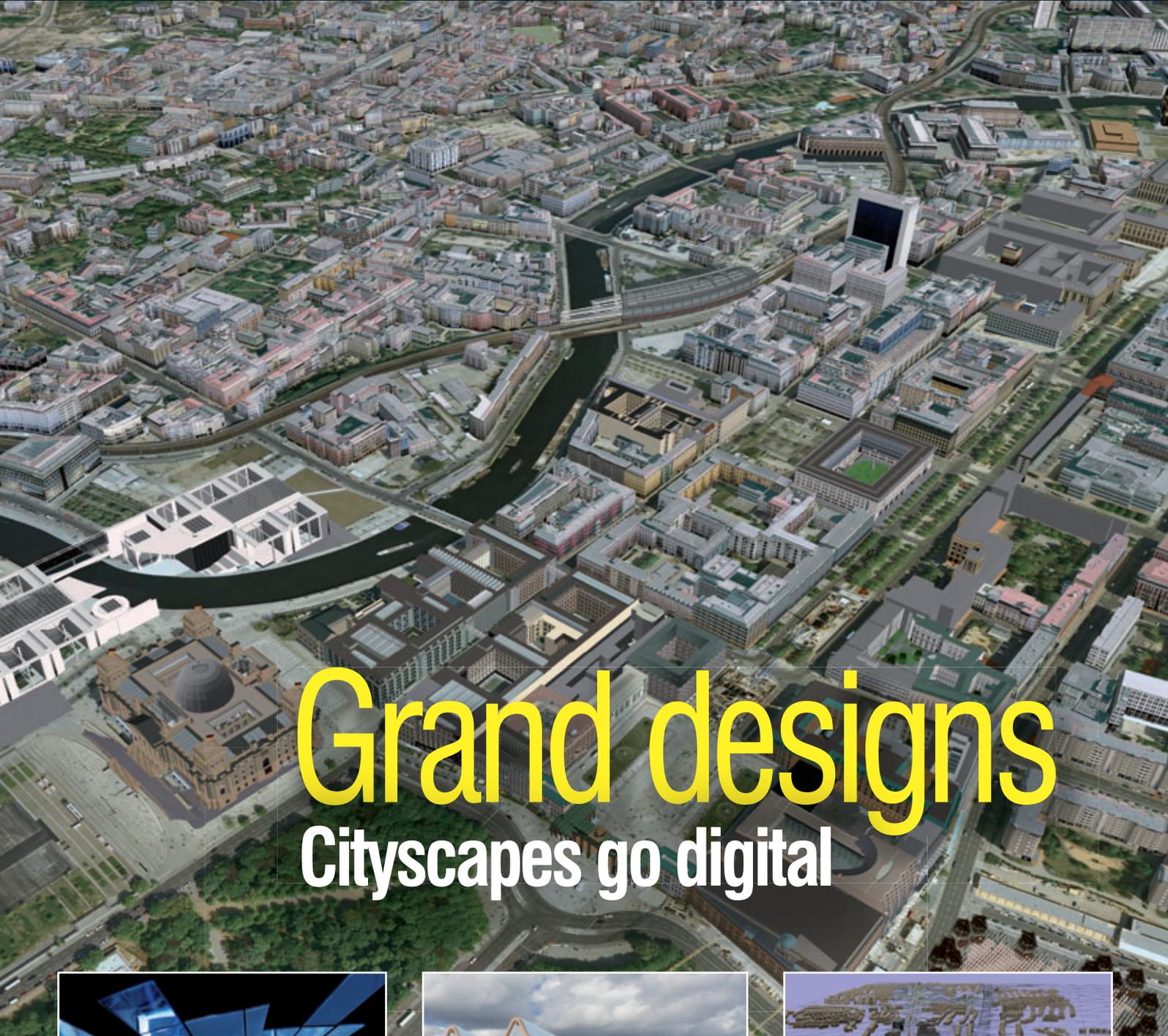


AEC MAGAZINE

DESIGN, MANAGEMENT & COLLABORATION IN THE BUILT ENVIRONMENT



Grand designs Cityscapes go digital



**A bright future for
AEC research**



**Environment watch:
Sustainable buildings**



**Digital terrain data
for the masses**

The Challenge: High-Performance Buildings The Solution: Bentley

geometry design geomet
sustainability generative components Architecture generativ
components geometry sustainabil
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geometry design



Image courtesy HKR Architects



Image courtesy CH2MHill (B-W Pantex-HVAC Design)



Image courtesy Thompson, Ventulett, & Associates

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Sustaining Infrastructure

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Salford University is one of the leading international research institutes for built environment technology. **Martyn Day** took a tour of its impressive facilities.



13 Report Gehry Technologies

Frank Gehry's Catia-based Building Information Modelling system, Digital Project, has been a slow burner since its launch in 2002. **Martyn Day** discovers that the software is being used on an increasing number of complex buildings.

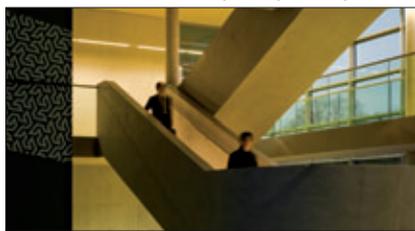
16 Review The lie of the land

Greg Corke reports on a new 3D dataset from the creator of NextMap Britain that has the potential to bring digital terrain modelling into the hands of the CAD masses.



24 Case study Squeaky clean

A new state-of-the-art cleanroom environment at Southampton University is providing students and visitors with a glimpse into the normally hidden world of microscopic engineering.



30 Case Study Sustainable buildings

New design concept balances environmental, economic, and social criteria for Wyevale Garden Centres' next-generation stores.

18 Comment Grand designs: Digital cities

There is a widespread industry move to adopt Building Information Modelling and intelligent 3D design. But, if the advantages are so clear, why stop with just the one building? Why not model the whole city? **Martyn Day** looks at the bigger picture.



27 Review EcoDesigner and Virtual Building Explorer

Originating from Hungary in 1982, Graphisoft's ArchiCAD is the most mature 3D BIM solution on the market. With a very loyal installed base over Europe and America, the company regularly produces updates and add-ons. **Martyn Day** evaluates two of the latest enhancements.

33 Case study Domestic bliss

Architecture & Design Services mastered MicroGDS and Piranesi from Informatix software in just two weeks to deliver its first residential project in 3D.

34 Workstations 3DBOXX 8500 Series and Lenovo ThinkStation S20

First a specialist workstation for high-end design visualisation, backed up with knowledgeable support, but let down by poor acoustics. Then a solid, well built, high performance CAD workstation, which still offers much for design visualisation and rendering. By **Greg Corke**.

Allied Images cuts price of SmartLF scanners



Allied Images, UK and Ireland distributor for Colortrac's large format scanners, has reduced the prices on the Colortrac SmartLF

Ci40 and Gx+42 scanners by up to 10% and included first year on-site warranty in the purchase price. The scanners use Contact Image Sensor – ideal for technical documents – or Charge Coupled Device - best for graphics – imaging technologies. Prices start at £3,495. www.allied-images.com

Cadsoft takes on photogrammetry solutions



Cadsoft Solutions has become a reseller for the Qualup SAS Photogrammetry Solutions, including PixDim and Rhinophoto.

PixDim is a Photogrammetry plug-In for Google SketchUp Pro which allows you to use your existing DSLR camera as a 3D digitiser / measuring device, while Rhinophoto is a similar plug-In for Rhinoceros which allows you to use your existing DSLR as a 3D digitiser / scanner.

www.cadsoftsolutions.co.uk

Isle of Wight engineers look for detail in road map

Isle of Wight Council is creating what is claimed to be the UK's most detailed road network map as part of a 850 million pound investment in the Island's highways. The digital map is being created using special mapping software from Mayrise Systems called MapNow that is linked to an asset database. The map not only provides information on every highway asset such as manholes, footpaths, road signs and bollards, but also describes their type, condition and value. www.mayrise.co.uk

Autodesk to offer 0% finance on software

Autodesk is offering 0% finance and nothing to pay for five months to help firms in the UK purchase new Autodesk design software or upgrades. The offer is made in partnership with Syscap, an independent IT finance provider. www.autodesk.co.uk

Autodesk to support software on Mac hardware

Autodesk is now officially supporting AutoCAD 2010 on Mac hardware running the Windows OS via Apple Boot Camp. Also supported on Boot Camp are 3ds Max Design 2010 and Autodesk Revit Architecture, Structure, and MEP 2010, among others. www.autodesk.co.uk

Bentley takes conference online as BE Connected goes live

The impact of the ongoing recession has been felt in many negative ways throughout our industry. Many events have been cancelled or postponed due to restrictions on travel budgets. Bentley Systems' annual BE conference was one such event, however the company has instigated a comprehensive, persistent online seminar series to replace it.

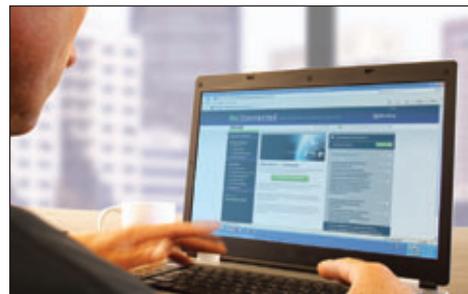
Called Be Connected (www.Bentley.com/BeConnected) the seminars are aimed at architects, engineers, builders, geospatial professionals, and owner-operators around the world. The website is a place to learn about the latest developments in Bentley's range of software solutions for information modelling.

Offering a mixture of over 150 live and on-demand programmes, the schedule covers everything from new technologies to best practice, with new content being added every week over a six month period. Understanding the pressures of time, each instalment is concise and to the point.

The Best Practices Seminars are presented by leading infrastructure professionals and bring a project perspective on best practices for the design, construction, and operation of specific types of infrastructure projects, including a series of seminars on each of the following: bridges, cadastre and land development, communications, electric and gas utilities, high performance buildings, mining and metals, oil and gas, rail and transit, roads, and water and wastewater.

The Product Seminars are given by Bentley's key product experts and designed for both current and prospective users. These sessions demonstrate the latest features and capabilities of Bentley's wide portfolio of MicroStation V8i software.

The first presentation of these hour-long seminars will include a live Q&A teleconference, giving seminar attendees



the opportunity to interact with leaders in the infrastructure professions. Each seminar will then be offered on-demand, allowing participants to attend multiple sessions at times of their choosing. In addition, customers can join discussion groups about the topics presented in the seminars on the Be Communities professional networking website, further extending the benefits and the insights gained in the seminar. Also every Be Connected participant will be provided with transcripts indicating seminars attended and Bentley Institute Learning Units earned.

Bentley has also assisted the SmartGeometry group to stream the majority of main stage presentations from the excellent SmartGeometry 2009 Conference, which took place in San Francisco on April 1st this year. The conference focused on generative design and building a vision for what the next generation of design tools will enable. Even if you don't use MicroStation, the presentations are highly inspirational, given by leading practitioners in architectural design and education, such as Hugh Whitehead (Foster and Partners), Jenny Sabin (Sabin and Jones), Mark Bury (RMIT), J Parish (ArupSport) and David Kasik (Boeing). www.Bentley.com/BeConnected

Virtual building site made for construction training



Simulation and visualisation experts at Makemedia have produced a range of immersive virtual reality environments for the ACT-UK Simulation Centre, a state-of-the-art training centre for construction managers which opens in Coventry in September.

The centre will enable construction managers to develop their skills through a combination of virtual reality computer techniques – recreating the construction process on site – and the use of actors. Trainees will work in actual construction site offices in the simulator hall and will have to deal with realistic site management situations with site personnel, colleagues, and members of the public played by actors. The 3D environments

created by Makemedia will be projected on the centre's 180° 12 metre-long panoramic screen. Trainees will use a joystick to 'fly' through the virtual building site, go inside properties under construction and inspect building work in detail.

Makemedia is producing the 3D virtual reality environments and providing the runtime software which will enable the graphics to be projected on to the simulator screen and run smoothly on the joystick. In addition, the company is supplying a web browser application which will be used as an assessment system by supervisors monitoring the trainees' performance.

The virtual reality environments recreate two actual construction developments – a housing estate in Coventry and a high-rise building in Birmingham. The company used more than 10,000 reference photographs taken during the construction of these two projects coupled with the architects' AutoCAD drawings in order that the 3D models are produced to the exact specifications of the original schemes. Many of the 3D models provide details which form a key element of those scenarios such as a badly-parked delivery lorry, wrongly installed down pipes and missing loft insulation.

www.act-uk.co.uk / www.makemedia.com



MicroGDS

From concept ...

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2D Elevation



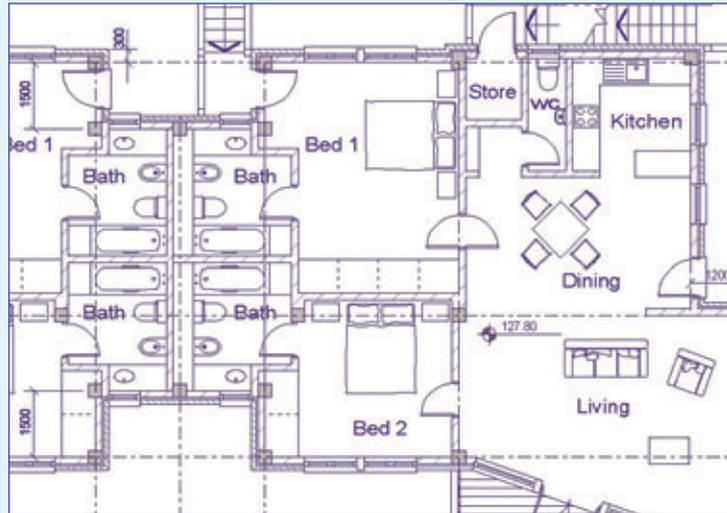
... to construction ...

Production drafting, presentation graphics, 3D modelling, and 3D rendering are all integrated in MicroGDS. You only have to pay once, and you don't need to waste time converting and managing multiple copies of your data.

... on any size project ...

Data capacity is unlimited, so you can grow your project team safe in the knowledge that they can all access project data simultaneously.

2D Plan



... in any organisation

If you need to exchange data with others, MicroGDS supports a wide range of formats including one of the best DWG/DXF translators on the market. There is also a .NET interface for customisation and application development.

The MicroGDS product family and its sister product Piranesi offer CAD users software that delivers a strong return on investment:

- Upgrade your software not your hardware, no need for expensive top-end workstations
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- Comprehensive training programmes available
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- Billions of pounds of PFI work under Design in MicroGDS

Please contact us for more information:

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Images courtesy of Jeff Radwell, Nigel Azis Ltd, London; TTSP, London; Hillier Architecture, USA; Scott Brownrigg, UK.



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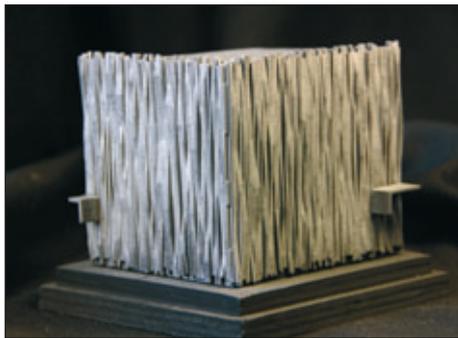
HOK invests in new printing technology from Z corp and HP

HOK Sport, one of the leading specialists in sports architecture, is using Z Corporation 3D printing technology to help improve the experience of fans attending events and the aesthetic appeal of landmark athletic venues around the world.

The company recently purchased the Spectrum Z510 multicolour 3D printer. "3D printing architectural models with the ZPrinter helps our clients better appreciate the designs we propose, and the models inject a 'wow' factor into our presentations," said Peter Friederich, director of HOK Sport's model shop. "Our ability to print intricate, high-resolution 3D models on demand throughout a project is also making us better at the fundamentals of what we do: creating the world's most exhilarating sports environments."

The company purchased the Spectrum Z510 in September 2008 and has used it in designs for dozens of projects, including the Kansas City Royals' ballpark renovation (Kauffman Stadium, Kansas City, Mo., USA, scheduled to open 2009), the Estadio de Fútbol Monterrey soccer stadium (Mexico, scheduled to open 2011) and the Pittsburgh Penguins hockey team's new arena (Pittsburgh, Pa., USA, scheduled to open 2010).

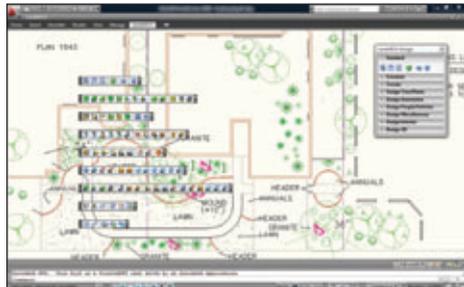
Meanwhile the London office of HOK architects has



Building facade at HOK Sport generated using a Z Corporation Spectrum Z510 multicolour 3D printer

invested in three HP Designjet Z6100ps printers, with a view to improving the efficiency of its pitch and production processes, the quality of materials for clients and to help adhere to the business' wider environmental objectives. The London office is also using HP DreamColor monitors in conjunction with the HP printers to help ensure that colours are accurately represented on screen and on the page. www.zcorp.com / www.hp.com

GlobalCAD updates tool for landscape architects



GlobalCAD has released LandArch 2010, the latest update to its integrated solution for landscape designers and architects who work with AutoCAD-based software.

LandArch includes 2D/3D design libraries, cost estimating and bill of material (BOM) tools, hatch pattern and linetype

libraries and authoring tools. 3D model libraries can be rendered directly within AutoCAD or exported to rendering programs such as 3ds Max. Coupled with LandArch's existing range of 3D landscaping libraries, the software boasts internal architectural libraries including furniture (office and home), accessories, kitchen fittings and sanitary items.

The software also includes terrain modelling tools for the creation of 3D surface terrains (with mesh and solids options) According to GlobalCAD this covers vast areas from almost any existing 2D or 3D survey data.

LandArch supports AutoCAD 2000-2010 including 32-bit and 64-bit versions and all vertical products including AutoCAD Architecture. The software is available from £349 for a single license and multi-user licensing options are also available.

www.globalcad.com

Bentley delivers AutoCAD-based electrical tool

Bentley Systems has released Bentley Building Electrical Systems V8i for AutoCAD, an intelligent AutoCAD-based electrical systems software for the integrated design and analysis, documentation, construction, and management of everything from power distribution and lighting systems to fire detection, security, communications, and other electrical/electronic systems. Developed for electrical engineers, designers, and contractors, the software also enables bidirectional interoperability with analysis programs, including Bentley's building performance analysis software.

Rob Whitesell, senior vice president, Building and Plant Products, Bentley Software, said, "A key advantage of this unique software offering is that it adds electrical design capabilities to a user's existing CAD environment, reducing costs and accelerating implementation. It also provides bi-directional compatibility with MicroStation, AutoCAD, and Revit, and offers an efficient migration path to 3D and Building Information Modelling."

www.bentley.com/BBESforACAD

Design competition calls for self sufficient cities



HP, together with the Institute for Advanced Architecture of Catalonia (laaC), has announced a global architectural design contest aimed

at emerging and professional architects. Under the theme of "Self-sufficient Cities," the third annual International Architecture Contest emphasises the importance of innovation for future environments. Judges will be looking for compelling innovations that reflect the ecological and technological needs of the future.

www.advancedarchitecturecontest.org

Autodesk introduces solar radiation analysis tool



Autodesk has made available the Solar Radiation technology preview on its labs website. The technology, allows users to study incident solar radiation on a building form within the conceptual massing environment and is available to all Revit Architecture and Revit MEP users.

labs.autodesk.com

3am Solutions releases Dynamite VSP v4.0



3am Solutions has started shipping Dynamite VSP v4.0, the latest release of its civil engineering visualisation solution for Autodesk 3ds Max Design. Reviewed in the March/April edition of AEC magazine, the software has the potential to revolutionize the role of design visualisation throughout the civil design process.

www.3am-solutions.com

CSC software optimised for Westok beams

CSC has enhanced the design solutions available for Westok beams within its Fastrak Building Designer, Fastrak Composite Beam Design and Fastrak Simple Beam Design software. All three Fastrak design products have been updated to accommodate the most recent design rules for Westok beams, which means that most designs can be completed within the Fastrak model.

www.cscworld.com

Informatix offers cash incentive to referrers

Informatix Software has launched an international referral programme in which anyone can earn up to £600 for every software licence of MicroGDS that Informatix sells. For more information contact Paul.Lloyd@informatix.co.uk



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www.tekla.com/uk

Océ unveils new generation wide format monochrome printer



Océ has unveiled the PlotWave 300, a brand new large format monochrome printer which is a direct replacement for the company's entry-level TDS 320 product. Designed for low-volume workgroups, the new machine prints 2.3 A0s per minute and is available with one or two paper rolls.

The PlotWave 300 is also available as a multifunctional

version that has a much smaller footprint than its predecessors as the colour scanner is stacked on top of the printer rather than being located to the side. However, according to Océ, the new system does not suffer from stacking problems typically associated with conventional single footprint systems, such as damaged drawings and documents in the wrong order. This is said to be due to its delivery tray being positioned on top of the system and using air separation to ensure documents are stacked in order and ready to use.

One of the most unique features of the PlotWave 300 is its ability to print from, or scan to, a USB memory stick, supporting a number of formats including TIF and PDF. This is likely to make it an attractive solution for site offices, where IT infrastructures are often lacking. The system also includes a number of green features, and according to Océ the purpose-built Radiant Fusing technology provides the most efficient way to fuse toner onto paper. The company also notes that the system starts up instantly, uses half the energy of comparable systems, emits virtually no ozone emissions, and there is no noise in standby mode.

www.oce.com/uk

Fulcro partners with MAP for CAD-Duct development

Fulcro, a provider of integrated design and engineering services for the built environment, has announced a partnership with Blackpool-based software house MAP on the development of CAD-Duct, the mechanical and electrical (M&E) systems design software. MAP relied on Fulcro's building-project skills to help develop the software, including the latest AutoCAD 2010-compatible version.

CAD-Duct enables designers to produce 3D models of buildings and their M&E systems to help ensure that services such as heating, ventilation and air conditioning (HVAC) and drainage and sanitation fit on site by giving the design team a real-world view of how they will look when installed.

Fulcro has already used the software on many building projects, especially in the healthcare arena. For example, the pipe work fittings in the plant room at Derby City Hospital (pictured), were configured and customised using CAD-Duct.



Ben Haldin, Managing Director of Fulcro, said, "CAD-Duct enables the design and construction team to view a virtual building with all the actual manufactured M&E systems in place so that it can examine all the operating, maintenance and cost issues before any on-site work begins."

www.fulcro.co.uk / www.cadduct.com

Management tool for steel fabricators enhanced

AceCad has released StruM.I.S .NET V7.3, the latest version of its management information system for steelwork fabricators. Offering processing, tracking, planning and reporting facilities through .NET software technology, StruM.I.S .NET is designed to streamline the estimating, procurement and fabrication process by providing interaction between departments, suppliers and clients.

StruM.I.S .NET V7.3 features the Microsoft style "Ribbon" toolbar for improved navigation, a brand new wizard for the creation of personalised and added search and report functionality associated with closed contracts, estimates and enquiries is also included.

The latest release also includes a new function called transaction interfaces which allows users to integrate purchase and sales invoices together with internal organisational costs and expenses into a number of 3rd party software accounting systems.

Finally, to further improve production automation and advanced system usage radio frequency (RF) bar coding functionality has been developed within StruM.I.S .NET V7.3 to enable workstations/users to rapidly move items through the production module - throughout the various stages of manufacture.

www.acecadsoftware.com

CADline delivers tips and tricks on YouTube



Autodesk software provider CADline is offering exclusive videos and articles for Autodesk, AutoCAD and Revit users. The free learning

aids have been developed in response to common queries, concerns and software issues faced by users. The videos are available on YouTube (www.youtube.com/cadlinemidas) or can be delivered to your inbox. tinyurl.com/lnrqb

BSI to hold Structural Eurocodes seminar



The Structural Eurocodes will replace their corresponding British Standards on 31 March 2010. To mark the changeover,

BSI is holding a conference aimed at helping businesses benefit from implementation demonstrating how to manage the change and how effective use can benefit businesses. "Preparing for Eurocodes Managing the Change" takes place at the CBI Conference Centre, London on 20-21 October 2009.

www.bsigroup.com/eurocodesconference

AutoTrack v8.52 features online vehicle libraries



Savoy Computing Services, developer of AutoTrack, the vehicle swept path analysis software, has released an update

that allows users to access online vehicle libraries. AutoTrack is supplied with over a thousand vehicles, but until now, new ones could only be made widely available in the next release of the software. Now, a link from the Vehicle Library Explorer, allows users to search online for new vehicles as soon as they are added. www.savoy.co.uk

New large-scale mapping programme launched in UK

The GeoInformation Group has introduced a new mapping programme called UKMap which is the UK's first commercially funded, large-scale topographic mapping and address database created completely independently of the Ordnance Survey.

Captured for use at 1:1,000 scale, UKMap includes buildings with 3D information, road detail including pavements, lane markings, and pedestrian crossings, and a full address gazetteer. It also has aerial photography and a detailed terrain model, derived from LIDAR and 3D building heights integrated into the mapping. This means architects have ready access to a 3D block model of the urban environment. www.theukmap.co.uk

Salford THINKlab

Researching the future of AEC

Salford University is one of the leading international research institutes for Built Environment technology. The press was recently invited to visit its impressive facilities and gain an insight into the types of projects and research its academics and students undertake. **Martyn Day** reports.

It seems like only yesterday the industry was making the slow and painful move from drawing boards to 2D CAD systems. A migration to 3D was just a pipedream and, while the industry knew that the mode of working was highly inefficient, nothing was being done about it. Yet in a very short space of time, the breadth and scope of 3D technologies available to architects and those working in construction has mushroomed, with a corresponding increase in appetite to understand and deploy this new thinking.

One of the driving factors for this U-turn is the extreme challenges the industry is facing, which have never been more serious or complex. The economic downturn has put tremendous pressure on firms to cut costs and find new work, often for reduced fees. It may have been more than 10 years since Sir John Egan published his Rethinking Construction report, which called for radical improvement within the construction industry, but it would appear that painful economic conditions have been more persuasive in getting the industry to evaluate better ways of doing its business.

Many of the new 3D technologies are still embryonic, with best practice and processes to be fully worked out. Enter Salford University and its futuristic virtual environment centre for research into interaction and collaboration, called THINKlab. The institution has been engaged by commercial and academic customers to look at virtual urban planning, regeneration and digital design. Based in the north west of England, it has strong contacts with local businesses, together with the wider academic research community. The recent press open day was an outreach to tell the story of Salford University's Built Environment research and explain a little about some of the projects the team has been working on.

As with nearly all British Universities, Salford campus is rather unremarkable with a mixture of 1960s and 1970s structures. There was little to prepare one for what had been done to the seventh floor of the Maxwell building. Walking out of the lift was like entering something from Star Trek with walls of lights, curved surfaces and glassed-off work areas. The THINKlab is a dedicated space where the Built Environment faculty has created a laboratory for research into technology-enabled collaboration and virtual technologies. Presentations were given in the THINKpod, an even more futuristic meeting room within the lab that bristles with the very latest

in high resolution projection, tracking and immersive stereoscopic hardware.

We were welcomed by Professor Peter Brandon, director of the THINKlab. According to Brandon, the THINKlab is a place to challenge the existing and prevailing orthodoxy, to find new ideas and the best technology to suit our needs, which could lead to a new era of enlightenment. Brandon highlighted advances in instant communication, knowledge-based systems, better integration of systems and the removal of geographical boundaries as being driving forces to provide new machine-based support for the creation of knowledge.

Salford University's vital statistics are impressive. Originating from the merger of multiple departments, the School of Built Environment was started in 2006 and now has 1,350 undergraduates and 309 postgraduates from 57 countries (175 of whom are doing PhDs). In total it has 69 staff, including 22 professors and 37 external visiting professors. Since 1993, Salford has been the base for the Foundation for the Research Institute of the Built and Human Environment and is the education partner for the government-sponsored Center of Education in the Built Environment (CEBE), as well as being the Centre for Construction Innovation, which links to 15,000 local firms. With a special focus on research, over the last five years Salford has brought in over £20 million in construction-related research funding.

The key areas of thought leadership that THINKlab is engaged in are wide and varied, and cover the threat of global warming, sustainable development, improved performance, changing social patterns and the change in the way built assets are managed. On pure technology development, expertise is being developed in Building Information Management, Virtual Environments, Future Workspaces, Off-site fabrication, distributed intelligence and procurement.

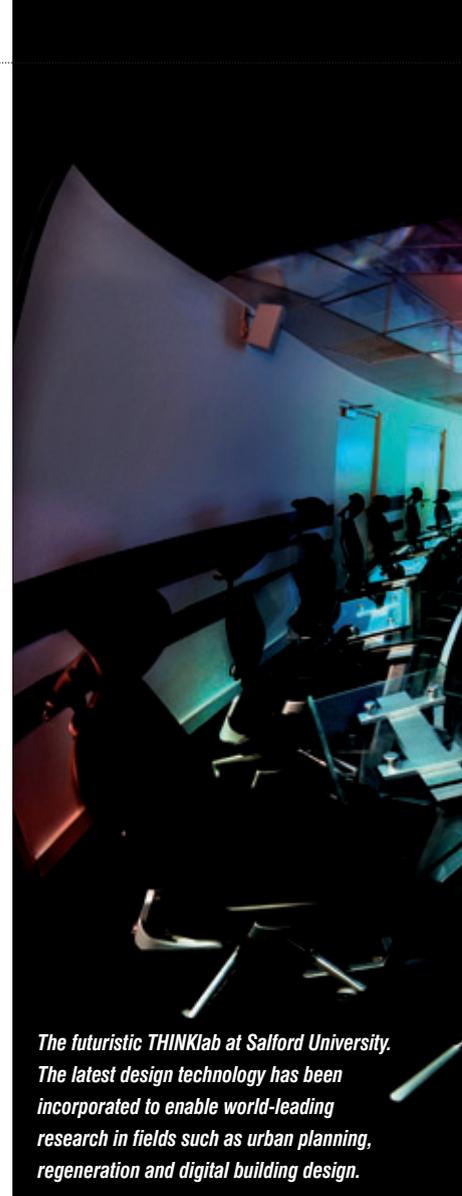
Following the introduction we were given a series of presentations by faculty members on a selection of the diverse range of projects that they are currently involved in.

Optimal learning spaces

Carl Abbott explained how Manchester City Council had asked for the latest ideas on the optimal design of primary schools. A team of experts from the built



Professor Peter Brandon, director of the Salford University THINKlab and director of strategic programmes, School of the Built Environment.



The futuristic THINKlab at Salford University. The latest design technology has been incorporated to enable world-leading research in fields such as urban planning, regeneration and digital building design.

environment faculty at the University worked with the council on all the key areas that influence learning, covering everything from air quality, use of light, colour, layout, plants and acoustics. The net result will be new designs for places that assist the learning process taking into account physical and social criteria.

E-Readiness and IT maturity

Professor Mustafa Alshawi examined the current process and implementation of Building Information Modelling (BIM) systems that use a master model concept, together with the sophistication of other business systems such as Enterprise Resource Planning (ERP). According to studies as much as 80%-90% of IT investments do not meet their performance objectives. Prof Alshawi has designed a program to measure a company's 'e-Readiness' prior to adopting process centric applications, checking the people, the organisation and the process to hopefully ensure a higher degree of success.

With an estimated market of £2 billion, rising to £20 billion in the next five years, a prefabrication research engagement was also highlighted by Prof Alshawi. ManuBuild, which makes pre-fabricated buildings, is looking to bring the building industry into the industrialised age by manufacturing pre-fabricated buildings and delivering them onsite. The development of training project simulators and



The THINKlab at Salford University has an impressive array of state-of-the-art immersive Virtual Reality technologies. These are even available in the 'Thinkpod' conference room, where built-in infra red tracking devices can provide computer/human interaction.



dashboards using PDAs for project managers was explored, concentrating on the kinds of dynamic decisions that are frequently made on site.

Future collaborative workspaces

Using all the power of the THINKpod, Professor Terrence Fernando took us into a Virtual Workspace to see the research work on co-located, distributed and mobile collaboration.

In one live urban planning scenario, a user could physically interact with a 3D displayed city model. While at first we could see him as a video feed within the environment, Fernando then enabled the extraction of 3D data from this video, actually bringing in a 3D representation of the user.

While quite jagged, the next phase involved mapping the user's face to a human head mesh. This is the closest you will get, for the time being at least, to living in the 'Matrix'.

Paul Welshman has spent the past 12 months working with the Specialist Schools and Academies Trust to produce interactive resources for 14-19 diplomas. Using games technology, children can cover the curriculum such as health and safety at work, site layout and management, as well as bricklaying.

Interactive learning

Over the past twelve months Salford has been working closely with the Specialist Schools and Academies Trust to produce interactive resources for 14-19 diplomas.

Built on games technology the researchers have come up with engaging and intuitive scenarios that back up traditional classroom work, together with matching employer needs. In the example shown, a student can navigate around a building site, visit the offices, read health and safety information, see schedules and examine the machinery. There is even a tutorial on how to lay bricks and make different patterns.

BIM and construction

Throughout many of the presentations it was clear that Salford has access to all the latest CAD tools, together with some of the very high-end solutions such as Gehry Technologies' Digital Project, which is based on Dassault Systemes' Catia engine.

Dr Tuba Kocaturk, programme director MSc Digital Architectural Design, gave a great insight into the wide scope of work undertaken, examining best practices in BIM and being at the cutting edge of free form generative modelling.

Salford University recently held a symposium on generative design, which attracted major architects from around the world. While the University only offers

postgraduate courses at the moment, there are firm plans to offer degrees within a few years. Looking at the exemplary focus on digital design, Salford could become a real centre of excellence here.

Resilient homes

Professor Erik Bichard worked with the Environment Agency to study the needs for improved flood protection and energy conservation. One initiative is to offer households rewards for installing insulation and lowering power consumption by offering free local transport, fruit and vegetables, landscape gardening and tickets to sporting events.

Conclusion

While these presentations were only a small selection of the ongoing projects that Salford University is undertaking, the sheer breadth of topics was impressive. The two stand-out sessions for me were the immersive collaborative workspaces and the digital architecture overview. While Virtual Reality has become a bit of an overused term and a technology that has never really made it, the THINKlab demo proved that there are real applications now that design data is becoming increasingly 3D.

To be actively teaching and engaging with the Generative design family (Bentley Generative Components, Rhino Grasshopper, Gehry Digital Project), pushes Salford to only a handful of institutions in the world that are really at the cutting edge of digital design. Students with exposure to this technology will be in a very small band of in-demand architects that get experience with the most expressive design systems under development. I really look forward to hearing more about the degree course Salford is planning.

Salford University obviously has a huge focus on research for the Built Environment. The dedication, enthusiasm and resources available obviously attract a lot of investment. The facilities not only look out of this world but are also the best I have seen at any university or company for that matter.

Firms can use the THINKlab and THINKpod for collaborative design sessions or meetings and can engage with the Built Environment team to run their own research projects.

www.thinklab.salford.ac.uk

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Consulting with Digital Project

Frank Gehry's Catia-based Building Information Modelling system, Digital Project, has been a slow burner since its launch in 2002. **Martyn Day** discovers that combined with consultancy, the software is being used on an increasing number of complex buildings.

The launch of Digital Project in 2002 brought Frank Gehry to Paris to join Dassault Systemes' (DS) chief executive Bernard Charles on stage, to announce the intention to develop a high-end 3D software tool for architects, structural engineers and construction managers. The software was to be called Digital Project and it would be developed on top of DS' flagship modelling solution Catia, which was mainly used in aerospace and automotive design. The combination of signature architect and 'the Ferrari' of CAD system developers certainly made for great headlines at the time.

Gehry's 'deconstructivist' designs are legendary, as is his unusual design process, which involves lots of crumpled up paper. These paper models have to somehow be translated into documented designs and then built. Gehry, now 80 years old, is proud of his lack of technical knowledge, admitting he wouldn't know how to turn a computer off or on, let alone use it. Instead, in 1992 his practice recruited some of the best and brightest young architects to join the team and use every technology under the sun to realise these complex projects.

For a considerable part of his life, many of Gehry's designs were deemed too expensive to build, mainly due to the complexity and huge number of unique components required. At the launch Gehry stated that by using the latest in modelling technology, his practice was finally capable of getting reasonable quotes in from contractors due to the explicit nature of the models that could be provided with the request for quotation. The contractor's bids also all came within one percent of one another. Using this technology, Gehry claimed that he could make a curved wall for practically the same price as a straight one. The aim was to integrate the design to construction phase without the need for paper.

The most common methodology that the practice developed is based around digitising Gehry's paper designs by scanning them in to Catia as point data and then building the structural and facade systems that would support it. It is through this methodology that Gehry really started to define a process that would allow it to move away from 2D documentation and rely mainly on 3D models. At the same time this ushered in a different way of working with contractors and required the rewriting of standard contracts. Without knowing it at the time, Gehry was defining Building Information Modelling (BIM) and

Design complexity and innovation can lead to increased risk for all projects. SOM has used Gehry Technology and Digital Project to mitigate errors on site.



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experimenting with producing best practice. The additional technology layers that were being created in-house to better adapt Catia for architectural work proved also to be the foundations of Digital Project and an additional business unit.

Gehry Technologies

In 2002, Frank Gehry and his team also founded Gehry Technologies (GT) aimed at bringing the in-house technology and methodology advances it had made to the wider architecture and building industries. GT comprises a team of architects, engineers, and construction professionals, computer scientists and management consultants.

The original concept was to create a CAD system, based on a Catia core that could be resold around the world. However, GT had little knowledge about reseller channels or selling software, and the solution it developed was anything but low cost. Because the technology had been proven on Gehry's own projects, the thought was that other leading design firms would be open to adopting the new CAD system. Unfortunately, this wasn't to play out.

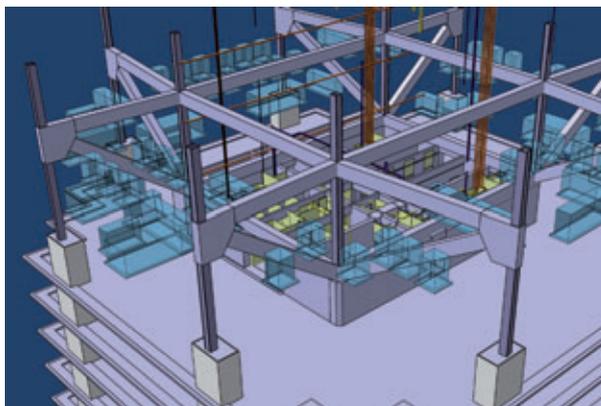
The more traditional CAD vendors such as Autodesk, Graphisoft, Nemetschek and Bentley Systems offer shrink-wrapped 3D solutions. The truth was that many other architects had been experimenting with 3D as well as other advances and a number had gone some way to adopting either a more common BIM system or had developed 'work-arounds' using scripting or other form-based design tools. Those firms that were interested had concerns on the availability of people who could drive it, without extensive training. The thinking that Digital Project would be a fast success soon became a false hope.

There have been some big successes with the software, however. Skidmore Owings and Merrill (SOM) acquired 100 seats and Zaha Hadid has a number of seats in-house, to name but two. The issue appears to be that architects are opting to not use just one system anymore but use any number of applications depending on what the project requires.

GT has been doing very well as a consultancy firm in its own right with many architects opting to call in GT as consultants for complex design projects. This has led to Digital Project playing an under-cover role on a considerable number of high-profile projects. As the architectural vocabulary expands to include ever more complex forms, and as digital fabrication reduces the cost, the demand for new in-house skills greatly outstrips the supply of people with the necessary 3D and BIM experience.

The key benefit of BIM is its ability to reduce the inherent risks of innovative designs, by addressing much of the risk associated with routine errors and omissions. Basic errors get caught during the design process by using 3D.

In a typical poorly co-ordinated set of 2D construction documents, by comparison, errors may not become apparent until on the construction site. A properly structured model will ensure that the whole process runs more smoothly.



GT Services

GT offers a broad range of consultancy services to get complex projects built. The development of a base project model is the initial stage of GT's project modelling services. The project master model assembles all relevant two-dimensional and three-dimensional project information into a common project database, which allows for the compilation and easy retrieval of project data, and rapid visibility and decision-making.

Using this base model, cost planning and control can be derived directly from the master model, and linked directly to published or internal cost data. No need for time-consuming and potentially inaccurate manual takeoffs. This information can be used for project cost planning and provided as a basis for subcontract bidding.

All the geometry in the Digital Project model can be linked directly to project schedules developed in various applications, to create so-called 4D Models, which integrate both the design and schedule information. Resource loading can be projected from quantities extracted from a master project model on a basis of associated project activities. The model can also be used to visualise and analyse multiple construction phasing strategies. This can be used to establish and verify payment schedules for completed phases.

The more commonly used contracts do not usually apply with a comprehensive BIM project and here GT can provide support for numerous contractors and subcontractors, establishing the scope of different participants' responsibilities, removing the ambiguity and potential inconsistencies that may occur.

GT can offer analysis and simulation of site

“Gehry is proud of his lack of technical knowledge, admitting he wouldn't know how to turn a computer off or on, let alone use it. Instead, in 1992 his practice recruited some of the best and brightest young architects to join the team and use every technology under the sun to realise these complex projects.”

Gehry Technologies uses Digital Project to model all structures in a design, from steelwork to concrete. In turn this can assist planning the construction sequence.

logistics, the modelling of foundation and excavation scenarios, analysis of construction sequence alternatives and 'digital mock-ups' of alternative primary structure and curtain wall system designs. Clash detection is also automated within the system and workers can be trained using 3D simulations to enhance on-site safety.

Having created a master 3D model, it is possible to compare the digital design with the 'as built' reality, to assess the quality of the build, or identify any errors. GT can provide detailed on-site digital surveying and measurement technologies to compare, as well as establish any grading geometry.

Conclusion

Digital Project has become a business in its own right for Gehry, although the early high-hopes for it to become a volume player in the 3D architectural world were perhaps a bit over optimistic. With progressive software revisions, GT's technology and considerable in-house experience in BIM best practice, it seems that through consultancy, Digital Project is contributing a valuable, multi-faceted role on signature global projects, such as the Beijing National Stadium (the Birds Nest), Lou Ruvo Brain Institute and the Lincoln Center Alice Tully Hall.

With each successful project, GT is proving the value of its construction and process know-how, together with establishing Digital Project as a field-proven BIM modelling tool. This is finally leading to increased software sales and ongoing engagements for GT, as it continues to educate the market as to the benefits of modelling, reducing project risk and solving thorny issues of today's complex designs.

www.gehrytechnologies.com

Digital Project base products

DESIGNER

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4D Construction Planning + Coordination
BIM Attributes, Quantities + Translator
Architecture + Structures
Assembly Design
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Real Time Rendering
CATIA Infrastructure

ADD-ON PRODUCTS

Primavera Integration
MEP/Systems Routing
Imagine & Shape
Knowledgeware (Knowledge Capture + Reuse)
Specialised Translators

The lie of the land

Greg Corke reports on a new 3D dataset from the creators of NextMap Britain that has the potential to bring digital terrain modelling into the hands of the CAD masses.

Off-the-shelf 3D terrain data is becoming increasingly important to engineers and architects. For highway, railway, and site design it is used to balance cut and fill volumes at the tender stage, plan construction sequencing, or perform environmental impact studies. For building projects it is used to assess the topography of sites, form the backdrop for 3D visualisations and help assess the impact of projects on the surrounding area through line-of-sight and acoustic studies.

There are many different terrain data products available, each of which varies in terms of accuracy, suitability to the task at hand and of course price. A new product to recently hit the market is OTM (Optimised Terrain Model) from Intermap Technologies, the developer of the NextMap Britain dataset. OTM is an off-the-shelf product that is available for all 244,000 square kilometres of the UK, but most importantly it has been designed specifically for use with CAD and design visualisation software.

Optimised TIN models

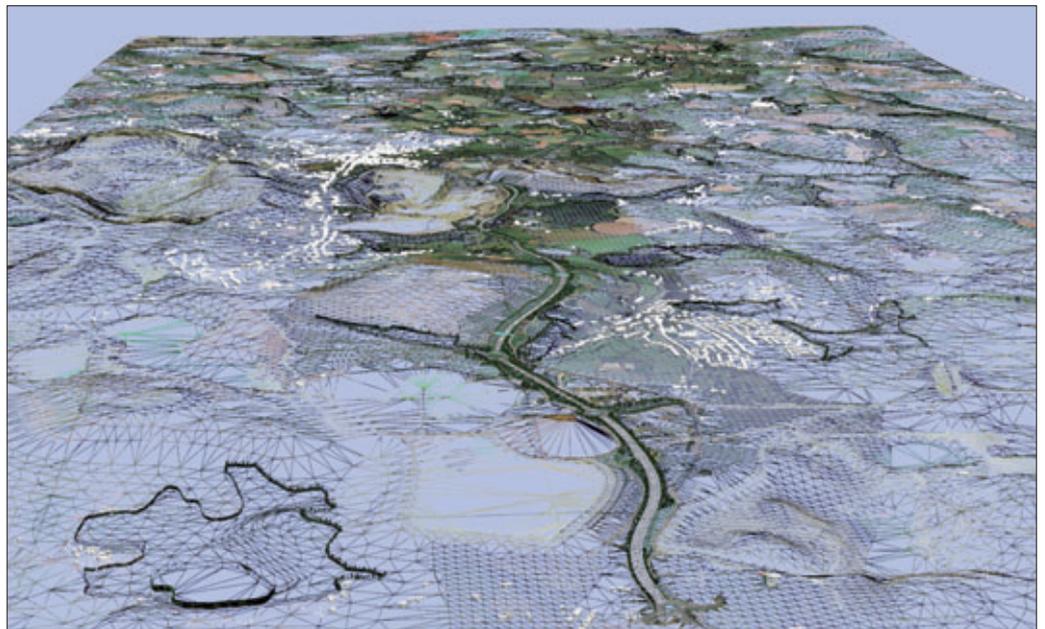
To represent a terrain inside a CAD application requires a TIN (Triangular Irregular Network). These are vector-based surfaces, made up of nodes and lines that form a mosaic of triangles. However, a lot of 3D terrain data comes formatted for use in Geographic Information Systems (GIS) in the form of a Digital Elevation Model (DEM). This is a gridded dataset where every point on the grid has a height value (or elevation point).

TINs can be created from DEMs, and dedicated terrain modelling software such as AutoCAD Civil 3D can deal with the conversion process. The problem is most TIN datasets are huge in terms of MB and while high-performance workstations can cope with the loads they can grind to a halt when files reach a certain size.

The obvious solution is to optimise the data, whereby the TIN is simplified while retaining critical data. This can be a complex process and finding the right balance between file size and which data to keep is not easy, particularly for the inexperienced user.

With a view to providing an off-the-shelf product for CAD use, Intermap's OTM product is pre-optimised so approximately 15 percent of the most important raw TIN data is retained. This results in a relatively lightweight data format that can be used on moderately specified computers and also be accepted by virtually all CAD systems.

Putting the size of data in perspective, an average 100 square kilometre dataset is only approximately 45MB and AutoCAD or MicroStation can quite



happily handle this in 3D, even on a moderately specified laptop. With the equivalent area in raw TIN format the same machine would struggle.

OTM data is readily available in the 2007 DWG format, which is widely supported in many products including Revit, 3ds Max, SketchUp, MicroStation, Cinema 4D and, of course, any AutoCAD-based product, such as Civil 3D or Map 3D. Other formats are available on request and the data can also be geo-referenced to a variety of mosaic gridded aerial photography formats. These can then be easily draped over the terrain to create an instant 3D model for design visualisation.

This 8 x 10 km model was created for a series of public consultations and submission with a planning application. It uses three levels of data — road design data from MX, topographical survey point data (captured by GPS) and OTMs at varying levels of optimisation. Model imagery and data content supplied by Cornwall County Council.

Accuracy of data

OTM is derived from Intermap's NextMap Britain DEM (Digital Elevation Model) data, which was created in 2003 and offers a vertical accuracy between 0.7m and 1.0m. With this in mind it is not the most

accurate data available in the UK. Some LiDAR (Light Detection And Ranging) data can offer up to 10cm accuracy, but this is reflected in the price.

Of course when it comes to 3D terrain data it is all about choosing the data most suitable to the task at hand. For design visualisation and site appraisal the accuracy of Intermap's OTM data should be more than enough. This is also true for tender stages of earth moving projects, where engineers can use the data to help cost jobs without having to invest time and money in expensive ground surveys.

Some firms may find a combination of datasets suits their requirements. For highway design, a detailed ground survey could be used at the heart of the project, then as you move away from your area of interest photogrammetric or LiDAR data could be used with the backdrop being formed from OTM data.

Optimising the raw TIN data in order to produce the OTM also has an impact on accuracy, but according to Intermap, while small inaccuracies are to be expected, it is almost identical to the raw data.

Intermap can also supply raw data or run the data through different optimisation routines to find the balance between the degree of optimisation and file size. The 15 percent optimisation is deemed to be the best fit for most AEC users, but Intermap also has plans to offer the data on-demand through a web portal at customer-specified levels of optimisation.

The cost

OTM data is sold in tiles and depending on the quantities bought cost between £24-£70 per kilometre tile. As with any tiled data, you end up paying a premium if your area of interest lies on the corner of four tiles, as realistically all four tiles will be required. Ring-fenced areas may be possible in the future but any system would need to be able to stitch these user-defined boundaries together should they be extended.

Conclusion

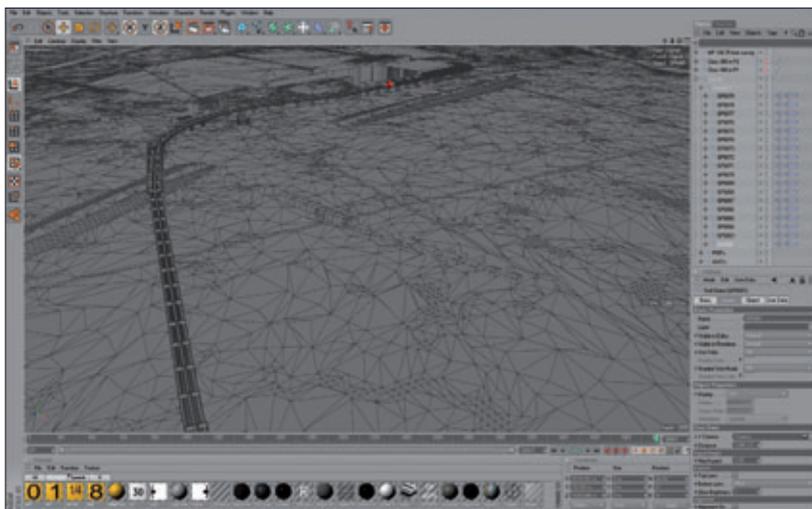
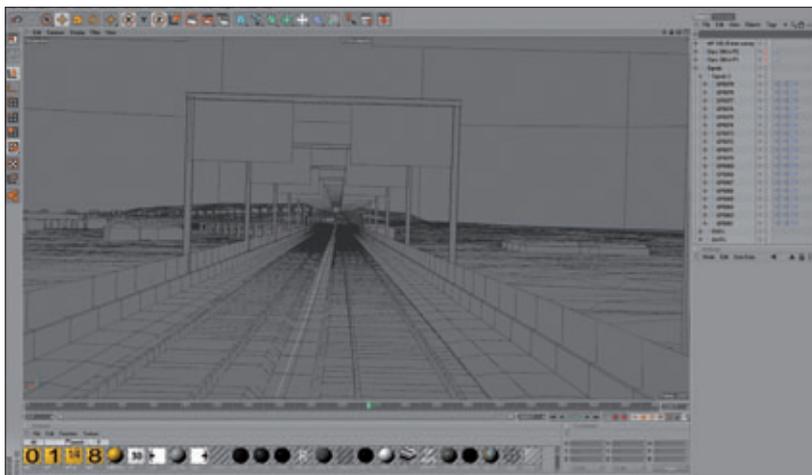
While 3D terrain data is becoming increasingly popular in the AEC sector, there are still many architects and engineers that are simply not aware of how cost effective and easy to use off-the-shelf data has become. Available in the widespread DWG format, Intermap's OTM is ideal for CAD users who want to get up and running with their data straight away. Also, because of its lightweight optimised format, it doesn't need a particularly powerful workstation to run. Subsequent processing with the data, such as rendering, is also more efficient.

OTM is by no means suitable for all types of projects. It is about choosing the right data for the task at hand, but when you need a readily available source of 3D terrain data for anywhere in the UK it is a very cost-effective solution for instantly putting your projects into a real world context.

www.intermap.com

Gioconda specialises in building 3D/4D engineering models for the railway industry. This particular model was used for part of the Signal Sighting process during the design stage of the Glasgow Airport Rail Link (GARL) project. Aside from the engineering benefits of having the 3D model there is always a wider audience and the availability of OTMs allows an instant 3D backdrop to be added for local familiarity and visualisation. Model imagery and data content supplied by Network Rail & Atkins.

www.g-vr.co.uk
www.gioconda.co.uk



How OTM data is made

Intermap's NextMap Britain Digital Elevation Model (DEM) is first converted into a raw TIN (Triangular Irregular Network), a process that simply involves triangulating the nodes. With over 244,000 square kilometres of data to optimise, the translation process from raw TIN to OTM needs to have next to no human intervention, but a 'one size fits all' algorithm is not practical.

The system analyses the fall of the ground, identifies any flat spots and large areas of open water and then removes data that is not 100 percent necessary, while still retaining the essential characteristics of the terrain. To illustrate this with an analogy, consider a kitchen table. There is little point in using thousands of points to define each sub-mm crack when the whole thing can be approximated very well with four points.

To manage the conversion process, Intermap started off by chopping the data into tiles of 500 square metres. Each tile was given a target face count, which roughly equates to keeping 15 percent of the raw TIN data, but the algorithm is allowed to deviate above and below this value depending on the complexity of the terrain. For example, if the terrain is flat the data can be

optimised more but if it is hilly then it is optimised less so vital information is not deleted. In order to retain a perfect seam between each tile, only 495m out of each tile's 500m was optimised on this first round. Adjacent tiles are then stitched together automatically so there are no overlapping triangles, or problems with faces overlapping each other.



One model of a series produced for the London Borough of Ealing by G-VR as part of the Dickens Yard development proposals. The ground data combines OTMs with traditional survey information to enhance the detail around pedestrian areas. Model imagery and data content supplied by LBE.

Grand designs: digital cities

There is a widespread industry move to adopt Building Information Modelling and intelligent 3D design. But, if the advantages are so clear, why stop with just the one building? Why not model the whole city? Martyn Day looks at the bigger picture.





News headlines in the early nineties occasionally covered the creation of 'virtual cities', where university academics or CAD developers would put together a 3D model of an existing city, or downtown area, because they had some funding or because, well, they just could. Typically 'blocky', these dumb models were primarily visual aids and were used to generate fly-by animations, or purely for the context of a major project. It was a time when the 'virtual' prefix could make a technology sound promising, but over time rarely delivered.

Scan forward ten years of computer innovation and there has been many advances in both the way we use technology and how technology impacts on our lives. With the popularity and amazing complexity of today's 3D games, the growth of the internet and innovations such as Google Earth, we now frequently interact with and explore 3D worlds. Even photographs can be accurately geo-referenced via Global Positioning System (GPS) and shared online, or a house, road or city modelled in 3D in SketchUp, and uploaded. On the consumer level at least, the initial vision of virtual cities has been greatly expanded, with companies such as Google and Microsoft competing to produce nothing less than 'Virtual Earths'.

But let us come back down to ground level. While consumers are finding many interesting uses for spatially referenced information, the professions of architecture, construction, infrastructure, civil engineering, urban and town planning, to name but a few, have a geo-spatial component to nearly every project. With every firm modelling the surrounding areas of their next project – reinventing the wheel — wouldn't there be benefits to having access to an accurate master city model? With the trend of adding valuable information to 3D models and their components, couldn't a master model of these intelligent projects, offer considerably more than just the dumb geometry vision of the past or the spatial-wiki of Google Earth?

The business opportunity offered by such a digital city may not be totally obvious. Consider the management of key infrastructure projects such as waste, water, energy and transport. The drive towards achieving sustainable, yet desirable and economically successful cities has only just begun. In China, for example, whole cities are being planned and constructed. Dongtan eco-city required a city model to test urban strategies for its infrastructure and there are plans in place to connect the city model to a smart metering system to capture valuable energy usage information streams – a digital dashboard for the city. For cities with aging infrastructure and a scarcity of greenfield sites, there is a need to capture what is already built to explore new projects, better maintain existing investments and renew worn-out utilities. A digital city could be a valuable resource for every stage of development, from cradle to grave — or with a sustainable mindset, cradle to cradle.

However, while the engineering and planning may concern us, many times the initial budget

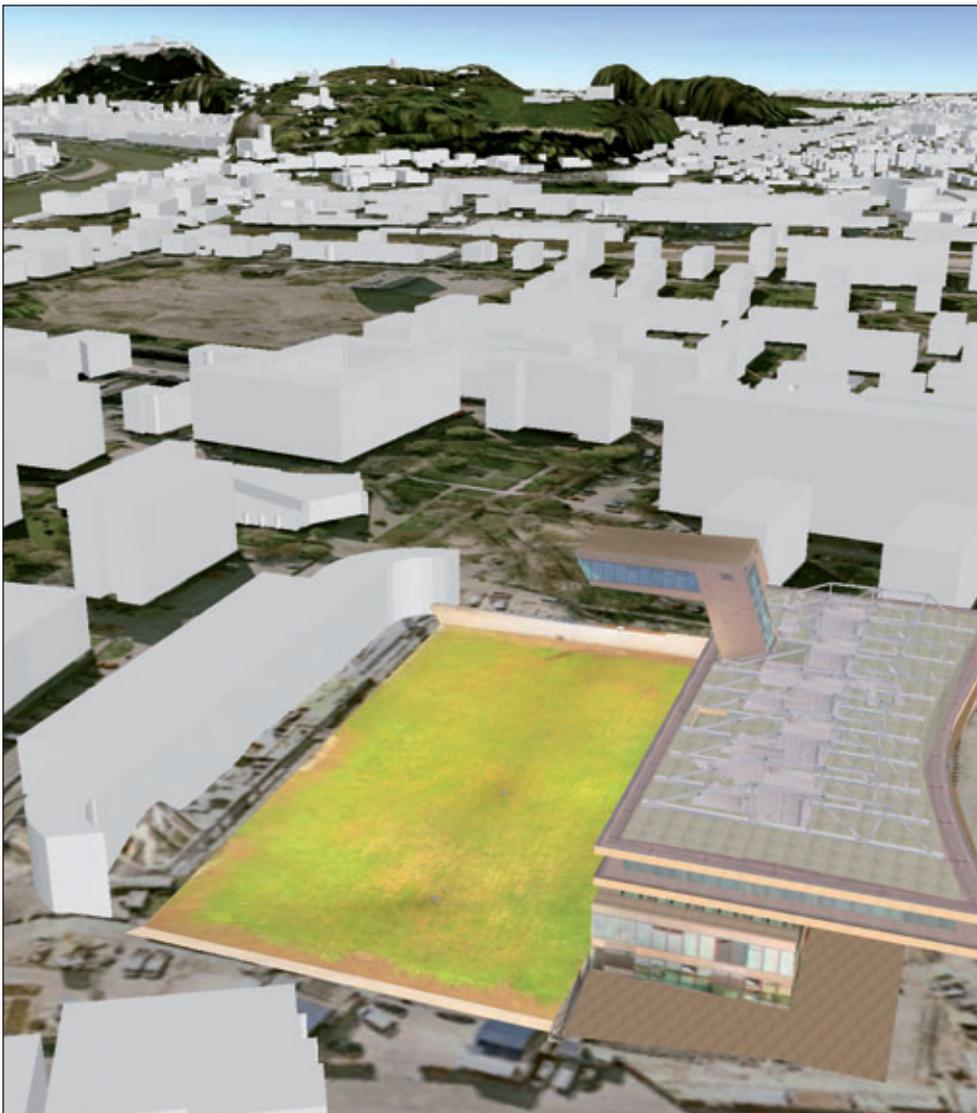
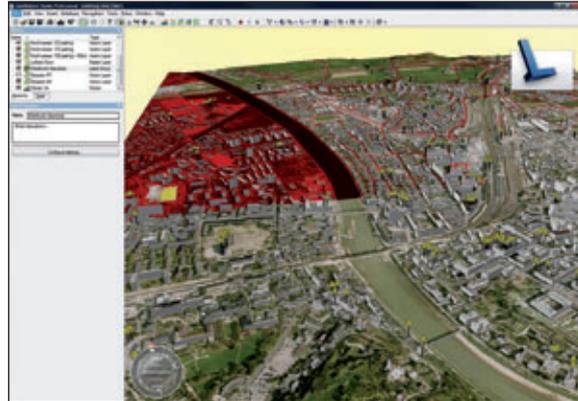
Autodesk LandXplorer Studio Professional

Digital cities can be created using Autodesk LandXplorer Studio Professional.

The software is designed to handle terabytes of 2D and 3D geodata sets for the visualisation and exploration of digital terrain models and terrain textures. High quality renders can be generated in real time and the models can be interrogated with vector and analysis tools, such as distance queries and land analysis.

In addition to GIS and 3D formats, LandXplorer Studio Professional supports CityGML, which is the industry standard for exchanging city model data. A popular output has been the creation of 3D city models for Google Earth, as well as for marketing, and serious uses such as urban and town planning.

Price: €8,950 (single seat)
€21,995 (server edition for 1-8 cores)



Used to build the pilot Salzburg Digital City model, Autodesk LandXplorer Studio Professional combines information from multiple sources to create a powerful reference model.

and justification comes from cities' economic development agencies. This is because these agencies usually have the budget to attract new businesses into their cities. Making a digital city is a cost efficient way of marketing, as opposed to creating a couple of cool fly-overs and getting a little airtime on television. People are able to visit the virtual model and it can be brought to life by many different departments to capture and improve planning and construction.

Convergence of data

To enable the construction of a digital city all one needs is data, and here, all areas of building and infrastructure design are moving to create 3D models with rich layers of metadata, allowing advanced analysis, simulation, quantities take off and estimates energy usage across the lifecycle. In the GIS world, what started off as just a 2D process, now encompasses the inclusion of real-world information, together with 3D topography, built on extendable databases that can manage terabytes of data. Visualisation technology has also driven the use of 3D in games, films and TV. With new techniques we can render huge models better and faster.

Undoubtedly we have seen Moore's law play out in workstation technology with much faster 64-bit processors now accessing vast amounts of RAM, together with stunning advances in computer graphics power, capable of rendering millions of textured polygons. We are also on the cusp of seeing 'cloud' server farms with thousands of processors being able to process terabytes and petabytes of data, to be served-up in real time down the internet.

In short, all the technology is now in place to build complex, intelligent 3D digital cities.

BIM on a city scale

Doug Eberhard is the senior director and industry evangelist for Autodesk's 'Digital Cities' vision. He explains: "Last year Autodesk acquired 3D Geo, a Germany-based infrastructure and urban planning developer, with its LandXplorer Studio Professional software that enables data aggregation and modelling on a macro or 'city' scale. Looking at the design landscape, the use of information modelling is bringing all the essential processes together — we are moving from file-based to model-based collaboration, which enables Building Information Management (BIM) on a city scale. LandXplorer Studio Professional can import spatially referenced 2D and 3D data from a huge array of systems and common formats and display this in a visually rich environment, in real time.

"This is not like Google Earth as customers want accurate information and care about what is below, on, and above the ground. You have to be able to factor in utilities, networks, roads, rail, and buildings and then be able to analyse, simulate, and collaborate on that data. In the past, this may have been carried out for each individual project, covering a very limited area of a city. With a digital city you can look at ten or more



different projects simultaneously, in a broader context. While it may be prohibitively expensive to create a city model for one project, pool three, four, or ten or more projects together and it becomes great value. The more you use it, the higher the return. Cities live and breathe, they are always changing and being renewed. Here, a city model can be an invaluable tool to capture and store what was, accurately document what is, and test what will be.”

However, to date, all the essential data needed to create the model sits in multiple departments and companies, in silos, where one department may not talk to another or share any information. With the introduction of many joint public/private partnerships, sometimes this information is also held outside local governments’ control. So there is never one model, just lots of data sources in

The textured 3D model of Berlin’s digital city within Google Earth. Here, it is possible to fly around the city and see such famous structures as the Reichstag and the Brandenburg Gate.

“While it may be prohibitively expensive to create a city model for one project, pool three, four, or ten projects together and it becomes very great value. The more you use it, the higher the return”

Doug Eberhard, senior director and industry evangelist, Digital Cities, Autodesk.

different domains, frequently reinventing the wheel. Mr Eberhard suggests things are changing: “There is a demand for more transparency and accountability. Everyone agrees that if you can bring all this data and geometric information into a spatially referenced database and share it, there are massive benefits. The model can then be used for traffic simulation, energy analysis, hydrology, slope analysis, or flood and pollution simulation. Sensors can be placed in the actual buildings or bridges and accessed from within the model. Or if designing a convention centre, the capacity of surrounding hotels and access to transport can be quickly identified. Digital cities are all about improving decision making on a macro level.”

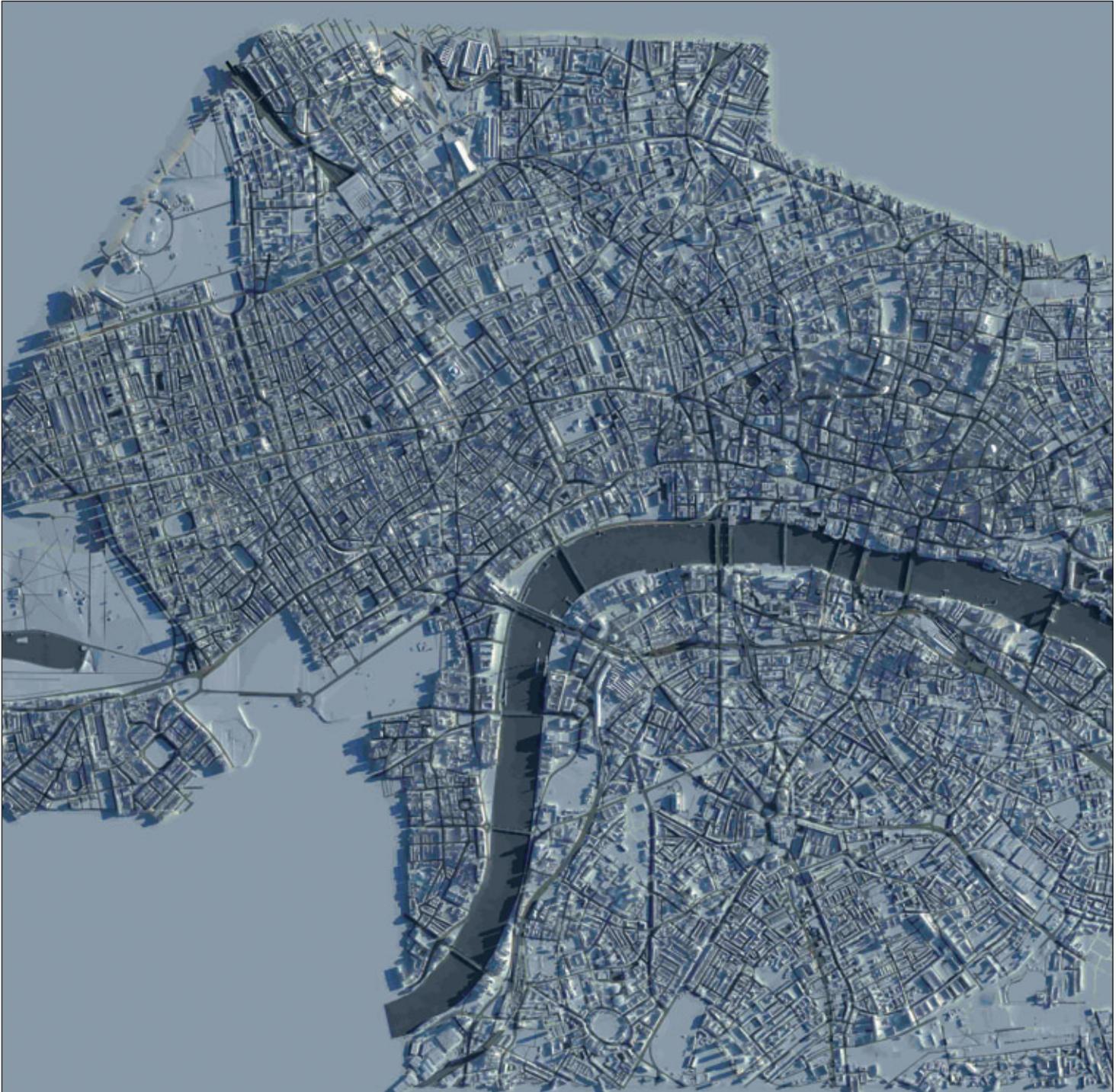
But before anyone can even think of building a digital city, the benefit has to be sold to all the various stakeholders, the local government departments and private firms in order to get their buy-in. “In my experience, a ‘Digital Cities’ pilot provides a great forum for all the departments to come together and have a positive discussion as to how they can benefit from sharing their data,” says Mr Eberhard. “Usually, the various departments are digitally well managed and it is a simple case of pulling the data sets together in a co-ordinated way. You don’t need to start with a perfect map of the city – not all the buildings have to be perfect and textured, that can be left until version two or three. A large percentage of the below-ground data may only be 2D but it is still very usable for a first attempt. With

LandXplorer Studio Professional it is possible to take existing co-ordinated data and build a digital city in an afternoon. From the parcel data you can give all buildings an arbitrary height and have an instant 3D model, but many local governments hold building height data in a database and this can be automatically added too. Later, using LiDAR (Light Detection And Ranging) and photogrammetry, exact roof pitches, overhangs and textures can be added. For signature buildings, most customers use 3ds Max to model stadiums, churches and places of historical importance.”

Autodesk’s digital cities

Autodesk has a number of customer cities around the world: Salzburg in Austria, Incheon in South Korea, Berlin (pictured in the main image, pages 16-17) and Dresden in Germany as well as Vancouver in Canada. Autodesk is also in negotiations to develop other digital cities around the globe.

Salzburg is the fourth largest city in Austria and a UNESCO (United Nations Educational, Scientific and Cultural Organisation) world heritage site. The 2,000-year-old city is under pressure to expand while constrained by valuable green belt land. A research pilot project was agreed in conjunction with the Centre for Geomatics at Salzburg University, to explore considerate urban design technology for citizens, businesses and key government agencies.



Autodesk's Mr Eberhard recalls: "The first step was sitting down with all the various departments, public works, economic development, city management, financial, and operations people, to see how they were currently working, what was missing, and how it could be enabled through the re-use of models. It was literally taking years to get planning approvals through the system. The digital city project established a workflow to enable the development of standards for the urban planning process. There is talk of getting architects to post proposed buildings to an online model, managed by the city."

In the case of Berlin, the project was initiated by the Senate Department of Economics and the Senate Department of Urban Development. The digital city model forms part of the 'Investor Information System', hosted at the Berlin Business Location Center, and acts as the platform for ongoing projects in city

planning at the architecture working group of the Senate Department of Urban Development.

There are already 500,000 individually texture-mapped buildings with all the transportation networks. Some of the below-ground data is in less detail such as 2D lines from GIS systems, however, an immediate benefit of the project can be seen in Google Earth, with all the buildings being available for view online. (Simply visit Berlin with the 3D building tag switched on).

Vancouver is a city with slightly different

Zoomed out: the full extent of GMJ's London CityModel. Created in extreme detail, the model has been used by many architects and planners.

"Everyone agrees that if you can bring all this data and geometric information into a spatially referenced database and share it, there are massive benefits"

limitations — it is surrounded by water. The city is addressing sustainability issues and has a strong EcoDensity Charter in place, which makes environmental sustainability a primary goal in all city planning decisions. The city is also undergoing considerable regeneration as it prepares for the Winter Olympics in 2010.

To support several planning activities, Vancouver began a digital city project ten years ago to model the downtown districts. This evolved into the adoption of geospatial mapping and the creation of Vanmap — a web-based map server that provides multi-layer CAD and GIS data for citizens and provides richer content for internal departments.

Vancouver has been in the practice of sharing and converging its data for many years, and this is becoming increasingly more 3D. The city is producing a fully accurate, texture-mapped digital city of the

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GMJ uses Autodesk 3ds Max to create its detailed city models for stills and animations. Here, the view looks over GMJ's CityModel of London showing Lincoln's Inn, Holborn and then onwards to Aldwych and the River Thames.



Photography by Jason Hawkes

entire greater region, which will include all utilities, transportation and operational information. Again, the city will look to share the model with all stakeholders.

Appetite for construction

According to Mr Eberhard, typical budgets for digital cities range from US\$50,000 to US\$300,000. However, there was one exceptional project that had a budget of no less than US\$16 million in the Middle East. Mr Eberhard explains: "There has been a big shift in the past couple of years with aerial image providers such as Digitalglobe (www.digitalglobe.com), Navteq (www.navteq.com), Terramatrix3D (www.terramatrix3d.com), where geospatially accurate, texture-mapped 3D city maps are available for purchase off the shelf. LIDAR laser scanning technology is revolutionising surveying; city models are almost a commodity."

A nightmare scenario: the impact on London of a predicted six metre rise in sea level as a consequence of extreme climate change. GMJ used its CityModel of London to assess the impact before rendering the photo-realistic image.

Looking at London as an example, there are at least 12 3D city maps in development. One of the most impressive 3D plans comes from architectural modeller and illustrator, GMJ. Its laser-scanned GMJ 'CityModel' is highly accurate, down to the satellite dishes on houses.

As the images here testify, 3D maps on this scale really do capture the imagination. Many firms license areas of GMJ's CityModel to use in development of new projects or to apply for planning.

GMJ has been using the model to examine and simulate the impact of global warming on the city, producing some startling images depicting the impact of a six metre water rise in the capital.

The online exhibition was launched to coincide with the G8 Summit held in Japan last year, and aimed to increase public awareness of the predicted rise in sea levels.

GMJ's digital landscapes

The images shown here were created by London-based architectural imaging studio, GMJ. The company has pioneered the production of high-resolution photomontage imagery for verified planning visualisation, immersive virtual reality presentations and interactive real time 3D. Established in 1994, the company has an impressive client list that includes Foster and Partners, KPF, BDP, Make, and HOK Sport.

The GMJ CityModel of London is an impressive example of the studio's work. The highly accurate model covers 40 square kilometres, including Southwark, the City and the West End. The sheer scale and accuracy of the GMJ CityModel would make an excellent 'off the shelf' starting point for a co-ordinated digital city of London, with all infrastructure and utilities information added – although no plans are yet underway. However, the GMJ CityModel has been used for many projects and can be licensed out for use by architects, local authorities or developers.

GMJ has also put the model to great use as part of its own online 'London Futures' exhibition, which offered visions of future city transport, clean energy generation and space saving solutions. Unfortunately, any future vision also needs to address the potential impact of global warming and the aerial view displayed here shows the effects on London of a six metre rise in sea level at spring high tide. The CityModel was used to predict the water levels across the capital for a number of alarming, yet thought provoking, images. GMJ also plans to develop other 3D city models from around the world and offers a service to generate models to order at approximately 1.5 sq kms per week.

www.gmj.net

Conclusion

We have the technology and information, so all that is now required is the buy-in of the right people. Digital cities are viable, easy to generate and offer huge benefits. They are slowly becoming a reality, though the majority of funding appears to be coming from institutions that are looking to drive economic development.

The problem appears to be the federated nature in which we break down and hand out infrastructure 'fiefdoms'. Add to that the duplication of work done in the private sector with creation of the archipelago of 'data' islands.

We need a more co-ordinated approach to the use of all this data. If we are to get the benefits of sharing, we need buy-in at government or EU level for digital city projects to be mandated.

Squeaky clean

A new state-of-the-art cleanroom environment at Southampton University is providing students and visitors with a glimpse into the normally hidden world of microscopic engineering. **Stephen Holmes** reports.

With the original building destroyed by fire in 2005, the new Mountbatten Building, a £55 million interdisciplinary cleanroom and office complex for the Optoelectronics Research Centre at Southampton University, offers passersby the chance to look in through its glass curtain walls into a spotless world where electronic developments are taking place.

With the department having already played a role in the building of the Internet, mobile phones and other revolutionary electronic equipment the university hopes the new white-walled labs will become one of the world's leading nanotechnology research centres.

Wanting a memorable building to reflect the research taking place inside its prominent position at the north of the university's Highfield campus makes it visible to thousands of people travelling along one of Southampton's main roads, making it a stand-out structure in the surrounding community.

Behind the aesthetics the building needed to be capable of accommodating the multi-million pound pieces of equipment necessary for nanoscale research, as well as the flexible interdisciplinary space needed for the cleanrooms to provide the next generation of technological research.

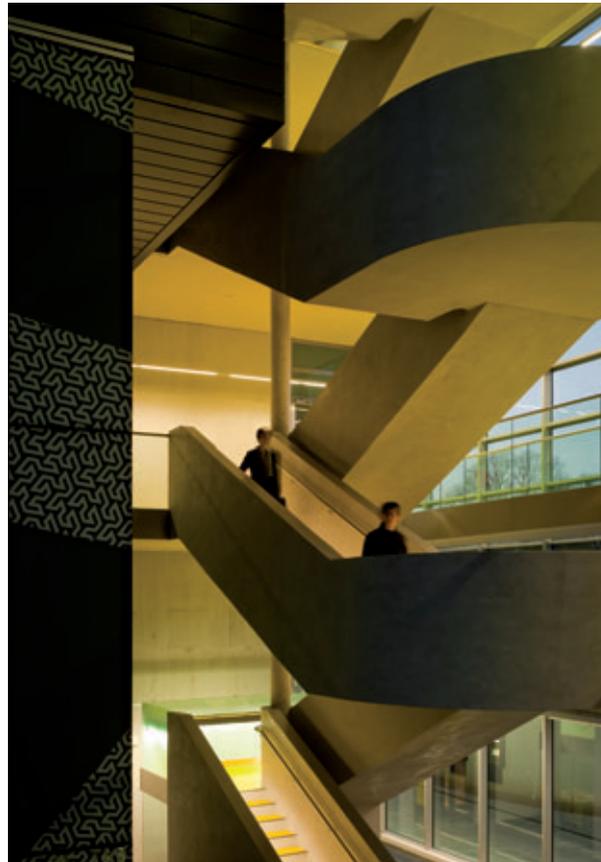
The nature of the electronics labs mean they are normally hidden from view, and as a result very few people have an idea of what goes on inside the air-controlled, white-walled vaults where pristine air, light and surfaces are key.

However, at Southampton that mode of working has been turned on its head. "People can actually view the process going on within; that was one of the requirements from the user, that external students or visitors to the building could actually see what's going on," explains Allan Thomson from CHM2, the project manager for the build. "It also makes a nicer environment for the inhabitants of the cleanroom."

The outside of the building provides a visual clue to its purpose, with the glass frontage enclosed by Peano-Gosper fractal patterns etched on the panels. The fractal was used in research undertaken by Professor Darren Bagnall and Dr Adrian Potts of the School of Electronics and Computer Science and Professor Nikolay Zheludev of the Optoelectronics Research Centre.

A cantilevered office section that juts out over the passing road, along with the high atrium with its glass curtain wall and thick concrete staircase make this a stand-out building.

Having already picked up a Royal Institute of



Above: the concrete staircase, a dramatic feature that adds weight to reduce vibrations.

Below: the build was designed to incorporate the new tall atrium and link the building on all floors to the neighbouring university building.



British Architects (RIBA) award the build is in the running for the Stirling prize, although on an everyday level it is giving 30 teams of students many more rewards for its cutting edge design.

"It is for research development, teaching and innovation in electronics," continues Allan.

Everything used in the building, from the lights to the computers monitoring the airflow, was 'state-of-the-art', providing those working inside with the perfect environment to work in.

The use of such cutting edge methods also has the added benefit of keeping electrical use down, earning the building top marks when it comes to sustainability.

Cleanrooms by their very nature are very high energy consumers. However, with the use of modern technology, from the fan motors through to the software used to design the building, the design team were able to greatly reduce the amount of electricity consumed. This was something the university was keen to invest in. "It was good to have the University's backing for this," says Allan, adding from his build manager's view point that it was good not to have budget worries looming over the project.



"The building is 65 percent more energy efficient than a normal building. Computational fluid dynamics (CFD) studies were completed, but there was an emphasis on minimising the energy consumption — evaporative cooling systems, variable frequency drives, air efficiency motors.

"The materials used for the build, and the design of the building and the way it faces — all helps to contribute to keeping the energy consumption down," says Allan, pointing out that a number of departments within CHM2 were responsible for different areas of the build, each using their own technologies before adding it to an overall Revit model. Specialist teams optimised the building orientation, solar shading details, underfloor heating, and even the rainwater harvesting capabilities of the new structure.

The stringent demands of nanoscale research need a vibration-free environment, a problem with the

“The stringent demands of nanoscale research need a vibration-free environment, a problem with the use of light materials like glass. Extensive analysis and modelling helped to design out the vibrations, while the use of concrete helped weight the structure.”



*Main: the new Mountbatten building at the University of Southampton.
Below: the intricate work in the cleanroom takes place in pristine conditions.*

use of light materials like glass. Extensive analysis and modelling helped to design out the vibrations, while the use of concrete helped weight the structure.

Used from the early planning stages Revit helped plan the initial co-ordination of the highly serviced building. “From there on,” adds Allan, “all drawings were created in 2D using AutoCAD 2004 and Autodesk Architectural Desktop. At a later date these drawings were imported into a NavisWorks application by the main contractor [Bovis Lend Lease] to form an overall system co-ordination 3D model.”

The final structure is a striking example of how even the most power-hungry of buildings can lessen their hunger through adaptation of materials, positioning and the adoption of new technology. In this example it is a case of new technology helping to build new technology.

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EcoDesigner and Virtual Building Explorer

Originating from Hungary in 1982, Graphisoft's ArchiCAD is the most mature 3D Building Information Modelling solution on the market. With a very loyal installed base over Europe and America, the company regularly produces updates and add-ons. **Martyn Day** evaluates two of the latest enhancements.

While it may have taken decades for architects to get into 3D, the advantages of Building Information Modelling (BIM) have now instigated a move towards detailed virtual buildings instead of just drawing plans and elevations.

While the initial benefits of modelling in a BIM system are the automatic production of drawings and elevations, together with guaranteed co-ordination of edits across all documentation, there are other advantages. As a 3D model has to be created to get the drawings, it can also be used for creating photorealistic renderings, fly-throughs, sun studies and carbon footprint analysis. BIM is rapidly being seen as a prototyping environment for architectural and structural designs, and particularly for key eco-related criteria.

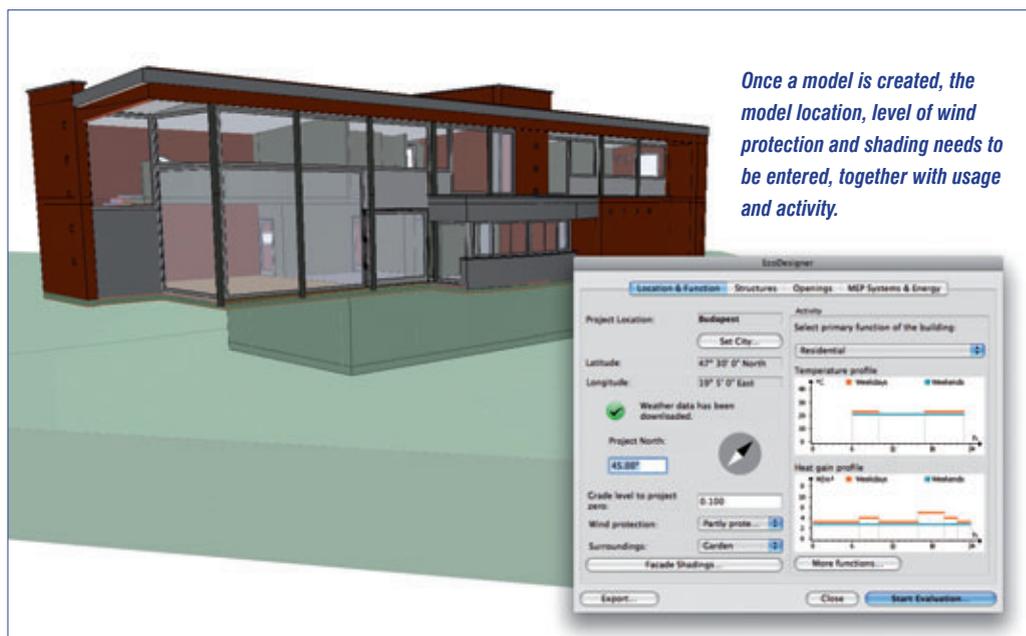
Graphisoft has long pushed the benefits of model analysis but has mainly worked with third party developers, such as Ecotect, to offer external applications. Unfortunately Ecotect was bought by rivals Autodesk, and these add-on applications also required the model to be exported outside of ArchiCAD, leading to a disconnect in the process. In response, Graphisoft has released EcoDesigner, an application that works inside ArchiCAD and gives architects a good indication of the environmental impact of any building under design.

EcoDesigner

While there are a number of carbon and energy-use analysis applications on the market, Graphisoft identified a niche area for an application that gives architects quick and simple feedback on the quality of their design. Sustainability is all about making the right choices early in the initial design phases and architects have a major influence on a building's energy performance.

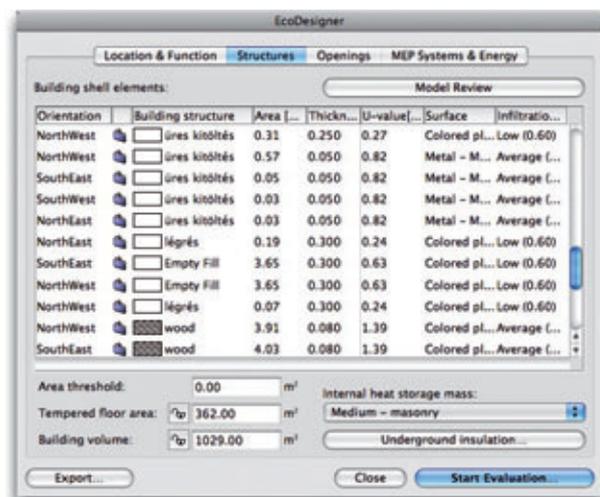
EcoDesigner helps architects compare energy consumption, monthly energy balances and other key eco-indicators to improve the building creation process and keep the architect aware of the impact of design changes.

EcoDesigner is an add-on for ArchiCAD version



12 and ultimately provides a 'one-click' analysis tool. However, to get to that one-click, a number of steps have to be followed. The first stage involves placing the model in context, setting the city, the 'North', the wind protection, type of surroundings, facade shadings and assign usage (residential, education, hospital etc). These are all used to derive the temperature and heat gain profile of the building.

The next stage is to allocate materials to the main structural elements. EcoDesigner does a good job of automatically recognising the key structural elements, but these need to be allocated materials such as plaster, concrete or wood, together with the type of surface material. The software automatically works out the areas, thickness and U-values. The U-value is a figure that denotes the heat transfer capability of a material or assembly of materials. Every structural component in a building has a U-value and is used in the energy calculation. There is a massive database of materials to choose from with thermal conductivity, density and heat capacities. If materials are not



Each structure within the building needs to be set a material with a corresponding U-value. The software works out the orientation, area, volume and thickness, which can be edited by the user.

in the library it is easy for users to add their own custom materials, also thicknesses and values can be edited too. The same process is repeated for all the openings. Obviously the more complicated the building the more time will be spent in prepping the design for final analysis.

The final information to be entered covers the mechanical electrical plant (MEP) systems and energy systems contained within the building. This covers the hot water generation, cooling system types, ventilation type, any energy recovery systems, efficiency levels, heat

“Building Information Modelling is rapidly being seen as a prototyping environment for architectural and structural designs, and particularly for key eco-related criteria”

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After some number crunching EcoDesigner produces an XML output report (which can be saved as a PDF) with all the key facts and figures on the design performance. The Energy Balance Report includes an array of useful information: floor area, ventilated volume, heat transfer for key structural components and the average U-value for the building. The Energy consumption is displayed per month in a bar chart showing energy emitted and energy supplied, together with the breakdown of sources. Then there is an all-important CO₂ emission figure in Kg CO₂/year.

On a decent size model, there is a fair amount of prep work involved in getting to this result. However, once a design is defined, making small changes usually means that EcoDesigner can quickly spit out revised evaluations, enabling comparisons and fast design optimisation.

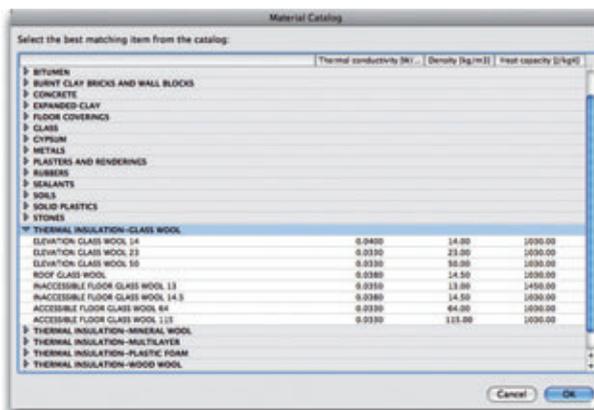
Virtual Building Explorer

When time and effort has been placed into creating a 3D model of a building, it seems a shame to have to send only 2D drawings of still rendered images to clients, contractors or structural engineers. Graphisoft's solution to this is Virtual Building Explorer (VBE), which is an application for generating self-extracting 'virtual worlds' from ArchiCAD models. This enables other teams to navigate and explore designs without having to have copies of ArchiCAD, using 'games like' friendly controls. Each environment has 'gravity', layer control, fly-mode, egress recognition and pre-saved walkthroughs. Storing walkthroughs and multiple viewpoints in the gallery are great ways to guide recipients as to specific features of the design.

While navigation alone is a useful capability, VBE extracts and offers access to building information such as surface finishes, volumes, sizes and quantities. Exact measurements can be made at any point during a walk through with access to element information and layer control for more advanced users.

There are multiple viewing modes — perspective or parallel, line-drawing, shaded cartoon-style, fast OpenGL with shadows, materials and texture maps, or high-end Global Illumination radiosity rendering with controls for camera height and view cone, sun altitude and azimuth, brightness and transparency. With 3D it is even possible to use the stereo viewing capability using the special red/cyan glasses that come in each software box.

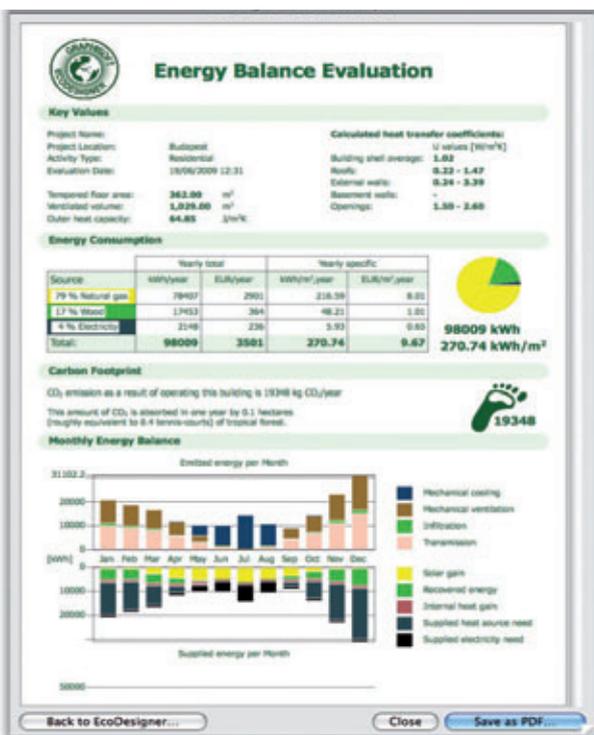
Using VBE is very straightforward. Once installed an additional function is added to the ArchiCAD menu to 'Export for Virtual Building Explorer', this will convert the model into a VBE model, including materials, geometry and surfaces. After launching VBE there are lots of style settings that can be adjusted to create the viewing experience that is intended. At this stage pre-defined walkthroughs and set viewpoints can be created for inclusion. Then



The system comes with an extensive range of materials for all building possible components, each with the correct thermal characteristics to enable accurate calculations.



The final part of the process is allocating values under the MEP Systems and Energy tab. Here hot water, cooling, ventilation and solar power are costed and allocated values.



The end result of a complete analysis is an Energy Balance Evaluation, which produces an easy to read report on the building's key values and energy consumption. A bar chart gives the monthly energy balance with key indicators as to the carbon footprint for each design.

“When time and effort have been placed into creating a 3D model of a building, it seems a shame to have to send only 2D drawings of still rendered images to clients”

simply save out the model as a self-contained, self-extracting file. This file can then be distributed under a free license. The only limitation being that VBE files can only be opened in the Windows operating system. An OSX/Mac version is in development.

Conclusion

One of the main problems associated with a move to BIM is the extra effort required to build a detailed 3D model. The real story of EcoDesigner and Virtual Building Explorer is that the creation of the virtual building model is only the start of the design process. The more uses there are for the model the greater the return on the investment in its creation.

The ability to send complete model environments to customers or other project members to explore designs is obviously of massive benefit. The fact that there is no need for ArchiCAD, an application or in fact any CAD knowledge is an obvious boon in enabling collaboration. This is equally applicable from the earliest design stages to final construction and fit-out. Virtual Building Explorer is a brilliant addition.

EcoDesigner is an important application for ArchiCAD customers and is to some extent a return fire at Autodesk acquiring Ecotect. Instead of producing a carbon copy of Ecotect, Graphisoft has taken the opportunity to build code that works inside ArchiCAD, requiring no translation, with a feature set that requires the most basic information. EcoDesigner is not intended to be a super-accurate analysis tool but more of a tool to give feedback on the impact of key design decisions, such as materials, glazing and ventilation decisions. It performs this function admirably and should become an essential add-on for ArchiCAD customers and great value for those on subscription.

www.graphisoft.com

Prices:

Virtual Building Explorer

Single licence of Virtual Building Explorer for an ArchiCAD licence **£495**

Single licence of Virtual Building Explorer for an ArchiCAD licence on subscription **£295**

EcoDesigner

EcoDesigner Single licence for an ArchiCAD licence **£495**

EcoDesigner Single licence for an ArchiCAD licence on subscription **£195**

Turning over a new leaf with sustainable buildings

New design concept balances environmental, economic, and social criteria for Wyevale Garden Centres' next-generation stores.



Wyevale Garden Centres, a garden supply chain founded in the 1930s, is bringing its storefronts into the 21st century with a sustainable building design concept that can be used at any of its 110 nurseries throughout the United Kingdom. The green building plans meet Building Research Establishment Environmental Assessment Method (BREEAM) criteria for environmental performance, similar to the Leadership in Energy and Environmental Design (LEED) rating system used in the United States.

As the garden centres have grown in response to trends among gardening enthusiasts, the stores have begun to offer everything from plants and gardening tools to garden furniture, barbecues, and outdoor lanterns. As a result, however, retail spaces that were primarily greenhouses have become outdated, with cramped space and buildings that lack proper insulation and services.

Wyevale wanted its new store design to be underpinned by sustainability principles, a ground-up approach that covers building orientation, construction materials and energy conservation. Wyevale set a goal

for its buildings to derive 10 percent of their energy from renewable sources — in accordance with the BREEAM focus on reducing CO₂ emissions from building operations — and qualify for the highest BREEAM rating of Excellent.

Wyevale turned to London-based RGP Architects, a firm with a strong background in retail design and green architecture. The new building concept was to be part of a rollout programme for its existing store locations around the country. The Cardiff and York store locations were the first to be submitted for planning approval. RGP dedicated a team of five architects to the Wyevale project, which took 18 months to complete.

One of the greatest challenges the RGP team faced was finding a balance between Wyevale's sustainability goals and the concerns of local residents. Wind turbines were the principle obstacle. Used in combination with a ground-source heat pump, energy-efficient wind turbines would meet Wyevale's renewable energy goal. However, local residents did not welcome the concept because they believed that turbines would be too noisy and visually imposing.

Wyevale set a goal for its new buildings to derive 10 percent of their energy from renewable sources. Level access and ample parking allow customers to conveniently load purchases into vehicles.

RGP found the perfect compromise in solar/wind hybrid lamps. The aesthetically pleasing lamps are well suited for use in outdoor areas and parking lots. They derive electricity from a combination of solar panels and a small wind turbine hidden on top of the lamps. "Wind turbines are relatively new in the United Kingdom," explained Eddie Lamptey, RGP project architect. "We have had problems in the past trying to site them in residential areas and usually end up replacing them with other renewable energy sources."

As for the rest of the building, RGP went with materials from certified, sustainable sources chosen for their ability to be recycled wherever possible. The primary structure consists of glued laminated (glulam) European Larch timber beams and galvanised steel bracing on precast concrete columns. Glulam timbers give the building a warm, contemporary look while extending the available wood resource by using high-grade material only where it is needed. Window frames are double-glazed for better insulation and made from laminated timber. All structural and roofing materials are 100 percent recyclable.

Covering the sales area of the main building



is an 'intelligent' skylight made from ethylene tetrafluoroethylene pneumatic air pillows with a unique but simple contour. The pillows vary the amount of sun that enters the building, reducing the need for artificial lighting. They also provide shading in the summer and solar heat gain in the winter.

On cold days, ground source heat pumps provide under-floor heating. In the summer, natural ventilation cools the building. Louvers on the sides of the building adjust automatically according to the temperature and eliminate the need for indoor fans.

The building also collects rainwater from the rooftops into covered storage tanks and from the parking lot via permeable paving into underground storage. Landscape design retains existing vegetation, and drainage systems ensure no harm results in the downstream environment.

Social aspects of the design include accessible fixtures, fittings, and facilities for the physically and sensory impaired. Level access and ample parking allow customers to conveniently load purchases into vehicles.

The new Wyevale garden centre design is contemporary, attractive, and ideally suited to the store's function. The development plan demonstrates respect for employees, customers, neighbours and the environment. The design creates an exemplary state-of-the-art garden centre that goes far beyond what has been constructed elsewhere in the UK.

RGP relied on Bentley software to design the Wyevale garden centre. The firm used MicroStation for conceptual 3D modelling to explore various design ideas with the client. MicroStation enabled the team to produce 3D PDF files, which helped to create a more efficient flow of information and reduce meeting times. RGP used MicroStation PowerDraft to produce high-quality colour drawings similar to Adobe Photoshop.

"MicroStation is compatible with a variety of different file formats, which made it easy to exchange files with contractors and the developer," Mr Lamptey said. "The software automatically packages drawings in the file types needed for our network job site and on to an information-sharing site for the consultants involved with the project. We can then call or email those involved to let them know the files are ready."

Social aspects of the design include accessible fixtures, fittings, and facilities for the physically and sensory impaired.

"Normally we would export DGN files as line drawings to PDF and work with them in Photoshop to create our presentations. But unique features in MicroStation enabled us to bypass this step and keep it all in MicroStation PowerDraft. This increased our turnaround time and reduced storage space in our servers, since the drawings are smaller in size than Photoshop files."

RGP was also able to export information suitable for use in integrated environmental solutions software, which is used to check for energy performance and flag areas that may not conform to UK Part L building regulations. This review process ensured that integrated renewable energy systems and natural light were used to minimise energy consumption and associated CO₂ emissions.

Wyevale's green building design has approached a total of \$15 million with another one million in float for variations at different sites, such as putting in wind turbines in more remote areas.

"We now have a complete set of tender drawings as thick as a ream of paper to hand over to any contractor that is selected to build one of the buildings," said Mr Lamptey.

www.bentley.com



MicroStation enabled the team to produce 3D PDF files, which helped to create a more efficient flow of information and reduce meeting times.

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Domestic bliss when home and away

Faced with a tight deadline and no in-house 3D modelling skills, Architecture & Design Services took a leap of faith by adopting a new product suite of MicroGDS and Piranesi. Learning the technology from scratch it delivered its artistic concepts in just two weeks.

Essex-based Architecture & Design Services, a specialist in large scale leisure centre refurbishments and domestic projects, was facing a major challenge. The two-man architectural practice had secured a brief to produce sketch designs for a new-build domestic property, from a client who would be abroad for the entire design phase. Added to that the firm had no in-house 3D modelling skills and was given just two weeks to complete the brief.

Easy does it

Mark Cotton, director at Architecture & Design Services, decided that simple tools were needed to help to quickly create a 3D model and be able to prepare artistic representations of the project. The firm decided on a combination of MicroGDS Compact 3D and Piranesi from Informatix Software to complete the task.

Mark took delivery of the products on the Monday morning and started to work through the training materials. He and his partner received a standard foundation course from Informatix and learnt the rest of the programme by themselves. With no previous experience of MicroGDS but with many years using AutoCAD, Mark found initial 2D drawings were easy to produce as many common CAD standards are employed within the product. The initial 2D drawings were then used as the basis for the 3D model.

When working in 3D MicroGDS provides feedback and navigational controls. This helped Mark and his partner accelerate through the learning curve and become productive very quickly. "The 3D Model navigation was very intuitive and the non-wireframe option made for easy object selection and handling," he said.

Combining the need to learn a new software product and the new discipline of designing a project from inception in 3D was challenging, but by Wednesday the first 3D model was ready to show to the client for initial discussions.

"3D model navigation was very intuitive and the non-wireframe option made for easy object selection and handling"

Mark Cotton,
Architecture & Design Services.

File sharing

As the client was abroad throughout the entire design process, it was a necessity to share the designs digitally. The client used the free MicroGDS model viewer to view the designs, and because all MicroGDS project files are small, bandwidth was not a problem. Mark created two initial designs, which the client was able to review from a remote location and provide instant feedback on the concepts.

A number of changes were needed before the client was satisfied, but the digital process helped Architecture & Design Services maintain pace on the project.

MicroGDS was used to create an accurate 3D model for concept designs, from this model 2D elevation and design drawings could be extracted. This was regarded as a major benefit by Architecture & Design Services, saving significant time by supporting the need for quick 3D concept design and the basis for the design drawings. Next, for the production of the artistic images, the 3D model was exported to Piranesi where textures, colours and blends were 'painted' on.

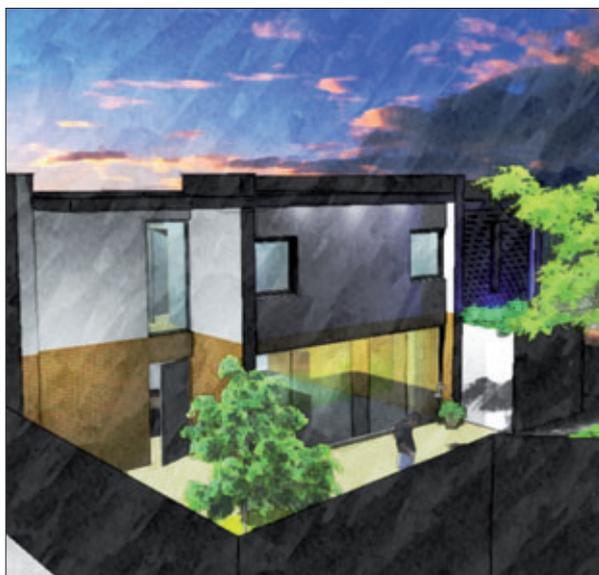
In very short period of time Architecture & Design Services was able to produce a portfolio of concept designs which exceeded their client's expectations and complete the commission comfortably within the deadline. From being faced with a seemingly huge challenge, at the end of the two weeks the firm had added another competency to the business, built a new revenue stream and has since secured repeat business on the back of that initial project.

www.aandds.co.uk

www.informatix.co.uk/microgds.htm



(Above) MicroGDS was used to create an accurate 3D model for concept designs. (Below) This 3D model was then brought into Piranesi where textures, colours and blends were 'painted' on to produce artistic sketches.



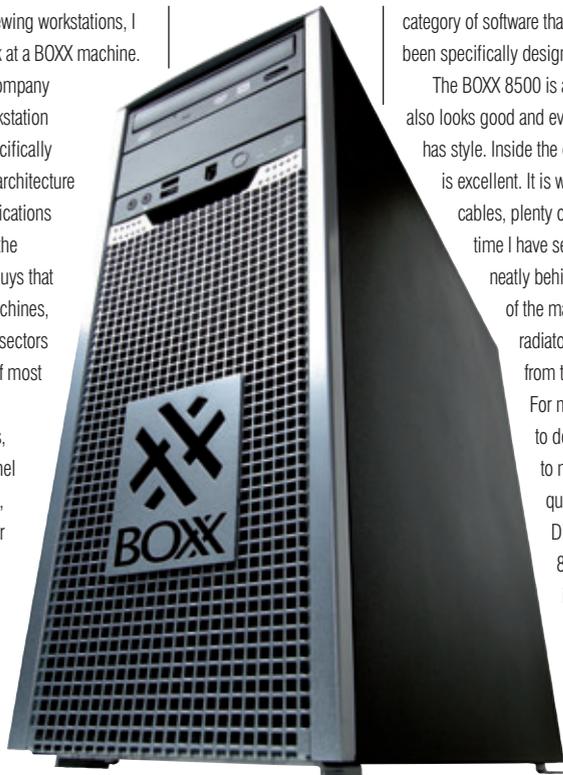
3DBOXX 8500 Series

A specialist workstation for high-end design visualisation, backed up with knowledgeable support, but let down by poor acoustics. By **Greg Corke**.

In the ten years I have been reviewing workstations, I have never had a chance to look at a BOXX machine.

One reason for this is that the company is more than just your average workstation manufacturer. Its machines are specifically built for visual effects companies, architecture firms, and design studios and applications such as 3ds Max and Maya. From the conversations I have had with the guys that design, market and support the machines, it is clear their knowledge of these sectors is head and shoulders above that of most workstation manufacturers.

Headquartered in Austin, Texas, BOXX recently opened a new channel to market in the UK through Jigsaw, a company probably best known for its close relationship with Apple, but one that also has a strong focus on architectural and design visualisation software. With dual Xeon processors, a high-end Quadro graphics card and 6GB of RAM, it is for this latter



category of software that the BOXX 8500 workstation has been specifically designed.

The BOXX 8500 is a solid, well-built machine. It also looks good and even the in-your-face BOXX logo has style. Inside the chassis the attention to detail is excellent. It is well laid out, with minimal stray cables, plenty of low duty fans, and it is the first time I have seen a hard drive tucked away neatly behind the motherboard. At the front of the machine, just behind the grill, is a radiator, which is used to dissipate heat from the liquid cooled processors. For me, liquid cooling is designed to do one of two things — either to make a machine incredibly quiet, or to facilitate overclocking. Disappointingly, this 3DBOXX 8500 does neither and even when idle, fan noise is noticeable.

What it lacks in acoustics, it makes up for in performance. The two dual Xeon X5550 processors, with eight physical and sixteen virtual

Specifications

2 x Quad Core Intel Xeon 5550 (2.66GHz) processors
6GB (6 x 1GB DDR3-1333 REG ECC) memory
Intel S5520SE Motherboard
250GB 7,200RPM Western Digital hard drive
Nvidia Quadro FX 3800 (1GB) graphics card
Windows XP x64 Edition
(or Windows Vista business 64-bit)

Benchmarks

Graphics (bigger is better)
3ds Max Design 2009 — 205
CPU (smaller is better)
3ds Max Design 2009 — 484 secs

Price: £3,999
www.boxstech.com
www.jigsaw24.com

cores between them, will make light work of any rendering tasks. The Quadro FX 3800 graphics card, with 1GB RAM, is more than a match for most material heavy datasets. The system comes pre-loaded with Windows XP x64 and even with 6 x 1GB of RAM, there is room for more with six spare DIMM slots for expansion.

The BOXX 8500 is a specialist piece of kit designed for high-end design visualisation. In a commodity market this is a big selling point, particularly as it is backed up with excellent support for applications such as 3ds Max. It is just a shame it couldn't be a little quieter.

Lenovo ThinkStation S20

Solid, well built, high performance CAD workstation, which still offers much for design visualisation and rendering. By **Greg Corke**.



Lenovo's new Nehalem Xeon-based workstation lineup comprises the ThinkStation S20 (S for single processor) and the ThinkStation D20 (D for dual processor). While the D20 is likely to grab the attention of power hungry rendering specialists, for CAD it is the S20 all the way.

For CAD, a single fast processor is optimal and the 3.2GHz Xeon W3570 CPU at the heart this ThinkStation S20 test machine is the fastest you can get. The machine is incredibly responsive and makes light work of single threaded operations, which form the code base for the majority of CAD applications. There is three additional cores to use on rendering. 6GB of RAM and Windows XP x64 Edition provide plenty of capacity for even the most complex models.

This high-end computational power is backed by Nvidia's Quadro FX 1800 graphics cards. A high performance VelociRaptor hard drive rounds off the spec. A workstation is much more than its constituent parts, and the ThinkStation S20 is an excellent machine in its own right. The chassis is well built, solid and compact and runs quietly even under load.

Interestingly, Lenovo offers Nvidia's Tesla C1060 GPU computing solution as an option in the S20. It is still very early days for this technology, but if your computational needs really take off in the future, this could become a viable way to boost performance under certain rendering and simulation products, particularly as the S20 has no room to add a second CPU.

The ThinkStation S20 is an excellent workstation for CAD. It doesn't come cheap, but for those without such high performance requirements, cutting the system RAM to 3GB and going down a notch or two on the CPU can take make this much more attractive to those on a budget.

Specifications

Intel Xeon W3570 (3.2Ghz) processor
6GB (3 x 2Gb) DDR3 (1333Mhz) memory
Intel X58 Express Chipset Mainboard
150Gb 10,000RPM Western Digital hard drive (VelociRaptor)
Nvidia Quadro FX 1800 (768MB) graphics card
Microsoft Windows XP Professional x64 Edition
(or Windows Vista business 64-bit)

Benchmarks (XP)

Graphics (bigger is better)
3ds Max Design 2009 — 224
CPU (smaller is better)
3ds Max Design 2009 — 618 secs

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“The S20 is well built, solid and compact and runs quietly even under load”

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