Topics in Theory & Programming of
DIGITAL IMAGES
Summer 2010

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DIG
IMG

Note **01** | 10 & 26 April 2010

Outline & Schedule

Content

Digital Media is a field of study and research between aesthetics and algorithmics. This study – the products, processes, aspects, and relations under study – requires activities, among others, of interpretation and construction. These two are not unique to the field of digital media, not at all. Special is the rigorous necessity of studying both at the same time. Interlinked, interwoven, intertwined. Aesthetics: how humans perceive digital media; algorithmics: how machines must function to become digital media.

C. P. Snow was most likely not thinking of digital media when he gave his lecture, in 1959, on the *Two Cultures*. Since then, the situation of the world has changed dramatically. In particular, the Cold War has come to an unbloody end. Capitalism has triumphed. It is rampaging around the world in its uncessant drive for quantity, and crises of huge dimensions are the necessary stages.

The media question is gaining importance, the society of the spectacle is taking on form. A community of high-power intellectuals or experts has arisen who call themselves the representatives of an emerging *third culture*. They may not belong to the digital media community (some probably do), but there is such a community of the third culture.

In our joint international study programme of digital media, the algorithmic stance is regarded by a considerable percentage of the students as difficult and hard to understand. I think the issue is not so much students' performance in matters of algorithmics, but rather the attitude of both, students and professors, towards algorithmics. We need to develop a kind of thinking that is algorithmic and aesthetic at the same time and towards the same object.

I want to make an effort in this course (workshop and seminar) to study a selection of important topics in the field of digital images. The emphasis will be on algorithmic and conceptual issues of digital images. We will ask questions like: How can a program draw a straight line? What is the difference between an analog straight line and a digital straight line? Perhaps, we take a look at digital brushes or pencils. How can the operating system of a computer detect which item on the screen was hit by the mouse cursor when the mouse button was clicked? How is a filter defined, and how is it used in Adobe Photoshop? Can we construct one ourselves? How does ray tracing work, and how is the aesthetics of its images related to the algorithmic working? What are differences between renderers? How con color come into the computer? And so many more questions.

The course should consist of a bouquet of topics that are only loosely connected. We collect those topics at the beginning such that a maximum of interests of students may be taken up during the semester. We organize them in a sequence, and we assign a few (or only one) persons to each topic. Their job will be to research their assigned topic to some degree, and prepare their findings in a way that other participants may gain new insight from.

This research should serve two purposes: through your efforts, we make good use of the internet as a first source. But we do this critically. You will be asked to research your topic and summarize your

findings in about one page. But you amend this by at least trying to give a critical appraisal of the sites you found and of the manner they dealt with the topics.

It would be fine if, through our combined efforts, a little brochure or website could be designed, written, and implemented.

Conditions for credit

You may, first of all, take the course just out of interest. If you do so, I recommend that you work hard nevertheless. Otherwise you cannot take much out of the course. But if you do take it for credit, you should be aware of the relation between meeting hours and number of credit points: it is not usual that you can gain 6 credits for only 2 hours of weekly meeting time. What this means is, you are expected to put in a substantial amount of work. We must be aware of this and organize the course such that you all get a realistic chance to propel your algorithmic skills forward. There will be lectures, exercises, tests, reading assignments, group work, oral presentations, and written essays. We should definitely organize an extra closing day for wrapping up our results.

You get credit if you satisfy the following conditions:

1. You join one of the topical groups we build. You contribute actively to their work and results. These results should be a short critical summary of your findings from the internet (written), combined with an oral presentation of those findings. You should try to derive a generative design contribution to a website or brochure documenting the course work. This more substantial work is to be presented at the final meeting.

2. You hand in solutions to the occasional assignments (four or five).

3. You answer the anonymous short tests in class that will be given as surprise.

A lot of detail must still be decided before this set of conditions is turned into a consistent and manageable workplan for you as individuals and in groups. Not knowing how many students will participate, nor what their particular interests and given knowledge levels are, I want to keep this open until we all know better. We will see much clearer after the first meeting. (The above version is reflecting this a bit.)

It would be great if all, or most, have a basic experience in Processing. We could test progress in algorithmic understanding by writing programs in that system. In the end, we might come up with a set of beautiful products! (Those, who are more advanced, will be encouraged to use C++ and OpenGL.)

A remark on the final contribution

The condition for credit says, that *you should try to derive a generative design contribution to a website or brochure documenting the course work.* Since people keep asking me, I want to explain once more what this says.

You work in a group on a topic. You present orally. You design and implement / prepare / write a contribution about your topic to a website or a brochure. In the first case, this contribution would be in form of a digital medium. In the second it would be a print medium. It is your choice.

This contribution must go beyond your oral presentation. Its topic must be some aspect of your presentation and, therefore, of your topic. Each group delivers one contribution. It may consist of several parts. But it is one contribution. So different parts must belong to the one contribution.

You are free in the choice of your topical aspect. You take up something that belongs to the topic but that you could not deal with in the oral presentation. Let your fancy play a bit. Do something special. But do it, and do it now! You must present this final contribution on the 15 July, between 9 and 19. Each group has one hour plus discussion.

If you still feel insecure, you must ask immediately.

Preliminary Schedule

12 April	A first introduction. Collecting topics of interest. Organization of work. Conditions for credit
19 April	Start into first topic (raytracing). Final organizational issues
26 April	A. Raytracing of 3D scenes
3 May	A. Raytracing of 3D scenes
10 May	B. Rasterizing graphic elements (straight line, polygon area, anti-aliasing)
17 May	B. Rasterizing graphic elements
24 May	--Holiday in Germany--
31 May	C. Image formats and compression
7 June	C. Image formats and compression
14 June	D. Color theories and systems
21 June	D. Color theories and systems
28 June	E. The process of generative (visual) design
5 July	E. The process of generative (visual) design
12 July	from 9 to 19: Presentations of students' projects (contributions to a medium). Looking back: what have we learned. Critique

A collection of possible topics

(1) Rasterization of graphic elements and antialiasing; (2) Rendering of threedimensional scenes by ray-tracing; (3) Compression of video or image data; (4) Formats for visual data files, their advantages and problems; (5) Color theory and systems; (6) The generative process between visual designer and algorithm.

For this list, I have changed students' suggestions (of 12 April) slightly, occasionally collapsing two into one. Since our meetings are only for two hours, we should usually reserve two meetings for each topic, but keep fexible.

For the schedule above, five topics have been entered after two discussions at the first meetings. Another note gives a bit more detail on this work.