THE COMPUTER MODELLING OF DEVELOPMENT PROPOSALS:
A ROUTINE PART OF DEVELOPMENT CONTROL

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Abstract. This paper describes and discusses the aims and practicalities involved in the computer modelling of contentious development applications becoming accepted as a routine part of the processes of development control. It uses three case studies drawn from the University of Adelaide’s work with the City of Adelaide in Australia to delineate the role of 3D computer models of proposed new buildings and their immediate surroundings in the public understanding of the streetscape, neighbourhood context, overshadowing and overlooking implications of the proposals.

1. Context: The City of Adelaide

Adelaide is the capital city of the State of South Australia and, with a population in the built-up area of about one million people, dominates the State. It is around 800 km northwest of Melbourne, the nearest large city, and 1300 km west of Sydney. The City of Adelaide itself is a prime example of a mid-19 century planned city. First settled by non-indigenous people in 1836, it became a fine example of late 19th century urbanism with broad streets set out in a regular grid. It is still considered to be one of the most attractive cities in Australia, although the redevelopment of the coherent relatively low-rise buildings of the 19th and early 20th centuries into the diverse (and often undistinguished) examples of commercial
mid to late 20th century architecture is widely held to have detracted from its charm.

In the 90's there has been relatively little development, but the preservation and enhancement of urban design qualities is still the subject of much debate. Any change is usually controversial, concern about aesthetic and environmental qualities being countered by calls for development in the interests of the economy and employment.

2. The City’s View

As part of the City of Adelaide’s ongoing Customer Service improvement programme, groups of three employees from different spheres of the Council’s operation are formed to review an activity or service that is, or might be, provided to internal or external customers. Essentially there are few restrictions placed on the scope of the projects that are selected, ranging from improving existing services, introducing new services or the complete re-engineering of a process. Such projects are fully supported by the Senior Executive Team who act as a steering Committee for all of the projects and each team is assigned one of the executive who acts as the team’s mentor. This ensures that the customer service teams remain focused on delivering outcomes, removing departmental barriers and encouraging the teams to challenge the status quo. The team in this case had the Chief Executive Officer as its mentor.

The project was “To carry out a feasibility study for the application of computer visualisation of Development Act applications” with the outcome of giving the City “the capability of providing the public with a communication medium for easy & accurate assessment of development applications”. This project was chosen because one of the team’s members works in the Building and Development assessment department, and was consistently faced with dealing with complaints from adjoining property owners who having viewed the plans had not understood the full impact of the development proposal. It was not until all the approvals had been granted and the buildings well advanced in construction that the impacts were starting to be understood. The simple fact is that most people can not read plans. This creates disputes and conflict between property owners and impacts on staff time. It is not unknown for design professionals to be mislead by submissions which have been produced to sell a scheme. Colorful perspective drawings and renderings show the projects in the best light, often using artistic license in terms of scale and impact.

Over an initial period of three months the City’s team:

- reviewed the existing practices within Council;
- conducted workshops with relevant Council staff;
- surveyed and interviewed adjoining owners that had notified 3rd party interests in developments over the past twelve months;
- interviewed the chairperson of the Council’s Development Assessment Committee (a Council Alderman);
- researched a number of cases which had led to complaints;
• reviewed the procedures with other capital cities;
• researched the market place; and
• trialed examples.

The feedback from Council staff was that:
• 3D Modeling would be a valuable tool;
• it would cut down on many manual tasks such as shadow diagrams and analysing over looking;
• it would be very beneficial with heritage work;
• it could be a tremendous urban design tool both in the application and testing of the urban design rules; and
• 3D models of development proposals would, however, need to be put into the context of surrounding development to be effective.

The feedback from residents and adjoining property owners previously involved with applications that had resulted in conflicts once development had started was that the use of 3D modeling:
• would have been helpful with previous applications in helping to understand the proposed developments impacts and identify the issues;
• provided a greater degree of understanding immediately;
• was better visually than a set of plans, particularly if animation was used; and
• most people interviewed confirmed that they could not read plans.

The feedback from the Chair of the Development Assessment Committee was that:
• 3D modelling would alleviate problems occurring when schemes are described in 2D graphics and with words;
• it would take away some of the mistrust of the bureaucrat or design professional when dealing with the public;
• the service must be on a user pays basis, either by passing the cost of the modeling on to the applicants or requiring models to be submitted as part of the standard process of submitting an application; and
• should be a commercially viable process allowing the City to sell data (ie geographic information and surrounding buildings and streetscapes) to developers and architects.

From this initial work there were a number of issues that needed to be worked through. These were:
• putting models into context with surrounding developments as models of new developments in isolation are of little value without the surrounding buildings, streetscape and topography. A 3D model of the entire City seems an appropriate approach.
• legal implications exist both in the accuracy of data provided by the City to applicants, in the veracity of renderings and animations and in copyright issues with regard to submitted designs.
• the appropriate level of detail and sophistication of 3D presentations. Too much detail greatly increases modelling time without increasing understanding of the relevant issues.
During the initial trialing discussions were entered into with the Architecture Department of The University of Adelaide to see what assistance could be offered in respect to this project. The University was enthusiastic to assist the City with this project in a number of ways. As well as the opportunity for the university to participate in a research project there was a greater opportunity for the development of a partnership between the two organisations and, as it turned out, with the State Government.

After presenting the initial results to the Steering committee for the Customer service projects and to Council, support was given to initiate a trial with live applications with the assistance of the University. The benefit to the project team of using the University was the ability of the University to act as and remain an impartial advisor who had access to a wide range of resources both physical and intellectual. The University is at or near the cutting edge of technology being applied in this area of design and is independent from solution providers. The Department of Architecture is linked with the Key Centre for the Social Application of Geographic Information Systems (a Federal Government, State Government and private sector backed organisation operating through The University's Geography Department). Through the Key Centre a 3D model of the CBD of Adelaide was developed (Kirkby et al. 1996a, Kirkby et al. 1996b, Kirkby et al. 1996c) using the City’s GIS building footprint and cadastral data, along with topographic information from the State Government.

![The Adelaide City Model](image)

*Figure 1: The Adelaide City Model  
(Key Centre for the Social Applications of GIS Systems)*

The University's recommendations (Woodbury, 1996) have been enthusiastically accepted by the City. The presentation of a major development application to the development assessment Committee received unanimous support and a good deal of press. At the time of writing this paper equipment and software were about to be installed and training initiated through the University. The training aspect has had a particular emphasis placed on it with the intention being that the University will work through a number real development applications to ensure that the City's development assessment team is taught not only the technical aspects of using the software but also understand the concepts of modeling as applied to architecture and urban design.
During the presentations it became obvious that great care is needed when using this type of technology because it is seductive and the processes involve in producing the end results need to be feasible in terms of time, cost and value to assessment process. With the high tech computer graphics that we see every day in the film and television industry expectations can soon out strip a local authorities ability to deliver when confined to development assessment time frames and limited budgets for equipment, software and staff time.

3. Case Studies

The University conducted four case studies, which were chosen for their contentiousness and complexity of site relations. The first case study was done retrospectively, after its development application had been approved. The subsequent three studies were successive versions of proposals for an addition to a hospital complex. For these, the modelling and presentation work was done as part of the development application process.

Case Study 1: A medium dense two story residential development on a major corner in a prestigious area of North Adelaide boasting large allotments with high building to site plot ratios. Issues included divergence from streetscape norms, limiting solar access on adjacent properties, and potential overlooking from first story balconies and windows.

*Figure 2: Proposed development and adjacent neighbours in North Adelaide.*

(modeller: Gwenda Braithwaite)
Case Study 2: An extension to an existing non-compliant institutional building in a quiet inner city residential area. The proposal included a multistory office building and adjacent three story carpark to be built on an existing parking lot landscaped with many mature shade trees.

*Figure 3: Proposed addition to existing hospital. The first of three proposals in this development application.*
(modeller: Krassimir Spassov)

Case Study 3: A revised proposal for the extension in case study 2, located in part on another area of the site, replacing an existing 3 story building with the new multi-story office building. The carpark was effectively reduced to two stories by pushing one story underground, but remains in the originally proposed location.

Case Study 4: A further revision of case study 3, modifying the massing and articulation of both the office building and carparking building in an attempt to quell objections made by area residents.

*Figure 4: An overview of the final proposal for the hospital addition. Existing condition at left, proposed extensions at right.*
(modellers: Robert Woodbury, Eleanor Huang, Gwenda Braithwaite)
4. Reflections on Process and Presentation

Given the current software market, there are several software combinations that can provide the needed modelling and rendering capabilities. There are both general and site-specific issues in selecting a particular suite of tools. Some of the most salient general issues are:

- A good renderer is essential. Abstract 3D models are effective in presentations and efficient to produce. This does not imply that renderings can be abstract. The rich texture, lighting and shadowing capabilities of relatively high-end renderers are important in creating communicative renderings and animations.

- Animation is important. Motion can make a number of phenomena, including sun shadows, overlooking and streetscape experience, much easier to comprehend.

- Customisation counts. A 3D modelling service for development applications will be subject to budget pressures and will involve repetitive work. Both point to the wisdom of automating as much of the service as possible. The usual customisation tools that accompany most CAD packages appear to be sufficient here.

- Ease of learning is important. Whether done by Council staff or externally provided, modelling of development applications are likely to be done by different people at different times and the suite of tools used will be different from those of production CAD (at least for the immediate future). A short learning curve is an important part of providing an efficient service.

More specific are issues of hardware compatibility with the City’s information technology enterprise and availability of local expertise.

Making modelling of development applications routine introduces other issues, both societal and technical. One crucial issue is that of legal liability, which is raised irrespective of how a modelling service is organised. Such a service replaces conjecture and implication with visual fact and in this process a legal responsibility for the veracity of that fact is created. Several steps in the process appear to introduce significant risk, especially context information in the form of a model of the city, design information from the applicant, the correctness of the modelling and renderings (especially sun-studies) and the choice of aspects to model.

An applicant for a development proposal has an inherent conflict of interest in providing a 3D presentation of an application. Like all media, modelling and rendering can be used to put a proposal in its best light. It may make most sense to put in place a formalised process of development application modelling to keep the modelling service and the applicant at arms length.

The costs of providing 3D models of developments must be borne by someone. In the current Australian context, that means the applicant for the development. The costs appear to be higher than those typically incurred in having a few perspectives prepared, but remain a small fraction of the costs of putting a development application to the Council. Whether costs are handled by an additional
charge on applicants or by a requirement to provide 3D presentations remains an open issue.

Even though there exist many software tools sufficient for the model building and presentation process, the problem of electronic transfer of data persists. Manufacturer's claims notwithstanding, the transfer of data between different systems remains fraught with difficulty and error. It is amusing that, from our experience, the most generally expedient method of data transfer remains manual input from scaled planning application drawings.

The modeller must be skilled at interpreting 2D information to accurately translate it into its 3D representational form. This initial stage, the evaluation of the documentation, can reveal oversights and discrepancies in the drawings which require expedient consultation with the designer or architect. Often the designer is aware of the vagueness of that particular aspect of the design (ie. how a roof actually works) and intends to work it out later in the design development stage once planning approval has been granted for the basic concept. Unfortunately, to create a realistic working model of the proposed building(s) the modeller requires a workable solution for the representation. This perceived flaw in the process can be transformed into an opportunity for the designer to explore a limited number of options through the model, which helps the designer appreciate the value of the model and ultimately results in a better final solution for the client. Taking advantage of this opportunity though requires that alterations to a development application be accepted during the process of modelling, leading to obvious problems of cost control and data validity.

Development proponents are normally somewhat wary about what a model may reveal about the proposal, but also very curious to actually see the building in a more understandable form. Until 3D modelling becomes an integral part of the planning approval process, attention to the concerns of the client must be addressed and balanced with a thorough exploration of what the model reveals about possible issues/problems the proposed development may cause on adjacent properties or even more generally in the neighbourhood or city at large. The modeller has a unique non-biased position, charged with revealing both positive and negative features of a proposed development.

5. Presentation Style

There are numerous vehicles available for presentation of the modelled material/results.

- Written reports generously littered with images of the model in its context.
- A dedicated Web site updated from within the council planning department making information on various development proposals under consideration available to the public for comment.
- Prerecorded slide shows or video presentations covering the project and its relevant issues, best used when the issues are clear and unanimously agreed upon. Large screen project is important in this context.
• Live computer presentation to small groups allowing a high degree of interaction between various participant and the driver of the model. This is the most exciting of potential uses for the model as it allows immediate exploration of "what if..." senarios provided the audience is willing to be patient while the requested changes are implemented and viewpoints are generated.

6. Public Presentation

Our recent presentation to the Development Assessment Committee of the Adelaide City Council raised several issues about how and what we present. In general the model did what it was designed to do, that is, inform the viewers in a more thorough way about what would be in place if the development was approved. The issue of incompatible scale was obvious from any angle, but the proponents had in their favour the existence of the present hospital buildings. It is unlikely that a development of the hospital's current size and scale would be permitted in this quiet residential area if it were proposed today. Sun shadowing and overlooking implications were clearly demonstrated, despite the architect's genuine efforts to minimise such intrusions, as opposed to merely trying to hide them behind clever perspective renderings. The model also revealed the architect's success in making the new administration building fit in well with its immediate surroundings, complementing the existing hospital buildings.

This said, the viewers revealed shortcomings in our choice of views and viewpoints, choice of limiting the buildings which cast shadows to the proposal alone for 'clarity', and lack of sufficient 'green stuff' to realistically represent all the buildings in their context. An interesting observation from one viewer gave us an idea for how to extend the usefulness of the model by including appropriate night time renderings of the proposed carpark which could reveal headlight intrusion into adjacent resident's bedroom windows.

7. A Tale of Two Institutions: Continuing Collaborative Research

At the time of writing, the City is continuing to develop ways and means to have, at least major, developments modelled in 3D at the time of their development application and is continuing to work with the University towards this end. Both players have their own goals. The City is concerned inter alia with the improvement of both its processes and the physical fabric of which it is comprised. The University sees inter alia opportunities for a virtual urban laboratory for students, for community service in development of a comprehensive model, and for research opportunities in the social and professional applications of technology. These goals appear to share objectives through the joint development of urban models and urban modelling expertise.
References


