

DAYMEDIA AND MULCOM

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ABSTRACT

DayMedia and MulCom are multimedia teaching packages targeted at architects and building engineers, as well as students. While DayMedia is concerned with daylighting in architecture, MulCom covers human comfort and the energy performance of buildings. Most of the content is related to thermal comfort, although acoustics and visual comfort are covered as well.

The development of the packages has part-funded by the European Commission and coordinated by the Low Energy Architecture Research Unit (LEARN) of the University of North London. A number of experts from different European countries collaborated in the production of the teaching packages. The approach taken was to produce a highly interactive product in order to visualise the concepts and make them easy to understand. This is in stark contrast to the traditional way of presenting information which is often done in form of text and formulae.

Both packages are produced in HTML format and can be downloaded from the internet. This ensures they can be viewed anywhere on any computer system.

KEYWORDS

Multimedia, teaching, comfort, daylighting, acoustics, thermal, GPL, HTML

INTRODUCTION

DayMedia and MulCom are multimedia teaching packages for architects and building engineers. While DayMedia is devoted to teaching daylighting in architecture, MulCom is designed to give information on the relationship between comfort and energy use in buildings.

Both packages are produced in an electronic format and written in HTML. They are freely available on the Internet. They take a visual approach and try to teach through images and interactive contents which are often much easier to understand than text and formulae.

DAYMEDIA

Aims and Objectives

To help architects and building engineers re-discover the skill of making buildings that use natural daylight for at least some of the requirements on lighting, the EC has supported research within the framework of several research programmes such as JOULE and THERMIE which promote renewable energies and rational use of energy.

As a result considerable work has been done in the field of low-energy architecture. However, the dissemination of the results has been rather slow. This is even more true for those who could get the highest benefit and make the biggest impact on the global reduction of the use of energy, namely the architectural practitioners and building engineers, as well as students.

The main objectives of the project were:

- To transfer and disseminate through training the expertise in daylighting design developed in the EC research and development programmes JOULE and THERMIE
- To meet the needs of European professionals with regard to the use of daylighting techniques in buildings
- To provide a flexible training tool ideally suited to the small enterprises that are typical of architectural and consulting engineering practices, i.e. a CD-ROM based program
- To provide a flexible training tool ideally suited to university students via the web
- To integrate aspects of daylighting techniques in the architecture curricula of the academic partners to promote a European dimension in training on architecture



Figure : Example of interactive animated content in DayMedia

The project aimed at developing a flexible training package which incorporates the newest daylighting techniques as well as reintroducing some of the wisdom of the past and making them widely available to practitioners across Europe.

Contents of DayMedia

DayMedia takes a very visual approach to teaching daylighting. Many images, both animated and static, are included. The images are a mix of photographs taken by the partners and computer simulations, mostly done in RADIANCE.

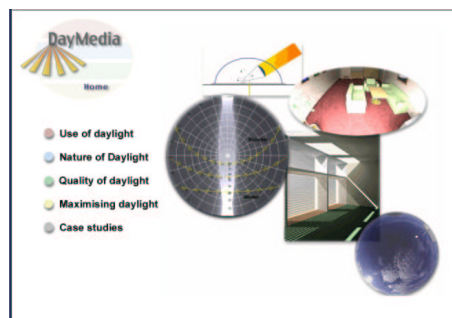


Figure : The opening screen of DayMedia with the five sections

DayMedia is structured into five main sections as seen in figure :

- **Use of Daylight:** Information on active and passive control devices, the transmission of light into the building and the integration of daylight and artificial light.
- **Nature of Daylight:** Different sky types and how they can be simulated, the availability of daylight throughout Europe and the path of the sun.
- **Quality of Daylight:** Questions about glare, the differences in colour temperature of daylight and artificial light and the modelling ability of daylight. Also information about measuring light in general and daylight factors and the no-sky line in particular.
- **Maximising Daylight:** Shows how building properties such as reflectance, the building geometry, glazing and outside obstructions affect the daylight performance of buildings.
- **Case Studies:** Looks at a particular project and discusses how the daylighting affected the design of a hospital ward by analysing three different alternatives. Also contains the introductory chapter from Daylight Europe.

Additionally, there is a glossary containing several hundred term found in lighting and daylighting. Apart from translations in six European languages, it gives a definition, as well as a short explanation of the word or phrase.

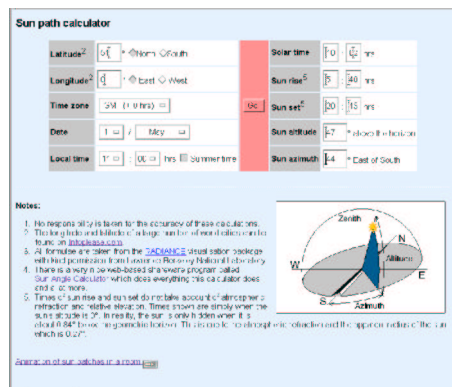


Figure : Interactive sun path calculator in DayMedia

The authors are fully aware that DayMedia is not a replacement to the text books written on the subject. No claim is made that it covers all possible aspects of the subject. By its very nature, it can only give an overview of the principles and cannot go into a deep discussion of the topics. The main objective was to provide a visually attractive supplement to other sources of information, making it easier for the student and architect to comprehend the concepts and formulae given there.

MULCOM

Aims and Objectives

The MulCom project is designed to provide a teaching tool for students and practitioners. The subject matter for the tools is the relationship between comfort and energy use in buildings. The intention is to equip architects and engineers with information which will help them to design low-energy buildings without compromising the comfort of occupants.

MulCom aims to present ideas rather than provide cast-iron solutions. It provides the background information about the nature of thermal, visual and acoustic comfort and how they

relate to the building's energy performance.

MulCom presents the user with two options: Comfort and Buildings. Each section deals with an aspect of the building-occupant interaction enabling the user to look at the latest thinking in terms of both comfort and energy use. There is also an interactive tool which allows for the comparison of different design strategies and their affect on thermal comfort.

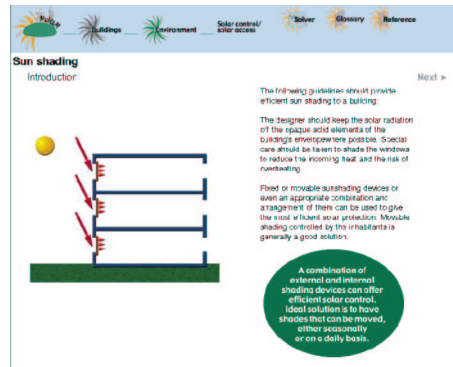


Figure : Section on solar shading in MulCom

Contents of MulCom

- **Comfort**
 - *Thermal comfort* : An essential feature of MulCom this uses the adaptive approach to thermal comfort to explain in detail not only the complex relationships of temperature, humidity, air speed etc. but also the interaction between buildings and their occupants and how these relate to human comfort
 - *Visual comfort* : Although not strictly speaking a design guide for interior lighting, this section covers the basics of lighting in human visual perception. A well-lit visual environment is the key for a healthy and productive working environment.
 - *Acoustic comfort* : Acoustic comfort is an important topic having a direct impact on the ability to naturally ventilate buildings.
- **Buildings**
 - *Energy and buildings*: This section deals with the role of insulation, thermal mass and the behaviour of building occupants. The apparent contradiction between the energy used by buildings and the comfort of occupants is explored.
 - *Climate control*: Including information on both passive and active renewable energy systems as well as detailed information on the more conventional mechanical systems. The role of ventilation and infiltration is also covered.
 - *Environment* : The effect of external character of the built environment is explored including the form of the building, the control of solar access and the way to treat the local microclimate through such means as vegetation and site form.
- **Solver**. A unique feature of MulCom is the Solver. This tool allows the user to compare various scenarios to illustrate the effects of changes in the thermal mass, insulation, and the size, orientation and shading of the windows. Two screens are presented so that comparisons can be made. The output gives the the daily variation in indoor temperatures and occupant comfort on hot and average summer days or the annual energy use for cooling or heating. These results are presented for two European climates: London and Athens. The MulCom solver is not intended to be used as a simulation tool but is more in the nature of an expert system using pre-calculated temperature and energy simulations.

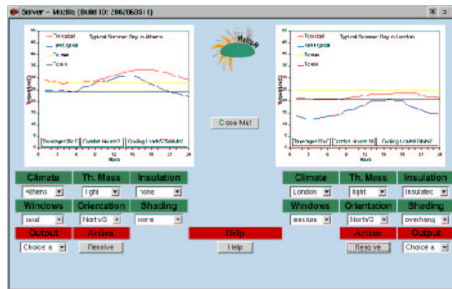


Figure : The MulCom interactive Solver

RUN IT ANYWHERE

One of the concerns was that the packages should be available to everybody interested. Care was therefore taken to ensure that the contents are independent from the computer platform. A decision was made to develop the packages in HTML format, the language that is used to describe pages on the World Wide Web. This format is used for presenting information on the internet. This guarantees true independence from computer platforms and operating systems, resulting in the widest possible audience.

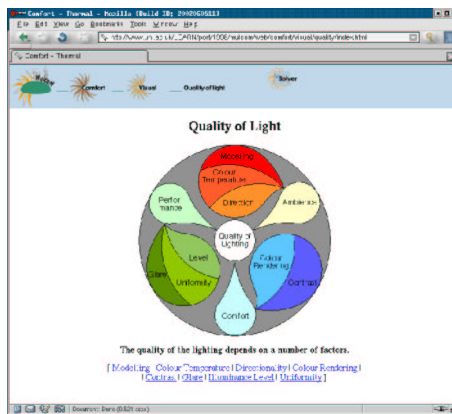


Figure : Quality of Light from MulCom in a browser window

The classic HTML document layout language is restricted to static content. However, DayMedia and MulCom were required to be more interactive and let the user play around with different configurations and parameters. To overcome this discrepancy, a platform independent programming language, JavaScript, is used allowing for interactions with the user beyond the classic hyperlink concept. It can be embedded into the web pages and is used for dynamically changing the content of the page following user interactions. JavaScript is understood by any recent web browser, so no proprietary plug-ins are required.

For those that are not directly connected to the Internet, a CD-ROM image can be downloaded and burnt. With this, both teaching packages can be used on any computer that is equipped with a CD-ROM drive and a web browser, allowing for the broadest possible audience [1], [2].

OPEN SOURCE LICENCE

Most software packages available today are published under rather restricted licenses. Even is

the package can be used free of charge, the user has usually no access to the source code. To ensure DayMedia and MulCom will be a useful tool not only for now but also in the future, it was decided to publish both under the GNU General Public License (GPL) [3]. This means that not only are they free to use, they can also be copied and given away free of charge.

The authors are fully aware that neither teaching package is perfect and all-encompassing. There are topics that are either not covered at all or are only touch upon. It is hoped that the open license will encourage users to produce more content if they notice missing content as they use the packages for teaching or self-study.

Encouragingly, both packages have been picked up by a number of people around the world which use them for teaching purposes. [4], [5] and [6] are only three examples of references to DayMedia and MulCom made by others.

ACKNOWLEDGEMENTS

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- Low Energy Architecture Research Unit, LEARN, at the University of North London, UK
- University of Athens, Greece
- University of Florence, Italy
- Technical University of Trondheim, NTNU, Norway
- ENTPE, Lyon, France
- Production company ARTEC, London, UK

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- Low Energy Architecture Research Unit, LEARN, at the University of North London, UK
- TNO Buildings and Construction Research, Delft, Holland,
- The University of Athens, Greece
- Production company ARTEC, London, UK.

REFERENCES

- [1] DayMedia: <http://www.unl.ac.uk/LEARN/port/1998/daymedia/index.html>
- [2] MulCom: <http://www.unl.ac.uk/LEARN/port/1998/mulcom/index.html>
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- [4] Architectstudent.net: <http://www.architectstudent.net/library/daymedia>
- [5] University of Hong Kong, Department of Architecture, Integrated Building Technology: <http://courses.arch.hku.hk/IntgBuildTech/learn.htm>
- [6] Natural Ventilation at the MIT: <http://naturalvent.mit.edu/Links/links.htm>