Presentation Outline

• What is & Why E-learning?

• E-learning technologies: where?

Worldwide  In NL  @ TU/e

@ Information Systems Section
of Mathematics & Computer Science Dpt.
@ TU/e

TU/e Technische Universiteit Eindhoven
University of Technology
About Me

Russia, Saint-Petersburg State Electro-Technical University, 1999

- Engineer diploma
  Development of the distance learning server for studying of artificial intelligence

Russia, Saint-Petersburg, 1999-2001

- Projects
  - IDLE (Intelligent Distance Learning Environment)
  - Distance Learning Course on Business Planning
About Me

The Netherlands, TU/e, 2007

• PhD thesis
  Incorporating Cognitive/Learning Styles in a General-Purpose Adaptive Hypermedia System

The Netherlands, TU/e, 2001 until now

• Projects
  – AHA! (Adaptive Hypermedia for All)
  – GRAPPLE (Generic Responsive Adaptive Personal Learning Environment)
  – CHIP (Cultural Heritage Information Personalization)
What is E-Learning?/
Some History Facts

• *Distance education* dates to at least as early as 1728, when the Boston Gazette printed an advertisement from *Caleb Phillips*, teacher of the new method of *Short Hand*, that offered

“... any persons in the country desirous to learn this Art, may, by having the several lessons sent weekly to them, be as perfectly instructed as those that live in Boston.”

![Advertisement from the Boston Gazette](image-url)
What is E-Learning?/
Generations of Distance Education

• 1840s: Stenographic Short Hand by Isaac Pitman, through written & print materials

• End of 1960s: Multimedia distance education through print materials, radio and TV broadcasting, cassettes, computers e.g. PLATO (computer system)

Q: What is missing in these forms of distance education?
What is E-Learning?
Generations of Distance Education

• 1970s: Computer-mediated communication through email, teleconferences, growing use of Internet
Why E-Learning?/
Online Course vs Textbook

- physical

- local

- uniform
Why E-Learning?/
Online Course vs Textbook

• paperless
• global
• possibly adaptive
Popular Tools for E-Learning: Learning Management Systems

WebCT (Course Tools) or Blackboard Learning System, now owned by Blackboard Inc.
Universities Worldwide Offering E-Learning

Top universities offering e-learning:
• The Open University, UK
• University of British Columbia, Canada
• Pennsylvania State University, USA
• University of Florida, USA
• Walden University, USA
• to add more ...
Dutch Universities Offering E-Learning

• Open University
  http://www.ou.nl

• Collaboration between

  University Medical Center Utrecht
  www.elevatehealth.eu

• Fontys University of Applied Sciences
  http://www.fontys.nl
E-Learning @ TU/e

- DiagNow - an interactive lecture-response system
- Escom-Method a multimedia guide through a knowledge area
- peach³ - for assignments evaluation [peach3.nl](http://peach3.nl)
E-Learning @ Information Systems Section, Mathematics & CS Dpt., TU/e

- Specialization in **Adaptive E-learning**
- **Software for developing adaptive applications:**
  - AHA! (Adaptive Hypermedia Architecture)
  - GALE (Generic Adaptive Learning Environment)

*The first adaptive online thesis*
Adaptive E-Learning & Adaptive Web-Based Applications in General @IS

• IS scope is not limited to e-learning:
  – AHA! and GALE are general-purpose tools for various types of adaptive applications
  – CHIP demonstrator - personalized museum guide based on Semantic Web Technologies
Ideal Adaptive Teaching

Master - Apprentice ->
Tutor - Student (Learner)
One Size Does Not Fit All
Adaptive E-Learning

- Consider adaptation to:

  - knowledge
  - goals & tasks
  - cognitive/learning styles
Adaptive E-Learning

• Most commonly used types of relationships between course topics:
  – knowledge propagation
  – prerequisites

  *A is a prerequisite for B*, means:

  *You should study A before B* or
  *You should study A before you can understand B*
Adaptation performed by AHA!

Adaptation in AHA!

Adaptive presentation (content level adaptation)

- Conditional inclusion of fragments
  - requirement for fragment
    - fulfilled
      - fragment included
    - not fulfilled
      - fragment not included

Adaptive navigation (link level adaptation)

- Link hiding or annotation
  - depends on "desirability" of a page
    - defined by link colors
      - good
      - neutral
      - bad

Anonymous user (no email address) has read 7 pages and still has 24 pages to read - list of read pages - pages still to be read
Changeable settings: link colors - knowledge of AHA! 3.0 tutorial LS - password - Form to change your preferences Log off
Example Created with AHA!: Presentation for Verbal+Analytic Learner

Anonymous user (no email address) has read 7 pages and still has 24 pages to read - list of read pages - pages still to be read
Changeable settings: link colors - knowledge of AHA! 3.0 tutorial LS - password - Form to change your preferences Log off

Adaptation performed by AHA!

- Regarding the content level adaptation fragments can have an associated requirement. This is a Boolean expression that decides whether the fragment should be included or not. In AHA! a fragment can be a part of an html or xhtml page. In that case the requirement is also part of the page, using an <if> tag. A fragment can also be an object, stored in a separate file. In that case the requirement is stored inside the combined domain and adaptation model, and the inclusion also triggers the adaptation engine to perform more user model updates.
- Regarding the link level adaptation AHA! checks a condition associated with the destination of a link in order to decide whether the link is "desirable". Depending on the status of the link destination the link anchor will be of the class "good", "neutral" or "bad". By default this results in the link anchor being blue, purple or black.

see more pictorial information
Example Created with AHA!: Inferring Preference for Image vs Text

Anonymous user (no email address) has read 7 pages and still has 24 pages to read - list of read pages - pages still to be read
Changeable settings: link colors - knowledge of AHA! 3.0 tutorial LS - password - Form to change your preferences Log off

Adaptation performed by AHA!

- more pictorial information
- more textual information
Planets

Image of Planet

Information

A planet, as defined by the International Astronomical Union (IAU), is a celestial body orbiting a star or stellar remnant that is massive enough to be rounded by its own gravity, is not massive enough to cause thermonuclear fusion, and has cleared its neighbouring region of planetesimals. **Visited:** 1

Next suggested concept to study: Moon
Example Created with GALE: World of Biomes
Environment

Definition

The environment is the combined modeling of the physical environment and the biological life forms within the environment, and includes all variables, parameters as well as conditions and modes inside the Earth's biosphere. The environment can be divided into two categories: the natural environment and the built environment, with some overlap between the two. Following the industrial revolution, the built environment has become an increasingly significant part of the environment. The environment is the context describing the ambiance of any entity therein. As this described entity itself is part of the environment, the description is partially recursive.

Constituents

The scope of the environment is all that contained in the biosphere, which is that part of the Earth in which all life occurs. A environment is the complex of biotic, climatic, and edaphic factors that act upon an organism and determine its form and survival, and morphs itself in the process. Ecosystems, of which there are numerous types and are a defined part of the biosphere, collectively make up the whole of the biosphere. Within an ecosystem there are habitats in which an organism (including human beings) exists. At its most natural state, an environment would lack any effects of human activity, although the scale of this activity is such that all areas of the Earth have had at least some influence by humans. At the other end of the scale is the built environment and in some cases it has the biotic component that is virtually absent.
permanent ice caps and floats towards hotter waters and melt there gradually.

Big chunks of ice can float around for months before...

Rich media content

[Image]

hotter waters and melt there gradually.

Big chunks of ice can float around for

No rich media content
Chapter 2 - Basics

This tutorial is aimed at getting familiar with the bare bones of LaTeX.

Before starting, ensure you have LaTeX installed on your computer (see Installation for instructions of what you will need). We begin by creating the source LaTeX file, and then take you through how to feed this file through the LaTeX system to produce quality output, such as postscript or PDF.
Clients: You Can’t Always Get What You Want

If you are invited to put forward a research proposal, then you are generally not alone. Clients often ask several firms to pitch for the job and then choose the proposal that suits them best. This does not necessarily mean that they go for the cheapest, or that expensive is always ‘good’. You normally have to do a lot of investigating and carry out an awful lot of leg and spade work before you’re awarded a project and start your research.

what the client wants: During the initial briefing with the client, you make a list of what it is they want. Often there’s a problem or a question, an objective and a reason. The objective may be that the client wants to optimize their service. The question is: how can they best go about this? Sometimes there’s a hidden agenda, an ulterior motive. If the issue you are presented with is completely different goal to the one you may see on the surface. It’s your job to get to the real objective and to formulate the relevant questions. This is crucial. If you launch into the project, without getting to the real objective of the research, you’ll be talking at cross-purposes and the chances of you getting the job will be compromised. Apart from anything else, as the researcher you are supposed to be independent and objective. You are there to help solve a problem, you don’t allow yourself to be used for any other purpose. Dealing with clients and what they want is sometimes difficult. You have to make the topic ‘researchable’, but at the same time you have to keep the client happy by doing what they want as far as possible.

Tips & tricks

- Make sure you know your client’s organization and its profile.
- Be convincing.
- Listen carefully and ask questions: don’t come up with ‘the solution’ at the drop of a hat.
- Make a note of how the first meeting went! Afterwards you can remind yourself of your first impressions.
- Don’t argue the point, even if you’re right.
- Don’t get involved in the subject: be critical and objective.
- Know what the client expects of you.
- Know what the client expects of the client.
- Make sure it is clear what is required (research objective).
- Use the right combination of what you’ve learned during your study and how to apply it in practice.
- During the briefing, make it very clear to the client what your intended procedure will be.
- Give serious thought to whether you can answer your client’s question, and if so, how.
- Work on your proposal at home or in the office.

demarcating your subject: Once you know what your client’s issues and objectives are, then you can set about demarcating the subject. You check whether you are familiar with the subject, if you know something about it, or have read about it, whether research into the subject has already been done, or whether it’s connected to projects you’ve done in the past. What problem will be solved by your research? The aim of this demarcation is to translate the client’s question into a researchable question. This is also known as problem analysis.

possibilities and limitations: Once you’ve established the main research question (more about this in Chapter 3 under formulating the central problem), you think of ways to address it. The answer depends on the nature of the question, but also on what is possible and the restrictions that the client may impose. The

The next suggested concept to study: Data Collection
User Names: user1, E-mail:
Statistics: 2 read pages and 43 pages to read - Read Pages List - Remaining Pages List
Account Settings: Change Password Logout

1. An interface
   ○ Inherit the properties of the interface
   ○ Contain the same methods as the interface
   ○ All of them

8. A local variable
   ○ Represent a class object
   ○ Is declared within a method
   ○ Must accept a class
   Wrong Answer!

9. An instance variable
   ○ Is an object of a class
   ○ Represents an attribute of an object
   ○ Is a method of a class
   Wrong Answer!

10. A Constructor
    ○ All of them
    ○ Is used to create objects
    Wrong Answer!
    ○ Must have the same name as the class it is declared within

Your score is 3.

There are 3 knowledge levels in this tutorial.

You were evaluated as a learner who has no knowledge (Level 1).

Therefore, the tutorial will be adapted based on your knowledge in which you have to study General, Programming Basics and Programming in C# subjects.

Please click here to continue.
C# Online Tutorial

This online tutorial is aimed to introduce some basics and advanced concepts to novice learners related to the C# programming language. Describes lots of different contents and topics related not only to the programming language itself, but to some used tools and technologies.
Syntax

A Simple C# Program

There are basic elements that all C# executable programs have and that's what we'll concentrate on for this first lesson, starting off with a simple C# program. The following list is an example of a C# program, to view this first program.

Warning: C# is case-sensitive.

A Simple Welcome Program: Welcome.cs

```csharp
// Namespace Declaration
using System;

// Program start class
class WelcomeCSS
{
    // Main begins program execution.
    static void Main()
    {
        // Write to console
        Console.WriteLine("Welcome to the C# Station Tutorial!");
    }
}
```

Next suggested concept to study: Comments

Number of page visits: 1
Example:
Course About Tennis

Tennis

In the last several years Tennis has been growing, as both a participant and a spectator sport. Tennis has gained immense popularity as a participant sport because people have discovered that it not only is fun to play, but also provides good exercised in a short period of time. Today it is easier to have a rewarding career in tennis both as a player and as a teacher. More and more youngsters are choosing tennis over baseball, football, and other sports, a situation which means that there will be more and better players turning professional in the future. The sport of tennis has finally lost its "country club" image and is being enjoyed by an ever-increasing number of avid fans.

Next suggested concept to study: Pre-Test
Designing an Online Adaptive Course

Consists of:

1. Designing *information structure* (domain model)
2. *Information* creation (application content)
3. Defining *navigation structure* (application content)
4. Defining *pedagogical structure* (adaptation model):
   Which navigation is desirable during learning?
   • An *adaptive* system such as AHA! or GALE should support navigation
Example:
Milkyway Information Structure

- The “logical” structure of Milkyway
- Different relationship types result in links in the application
Adaptation can be supported by Artificial Intelligence.
Authoring Adaptive Application: Domain Model
<h2>Authoring AHA! Applications</h2>
<p>Creating AHA! applications involves four main steps: writing pages, creating a conceptual structure of the application, defining the adaptation rules, and defining the look and feel, or layout of the application.</p>
Authoring Adaptive Application: Adaptation Model
Prerequisites Structure

• Different ways of creating prerequisites structure:
  – Top-down (deductive) approach  
    *from abstract to concrete concepts*
  – Bottom-up (inductive) approach  
    *from concrete to abstract concepts*

• Adaptive systems allow for the implementation of different prerequisites structures for one course to address individual learner’s preferences
How to Realize Prerequisites

• You should study A before B
  – “should”: different adaptation techniques either enforce this or give advice
  – “study”: this can be access or read or take a test; result is a knowledge value
  – how much knowledge is enough?
  – “before”: this does not imply just before
Conclusions:
Applications Developed With AHA! and GALE

- *Adaptation* to address *individual differences*
- Adaptation through *prerequisites*
- *Various* prerequisite structures are possible for the same course
- *Time estimation for authoring* an adaptive online course (TU/e master students who followed Adaptive Systems course) - *10 to 25 hours*
Use of Semantic Technologies in E-Learning

- In **software**, *semantic technology* encodes meanings separately from data and content files, and separately from application code.

- In computer science and information science, an ontology formally represents knowledge as a set of concepts within a domain, and the relationships among those concepts. It can be used to reason about the entities within that domain and may be used to describe the domain.
Use of Semantic Technologies in E-Learning

- Previous examples do not (yet) make use of semantic structures defined in ontologies
  \(\Rightarrow\) amount of reasoning over semantic structures is limited
- Next, we will see how to make adaptive applications based on semantic structures from CHIP project

*Although CHIP prototype is a recommender system, a personalized museum guide, it can also be seen as an e-learning application - teaching about Art*
Use of Semantic Technologies in E-Learning: Ontologies Mapping

Ontology A: #Rembrandt

Ontology B: #Rembrandt van Rein

Ontology C: #Rembrandt Harmensz. van Rein

ULAN vocabulary (Union List of Artists Names)
http://www.getty.edu/vocabularies/ulan#500011051
Use of Semantic Technologies in E-Learning: Reasoning Example

- Amsterdam is part of (stored) North-Holland.
- North-Holland is part of (stored) The Netherlands.
- Amsterdam is part of (deduced) The Netherlands.
Cultural Heritage Information Personalization, CHIP: a Personalized Museum Guide

- Developed in collaboration between TU/e, Telematica Institute and Rijksmuseum
- Personalized access through multiple devices – PC, iPhone, etc.
- Recommendations are based on: – metadata about artworks & art topics
- http://www.chip-project.org