MAGUS: Modelling Access with GIS in Urban Systems: An Application for Wheelchair Users in Northamptonshire.

Linda Beale, Hugh Matthews, Phil Picton, David Briggs.*

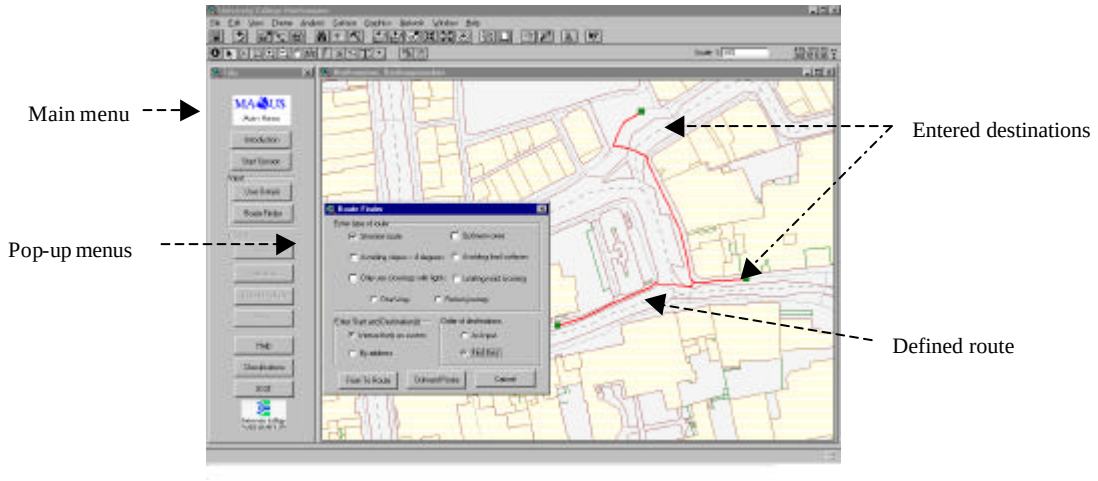
University College Northampton, The Graduate School, Nene Centre for Research, Park Campus, Northampton, NN2 7AH, UK. Tel: 01604 735500 Fax: 01604 791114
Email: hugh.matthews@northampton.ac.uk
*Department of Epidemiology and Public Health, Imperial College of Science, Technology and Medicine, Norfolk Place, London W2 1PG, UK.

The project aims to develop, test and apply a Geographical Information System (GIS) for modelling access for wheelchair users in urban areas. The principal focus is to provide a GIS system that will work as a decision support and mapping tool for urban planners. In addition, the system has been designed to encompass future developments, including use as a guidance device to help wheelchair users to assess and select optimal routes through the urban environment. The study employs and integrates two contrasting methodological approaches: social science techniques, aimed at investigating and quantifying the factors that need to be considered in modelling access to the urban environment by wheelchair users; and computer technologies (including GIS and AI) to translate these into an operational route assessment and modelling package. This tool is to be applied and tested in Northampton, U.K., using volunteers from both wheelchair users and urban planners.

Initially, 400 wheelchair users were contacted from across the county and invited to complete a postal questionnaire. To explore, more fully, emergent themes and issues three focus groups, of 6-8 participants, were convened. In addition, all wheelchair users were taken into a neighbouring car park for on-site observations. Aggregation of these results provided an overview of the those features that most impede, allow a further insight into how the configuration of built environments can often disadvantage those who are mobility impaired. Major barriers are those that relate to height, surfaces, gradient and lack of provision.

The second stage of the project is to use such data and precepts to define the GIS. Increasingly the role that GIS has to offer within both urban design [Singh, 1996; Dodge and Jiang, 97] and personal guidance system development [Golledge *et al*., 91; Golledge *et al*., 98] is being recognised. Using GIS the individual routes or access surfaces can be derived and the results output in both statistical description and map form. Network analysis also provides the capability for route modelling and route finding along networks.

The system is built entirely within ARCVIEW, using AVENUE scripts. Interaction with the system is permitted through a main menu. Navigation through the system is controlled, only permitting interaction at appropriate points i.e. controls only become visible as required. Further to the main menu, a number of pop-up menus are used. These menus control log-in, input of user details, route selection and eventually results' output. At the same time as access is permitted through any button on the main menu, icon buttons replicating these functions appear as required, should the user prefer to navigate by use of these. Differential 'log-in' procedures allow for the current needs of planners and offers the potential for future development for wheelchair users. User details are restored in the case of a wheelchair user, whilst a planner will enter new information on each occasion. Any user can alter any input throughout the session to redefine demands and routes.



The user may select a route in either of two modes; an optimal 'from-to route', or all wheelchair accessible routes outwards from a specified location. In selecting a route between points, a number of further choices are available so that if a number of points to visit have been entered, they can be re-ordered, if desired, to provide the 'best route'. These 'destinations' can be selected either interactively on a map or by entering the address, or name in the case of shops and public buildings.

The system will determine the optimum route for the user based on the accumulative weighting or 'impedance' of encountered urban barriers, and key input information such as wheelchair type and personal preferences e.g. avoiding slopes > 4°. The assigned impedance values have been determined using a combination of gathered qualitative data, field measurements and visual images. All this information is available on screen, throughout use of the system.

Throughout its' development the system is being evaluated by wheelchair users. This is currently being done through the collation of user feedback at workshops, but will eventually involve direct field validation within the study area.

References

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