorities, infant mortality, general mortality, juvenile offenders and illegitimate births. We ended up with information on a total of 20,563 individuals. Other information at an areal level (e.g. housing overcrowding) was integrated from census and other sources.



It became obvious at an early stage that in order to handle this amount of information we would need to use one of these new fangled computer things. There was no existing software available, so Paul and myself were packed off to a FORTRAN course, which (if my memory serves me correctly) ran for one hour per day for 5 days. Equipped with 5 hours of training, and a really excellent 20 page mimeographed handout, Paul and myself set about writing the programs required to convert our information on individuals into maps.

One of the first problems we had to face was to assign each individual case an areal code. In fact, we used two different types of areal identifier. The 1971 Northern Ireland census was collected for 100 metre grid squares. The idea was that these squares could be aggregated into areas of any size or shape, thereby eliminating the problems caused by boundary changes when comparing population changes between different censuses. I am not sure what happened to this innovative departure, but as far as I am aware it was not repeated in the next census in 1981. We decided that 100 metre squares would be too small for our purposes, so we assigned each of our individual cases to a 200 metre square.

Whilst providing a fairly fine mesh, grid squares take no cognisance of social divides (or, equally important in the context of Belfast, sectarian divides) on the ground. We therefore used a set of specially defined irregularly shaped, but similarly sized, small areas, which became known as SMP (Social Malaise Project) zones. These were aggregates of smaller areas which had previously been defined by transportation and planning consultants. The Belfast Urban Area was divided into a total of 97 SMP zones, each of which contained a minimum of 750 households to minimise the problems associated with small numbers.

Having decided on our spatial framework, we then had to allocate two areal identifiers to each of our 20,563 individuals. It did not take us too long to realise that locating each address on large scale OS maps one at a time was going to take forever. We therefore decided to bite the bullet and create our own 'GeoDirectory' – the Belfast Urban Area Codebook – by working through each large scale map sheet listing the house numbers in each street within each 200-metre grid square and SMP zone. Some of the newer housing

areas were not fully mapped, so to complete the job we had to map some rather scary housing estates by foot, hoping that our maps would not make us look too much like the army. It is amazing how confusing Radburn planning can be when you are trying to get out of somewhere in a hurry!

Once we had area codes for each of our individuals, the next step was to transcribe the information onto coding sheets. In those days computer users did not use keyboards, mice or monitors. All the data and, indeed, the programs themselves, had to be transferred onto punched cards – one card per line of data or program. Decks of punched cards were left overnight to be run, and if the program ran successfully they were returned the next day wrapped up in the line printer output. There were no magnetic devices for storing the data or program files (at least not for ordinary mortals) - so everything had to be stored on punched cards which could be fed into the computer using a card reader. The data and programs for the Social Malaise Project occupied somewhere in the region of about 30 boxes of cards, each of which I reckon must have contained about 1,000 cards. We had to transcribe the input data and the program source code onto special coding sheets which were submitted to trained operators to be punched up. Each card was in fact punched twice to check for errors. I often wonder what happened to the punched card operators when magnetic storage devices became available a few years later. They presumably became redundant, which must have come as a relief as it is difficult to imagine any job being more boring than being a punched card operator.

At some stage, Paul and myself drifted into a mutually agreeable division of labour. I spent most of my time writing the software to process the data, whilst Paul did most of the actual work in terms of editing and cleaning the data, analysing it and writing up the results. To process the data, we began writing a series of FORTRAN programs which became collectively known as the Queen's University Social Monitoring System (QSMS). Being young and naive we did not appreciate the benefits of a good acronym. Nor, it seems, were we too good at spelling as the 'U' for 'University' somehow got lost from the abbreviated title.

The QSMS was essentially a suite of standalone programs which could be used to perform different tasks. However, by using standardised data formats for different types of data, the various modules could be used to do different tasks on the same sets of data – similar in some respects to the earlier versions of Idirisi. Although we did not have access to magnetic storage devices, the computer could be programmed to output data onto punched cards. This allowed us, for example, to write a module to count the number of cases in each area satisfying specified criteria using the areal coded individual level data and then output the results onto punched cards. These punched cards could then be used as the input for another module which might divide one set of counts by another to create rates, which could themselves be output onto punched cards. Given that we had quite a lot of ancillary information on each individual, the QSMS incorporated a number of other options for ‘normalising’ the data. For example, there were modules to calculate the mean value of a variable for all the cases in each area (e.g. the mean duration of unemployment, the mean age at death) and also to calculate the maximum and minimum values of variables in each area, densities (i.e. counts per unit area), rates of change over time, and so forth.

The punched card output could also be used as the input to an early version of SPSS (Statistical Package for the Social Sciences) - a general statistics program which the University acquired around this time. This avoided the need to write our own modules for Correlation analysis and, more especially, the more advanced techniques which we required such as Multiple Regression, Principal Components Analysis and Factor Analysis. Results from the SPSS analyses (such as correlation matrices, regression residuals, and factor scores) could themselves be output onto punched cards for further analysis / processing, either in SPSS or in the QSMS.

Our end objective, of course, was to map the spatial distribution of social malaise in Belfast. One of the earliest mapping programs - SYMAP - was available at that time in America, but it did not (as far as I am aware) become available in Ireland for another year or two. I therefore wrote a series of modules to map the data. The QSMS had a total of four mapping modules (logically, if unimaginatively, called Map1, Map2, Map3 and Map4). Map1 and Map2 mapped the data by grid squares, whereas Map3 and Map4

mapped the data by SMP zones. We did not have access to plotters or other graphical output devices, so all the maps were output on a line printer – a device that only printed text characters, but printed them a whole line at a time, resulting in very fast output. However, it was possible to program the line printer from moving onto the next line after it printed a line, thereby enabling different tones to be produced by overprinting different combinations of letters. Solid black squares, for example, were created by overprinting the letters O, A, H and V on top of one another. Light tones might be produced by printing full-stops. Line printers printed 10 characters to the inch horizontally and either 6 or 8 rows of text vertically. This created a few difficulties when attempting to draw the maps in the correct dimensions.

My first effort was a total disaster, although I must admit I was very proud of it at the time. I decided to map each 200 metre grid square as a 1 inch square (i.e. 10 characters by 8). Each 1 kilometre grid square, comprised of 25 (i.e. 5x5) 200-metre grid squares, was printed on a separate page. These 1 kilometre grid squares then had to be cut out with scissors and then stuck together with sellotape to create a map of the entire city. The problem was this map measured several feet across, so to detect any pattern it had to be viewed from a distance of about 20 feet. However, unless the line printer happened to have a new ribbon in it at the time of printing, the ink was generally too faint to see anything at all from a distance of more than a few feet. Also, assembling all the 1 kilometre squares in the right sequence and the right way up was not only time-consuming, but error-prone. An alternative mapping module, using a single print character for each 200-metre square, managed to display the whole city on a single page, but resulted in the map being stretched by 25 per cent in the north-south direction. However, after a few more developmental problems, we eventually produced results which were almost presentable, especially for the SMP zones (see figure).

Like most modern choropleth mapping programs, the QSMS provided a number of alternative methods for the determination of the class intervals (e.g. equal divisions of the ranges, quantiles, etc.). It also provided modules for drawing histograms and for calculating means, standard deviations, skew and kurtosis to help the user decide which

method for determining the class intervals was the most appropriate. The absence of such facilities in most modern GIS has always struck me as a curious omission.



In answer to the question raised in the title, it would clearly be stretching things to claim that the QSMS was a fully fledged GIS as commonly understood today. However, it did contain a number of elements which one might expect to find in a modern GIS. By integrating the data manipulation and analytical modules into a unified system, albeit one that had to be run in discrete steps, it was much more comprehensive than a simple mapping program. Also, whilst not automated, the

geocoding facilities provided by the Belfast Urban Area Codebook were an integral part of the system which was delivered to the Community Relations Commission on the completion of the project. I still believe the QSMS was very advanced for its time and not a bad achievement in less than two years for two fresh graduates starting from scratch.

Even if the QSMS is not accepted as a GIS,¹ I am reasonably confident that the QSMS may have produced the first computer-drawn maps in Ireland, given that (as far as I am aware) it pre-dates the arrival of SYMAP in Ireland. I am therefore staking my claim to fame! However, if anyone knows of any other computer drawn maps drawn around or before then (i.e. 1971/2), I would be very interested to hear about them.

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¹ Two of the QSMS's successors, namely Superfred and MUMMS, written in the late 1970s / early 1980s and mid 1980s respectively, have stronger claims to being regarded as a GIS, but that is another story.