Virtual University / FernUniversität-Online

Preparing and offering teaching material in different network environments

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1. Introduction

First concepts for online teaching via computer networks were developed at the FernUniversität Hagen, the only distant teaching institution at university level in Germany, more than two years ago. In the meantime a prototype of the *Virtual University* has been implemented and tested in practice with over a thousand students.

The Virtual University is mainly structured as an online service using powerful workstations. Internet, modems, ISDN (Integrated Services Digital Network) and broadband ISDN (on ATM - Asynchronous Transfer Mode basis) are used to access the Virtual University. Further local area networks (LANs) and high speed local area networks (HSLANs) at university campus and at study centers are also used.

For a student of the Virtual University three functional areas are encountered in an integrated surrounding:

1. The Presentation and Administration Area, in which he receives diverse information on courses and lectures and where he can enroll to different events,
2. The Course Area, where he finds prepared teaching materials and
3. The Communication Area, where he can communicate with the lecturer and fellow students.

2. The Presentation and Administration Area

The Virtual University is presented on a WWW (World Wide Web) server using HTTP (Hypertext Transfer Protocol). The homepage of the Virtual University (Fig. 1) is the starting point to all the offered services.

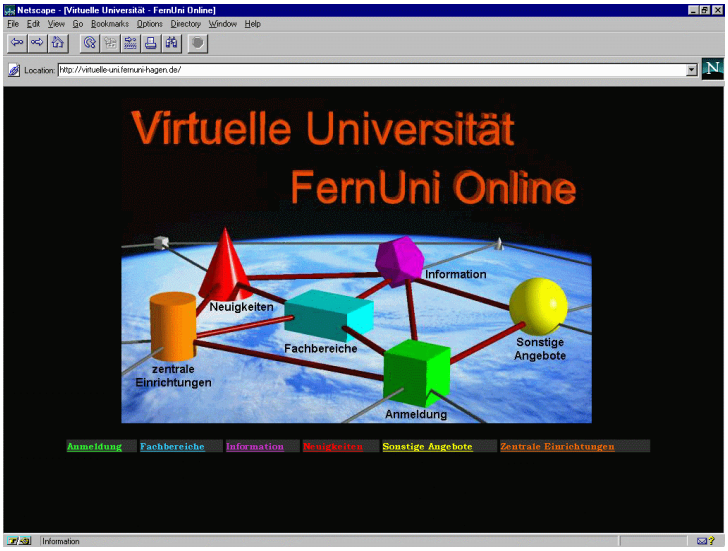


Fig. 1 Homepage of the Virtual University
(http://virtuelle-uni.fernuni-hagen.de)

Here general information about the FernUniversität (*Information*), its Faculties (*Fachbereiche*) and their research is available (Fig. 2). One can visit the central institutions (*Zentrale Einrichtungen*) such as the library or one can read the news (*Neuigkeiten*). In the area of the different offers one can go shopping or enter the cafe to exchange general information. In Registration (*Anmeldung*) general administrative functions are offered.
In the surface layout the different services are represented as different symbols and colours. This scheme forms a corporate identity which aims at avoiding the lost in cyberspace effect.

3. The Courses

The course material (Fig. 3) can differ widely in the degree of the multimediality. The span reaches from text oriented courses over screen oriented courses with little text and mainly pictures, sound, animations and videos up to highly interactive courses with integrated working and experimental surroundings.

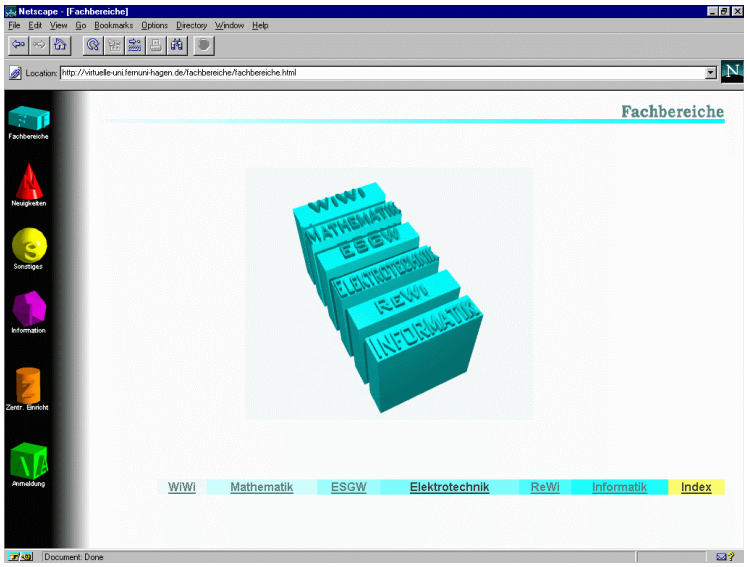
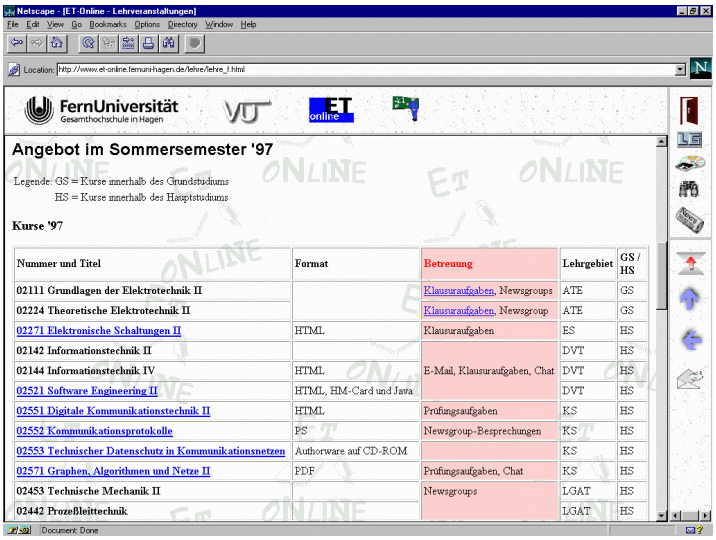


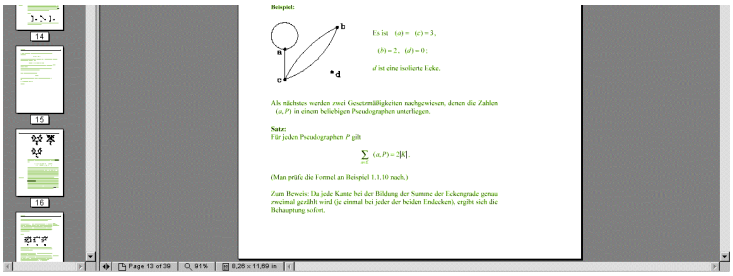
Fig. 2 The Faculties



Nummer und Titel	Format	Betreuung	Lehrgebiet	GS / HS
02111 Grundlagen der Elektrotechnik II		Klausuraufgaben, Newsgroups	ATE	GS
02224 Theoretische Elektrotechnik II		Klausuraufgaben, Newsgroup	ATE	GS
02271 Elektronische Schaltungen II	HTML	Klausuraufgaben	ES	HS
02142 Informationstechnik II			DVT	HS
02144 Informationstechnik IV	HTML	E-Mail, Klausuraufgaben, Chat	DVT	HS
02521 Software Engineering II	HTML, HM-Card und Java		DVT	HS
02551 Digitale Kommunikationstechnik II	HTML	Prüfungsaufgaben	KS	HS
02552 Kommunikationsprotokolle	PS	Newsgroup-Besprechungen	KS	HS
02553 Technischer Datenschutz in Kommunikationsnetzen	Authorware auf CD-ROM		KS	HS
02571 Graphen, Algorithmen und Netze II	PDF	Prüfungsaufgaben, Chat	KS	HS
02453 Technische Mechanik II		Newsgroups	LGAT	HS
02442 Prozeßleittechnik			LGAT	HS

Fig. 3 The Course Materials

Generally special tools are used for the production of multimedia teachware. Courses available at present were produced using *Adobe Acrobat* (Fig.5), *Toolbook*, *Authorware* and *Shockwave* (Fig.6), *Director*, and *HMCard* (Fig. 7) and *HTML*, enriched using *Java Applets* (Fig. 8).



Beispiel:

Es ist $\omega(a) = \omega(c) = 3$,

$\omega(b) = 2$, $\omega(d) = 0$;

d ist eine isolierte Ecke.

Als nächstes werden zwei Gesetzmäßigkeiten nachgewiesen, denen die Zahlen $\omega(x, P)$ in einem beliebigen Pseudographen unterliegen.

Satz:
Für jeden Pseudographen P gilt

$$\sum_{x \in E} \omega(x, P) = 2|K|.$$

(Man prüfe die Formel an Beispiel 1.3.10 nach.)

Zum Beweis: Da jede Kante bei der Bildung der Summe der Eckengrade genau zweimal gezählt wird (je einmal bei jeder der beiden Endecken), ergibt sich die Behauptung sofort.