

The Didactic Triangle

Using CAD, Photography and Descriptive Geometry as Educating Tools with Mutual Influence

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Teaching of architectural photography is still not very popular at universities. We developed a didactic concept of teaching architectural photography in response to caad and to descriptive geometry.

The first edge of the triangle (descriptive geometry):

By having knowledge in descriptive geometry, students will be more aware of geometrical context in caad and in photography. On the other hand the teaching and understanding of descriptive geometry is much easier, when students have already a basic knowledge of photography.

The second edge of the triangle (caad, animation):

This kind of teaching architectural photography is not only necessary to open the eyes for „young“ student to learn photography - it also helps to understand the basics of constructing perspectives in descriptive geometry or computer aided design up to different kinds of visualisation.

The third edge of the triangle (photography):

In the age of non-slr-cameras students are no longer used to take sophisticated photographs. They are mostly only able to take snapshots (even in the time of digital cameras). One of our main methods is to make them acquainted to slr-cameras (analog and digital), to tripods and spirit levels as essential tools and to teach the basic geometrical context. The didactic concept is continued by teaching knowledge about colours, light, different points of view etc.

Our didactical concept („Didactic Triangle“) is based on teaching all three elements (photography, caad, descr. geometry) by the same teacher in the same semester to the same students. This guarantees the mutual understanding of the three disciplines. Interactive, digital teaching elements (virtual „mock-up-studio“) support the acceptance.

Keywords: *descriptive geometry, photography, cad.*

Descriptive Geometry <---> CAD

The classical curriculum at Architectural Schools and Faculties has one core: descriptive geometry. A great number of teacher see this as a compulsory base for understanding the geometry, for producing exact drawings and getting measurements from the drawn scenes.

On the other hand freehand-drawings seemed to be essential to develop the artificial component of architectural and artistic way of expressing ideas or reproducing seen scenarios with a personal way of emphasizing.

The last generation of architectural students grew up with additional teaching and receiving of computer aided design (or drafting or modelling . . .). It depends of the individual department to introduce CAD in the first, second, third or fourth year. But regularly it is not a replacement for descriptive geometry, it is an additional skill.

My Point of view and matter of investigation is the other way round: using the inquisitiveness of first-semester-students about learning as much new technology from the first day on, student are really keen to use computers in their studios and to use the tools, specific for their field of study and practice.

We developed a way of using CAD not only as a drafting tool and not only as a tool of visualisation of

synthetic objects, but also as a tool of analysing the visual environment in an abstract way.

Architectural Photography <---> Descriptive Geometry

While CAD was introduced as a new item, developed in the time of technological evolution, architectural photography is an item, nearly as old as the history of academic education in architecture. The first photography in history was 1827 a photograph of an architectural object (a barn) by N. Niepce. At that time it was easier to get pictures from objects, which could not move or change their figure. In the early days of photography very important inventions were done such as stereo photography and photogrammetry.

Due to the precisiveness and the special equipment arch. photography became a field for professional photographers.

In the first half of the twentieth century the equipment became smaller and more comfortable - even for architects. Some examples: Mendelsohn traveled through America and presented a book with his photographs, Corbusier and Mies von der Rohe used photographs for their theoretical work, the Bauhaus cultivated the dynamic and experimental photography. And architects always used photography for publishing their finished buildings.

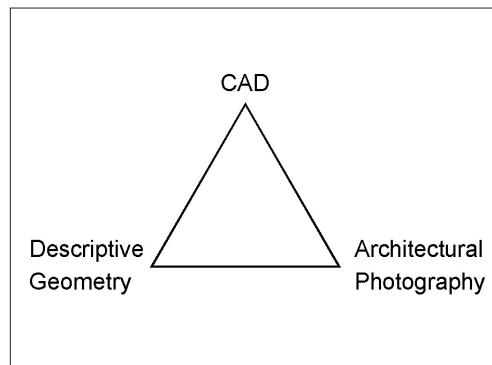


Figure 1
The triangle of mutual influence



Figure 2
Geometrical analysis of taken pictures

But photography in education?

We can observe several courses (not too many) in the curricula of different schools of architecture. The focuses are different: some use professional photographers to offer lessons to students with the aim for the students to be able to make photographs of a certain quality by themselves or to understand the way, professional photographers work.

Students and practising architects with a certain amount of engagement, interest and talent try to make their own (sometimes semiprofessional or even professional photographs). The threshold to do this, became lower and lower: the equipment became smaller, lighter and economically more affordable, the way of making own black-and-white prints in their own laboratories changed to using the professional equipment of professional laboratories for slides and negative/positive-prints.

But it still remained a process of „taking“ pictures from buildings and objects with the aim to reproduce in a handcraft or artificial approach.

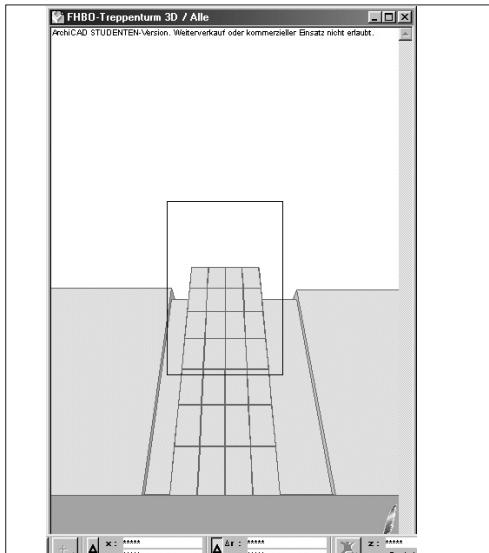
Even the digital revolution - the process of producing more and cheaper digital cameras and getting a

saturation in the market was on first sight a further step in reproducing pictures. On second sight the number of taken pictures exploded and the quality and accurateness grew down. In the meantime nearly every students comes to the university with a digital camera or a mobile phone with photographic unit.

On the other hand the understanding and deepness of knowledge in photographic technology rises down. Only a few know lenses without zoom, or know the connection between shutter speed and diaphragm. Nearly no one of them have ever heard about a shift lens or an exposure meter.

Our first approach to photography starts in the first year with the task to take a picture of a twodimensional object: an advertising panel. At first sight it seems to be an easy job, but students very soon realize, that it is much more difficult than to „shoot“ a regular photograph. They detect the rules of the geometry: to keep the camera in an exact position, to use a tripod, to recognise the context between distance and focal length.

Another insight is evident: they learn to judge the



*Figure 3a/b
Analysis of three-dimensional
objects*

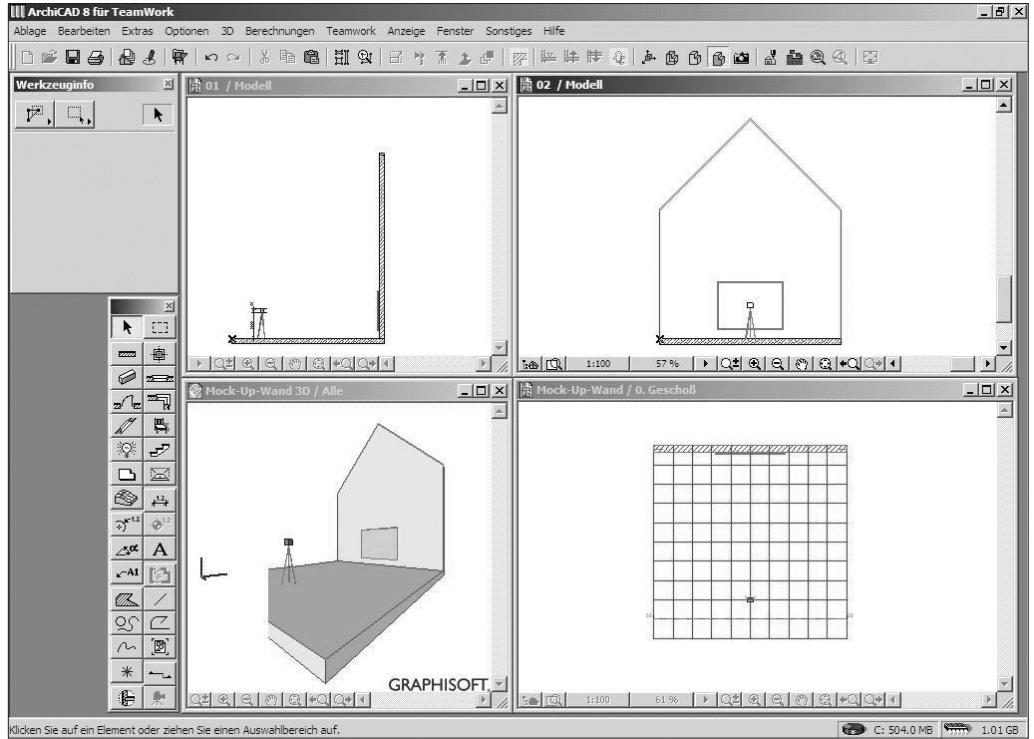


Figure 4
Digital (virtual) Mock-Up-Studio in ArchiCAD

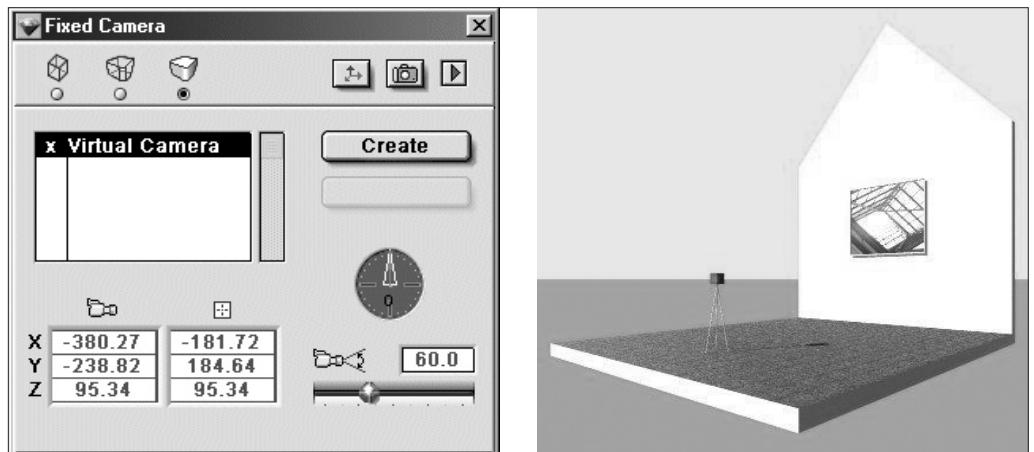


Figure 5 a/b
Digital (virtual) Mock-Up-Studio using Artlantis software

quality of their lens. And they learn playful how to use software like Photoshop or Paint Shop to eliminate distortion.

The first step of combining photography and descriptive geometry is analysing taken pictures, especially digitally taken pictures of two-dimensional objects.

The analysis shows the point of view of the photographer, the principles of architectural photography and tripods: horizon in the middle of the picture, aberrant lines as a result of inclining the camera.

The next step is the analysis of three-dimensional objects (vanishing points, central perspectives).

Architectural Photography <---> CAD

One of our central didactical ideas and actions was to combine the learning of taking pictures in a correct and „architectural“ way, with the simulation of picture-taking scenarios in a virtual studio.

We developed a virtual „Mock Up Studio“ in ArchiCAD and use the different ways of setting cameras in ArchiCAD itself. On the other hand we export the CAD-model into Artlantis, using the different and more powerful tools of changing the features influenced by different heights of tripod/camera, different tilt angles, different focal length,.

Even the differences in depth of field can be simulated.