Modelling Sustainable Systems and Semantic Web

Introduction

Lecture in the Module 10-202-2312
for Master Computer Science

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Background

Interdisciplinarity

Guiding motto of the University of Leipzig:

A Tradition of Crossing Boundaries
(Aus Tradition Grenzen überschreiten)

- Boundaries: Humanities – Science – Technology
- Tradition: The Faculty of Philosophy until 1951

But what about technology?

Our mode of production today is closely linked to the use of science and technology. This brings advantages, but also problems.

Background

This was not always so. This bourgeois (or capitalist) mode of production has developed over the last 500 years, first in Western Europe and has since spread around the globe.

Technology and its use have undergone important metamorphoses during the last 200 years, which had also a decisive influence on the organisational forms of that mode of production, for example with the establishment of the factory system and industrial production in the second half of the 19th century.

Background

This is the beginning of what brought Marx to the vision of a society in which the "social metabolism" ("gesellschaftlicher Stoffwechsel", MEW 23) is organised in a way that

> *no longer does the worker insert a modified natural thing as middle link between the object and himself; rather, he inserts the process of nature, transformed into an industrial process, as a means between himself and inorganic nature, mastering it. He steps to the side of the production process instead of being its chief actor.*
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> *Es ist nicht mehr der Arbeiter, der modifizierten Naturgegenstand als Mittelglied zwischen das Objekt und sich einschiebt; sondern den Naturprozess, den er in einen industriellen umwandelt, schiebt er als Mittel zwischen sich und die unorganische Natur, deren er sich bemeistert. Er tritt neben den Produktionsprozeß, statt sein Hauptagent zu sein. (MEW 42, ch. 14)*

Background

Marx goes on to state that the development of the productive forces is *necessarily* heading in such a way towards the organisation of the "social metabolism".

> *But, once adopted into the production process of capital, the means of labour passes through different metamorphoses, whose culmination is the machine, or rather, an automatic system of machinery (system of machinery: the automatic one is merely its most complete, most adequate form, and alone transforms machinery into a system), set in motion by an automaton, a moving power that moves itself; this automaton consists of numerous mechanical and intellectual organs, so that the workers themselves are cast merely as its conscious linkages.*
>
> *German translation on the next slide.*

Background

In den Produktionsprozess des Kapitals aufgenommen, durchläuft das Arbeitsmittel aber verschiedene Metamorphosen, deren letzte die Maschine ist oder vielmehr ein automatisches System der Maschinerie (System der Maschinerie; das automatische ist nur die vollendetste adäquateste Form derselben und verwandelt die Maschinerie erst in ein System), in Bewegung gesetzt durch einen Automaten, bewegende Kraft, die sich selbst bewegt; dieser Automat besteht aus zahlreichen mechanischen und intellektuellen Organen, sodass die Arbeiter selbst nur als bewusste Glieder desselben bestimmt sind. (MEW 42, ch. 13)

Background

The mastery of that "automaton", that apparently "natural" development of society, is on the agenda today, because its "naturalness" is increasingly undermining the very conditions of human existence on our planet.

Marx's vision that in this process the worker "steps to the side of the production process instead of being its chief actor" is based on a very narrow understanding of "production process".

Background

In the 150 years since then this narrow understanding has been replaced by a common modern understanding of "production process", in which

> *it is neither the direct human labour the worker himself performs, nor the time during which he works, but rather the appropriation of his own general productive power, his understanding of nature and his mastery over it by virtue of his presence as a social body – it is, in a word, the development of the social individual which appears as the great foundation-stone of production and of wealth.*
>
> *... es weder die unmittelbare Arbeit ist, die der Mensch selbst verrichtet, noch die Zeit, die er arbeitet, sondern die Aneignung seiner eignen allgemeinen Produktivkraft, sein Verständniss der Natur, und die Beherrschung derselben durch sein Dasein als Gesellschaftskörper – in einem Wort die Entwicklung des gesellschaftlichen Individuums, die als der große Grundpfeiler der Produktion und des Reichtums erscheint. (MEW 42, ch. 14)*

Background

In short, it is a question to overcome the "naturalness" of the "automaton" – the socio-technical-cultural "apparatus" created by human as social being – and put it under the control of the united humanity.

This requires one thing above all – educated and committed personnel who are capable of exercising also their civic responsibility (up to Art. 20 of our constitution). Academic institutions are requested to deliver an important contribution to this. This also requires to cross the old and new boundaries between Humanities – Sciences – Technology.

Background

The academic education system has been on this path for more than 100 years, as the development of technological academic educational institutions in Leipzig shows.

- 1838 Foundation of the Royal Saxonian School of Building Professions (Königlich-sächsische Baugewerkeschule) in Leipzig by Albert Geutebrück
- 1856 Foundation of the VDI, the *German Association of Engineers*
- 1875 Foundation of the Municipal School of Trades (städtische Gewerbeschule) in Leipzig as the historical root for education in mechanical and electrical engineering.

  Realisation that tradesmen need a thorough technical education in addition to a general higher education ("humanistische Bildung").

Background

- 1909 Royal Saxonian Building School
- 1914 Technical school for librarians
- 1920 Saxonian State Building School
- 1949 Technical School for Energy Markkleeberg
- 1954 Leipzig College of Civil Engineering
- 1956 Leipzig School of Engineering for Gas Technology
- 1965 School of Engineering for Automation Technology
- 1970 School of Engineering for Energy Management Leipzig
- 1969 Leipzig College of Engineering
- 1977 Unification into Leipzig Technical University
- since 1992 University of Applied Sciences for Technology, Economics and Culture

Background

In the 20th century, with *engineers* a whole new professional group appeared. Nowadays new professions such as computer scientists, are already crossing the border between science and technology and can graduate from our Faculty to obtain a doctorate in science (Dr. rer. nat.), but also a doctorate in engineering (Dr.-Ing.). The situation with the Humanities has not yet been clarified, but at least you can qualify for a Master in Digital Humanities.

Course Programme

Background and Objectives

The course is an interdisciplinary offer in the Master in Computer Science and Master in DH, but can also be taken as a minor (Nebenfach).

The aim of the course is to illuminate important developments in the outlined field of development.

Course Programme

Four Theses

1) The short digital age is already over, the corona age started.
2) Whereas the digital transformation was still characterised by a rapidly growing "world of digital data", through the analysis and processing of which influence on real-world processes was gained, we are now faced with the challenge of using these tools to meet the challenges of the corona crisis.
3) These challenges are only a small foretaste of the challenges that climate change will pose.
4) These challenges are closely linked to fundamental questions not only about our economy or mode or production, but also of our understanding of technology and science.

Course Programme

It is therefore appropriate to address the three topics

- Social structures of digital change
- Modelling of sustainable systems
- Conceptualisation processes and the Semantic Web

and to develop a set of conceptual and terminological tools that are suitable for a viable analysis of these topics.

The conceptual toolkit to be developed is oriented towards various aspects of the development of socio-technical systems that are addressed in the lecture and in the seminar.

Organisational Matters

The Seminar Module 10-202-2312 (5 CP) "Applied Computer Science" includes

- a lecture "Modelling of Sustainable Systems and Semantic Web"
- a seminar "Sustainability, Environment, Management"

Examination:

- **Prerequisite for examination:** successfully completed seminar.
- **Examination:** Seminar paper.

Organisational Matters

More about this in OPAL
`https://bildungsportal.sachsen.de/opal` in the course S22.BIS.SIM. There, please enrol first in the course and then in the corresponding group.

You can access OPAL with the data of your studserv account.

You will find a more detailed lecture concept in the github repo `https://github.com/wumm-project/Seminar-S22`.

Data protection

We follow an Open Culture approach not only theoretically but also practically and make course materials publicly available. This also applies to the course materials you have to produce (presentations, handouts) as well as to (annotated) chat sessions of the seminar discussions, in which your names are also mentioned. **We assume your consent to this procedure if you do not explicitly object**. The discussions themselves are not recorded.

Organisational Matters

- Lecture: Thursdays 9:15-10:45, SG 3-15
- The Flipped Classroom Concept
- Continuously updated lecture plan and list of references in the `Lecture/README.md` file in the github Repo.
- Further (mainly organisational) information also in the forum of the OPAL course.
- Seminar: Tuesdays 9:15-10:45, synchronous digital in the BBB room BIS.SIM, `https://meet.uni-leipzig.de/b/gra-w2c-fhz-qnp`

Questions ?