



African Virtual University

Applied Computer Science: CSI 4102

HUMAN COMPUTER INTERACTION

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Foreword

The African Virtual University (AVU) is proud to participate in increasing access to education in African countries through the production of quality learning materials. We are also proud to contribute to global knowledge as our Open Educational Resources are mostly accessed from outside the African continent.

This module was developed as part of a diploma and degree program in Applied Computer Science, in collaboration with 18 African partner institutions from 16 countries. A total of 156 modules were developed or translated to ensure availability in English, French and Portuguese. These modules have also been made available as open education resources (OER) on oer.avu.org.

On behalf of the African Virtual University and our patron, our partner institutions, the African Development Bank, I invite you to use this module in your institution, for your own education, to share it as widely as possible and to participate actively in the AVU communities of practice of your interest. We are committed to be on the frontline of developing and sharing Open Educational Resources.

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Course Overview

Welcome to Human Computer Interaction Course

Human-Computer Interaction (HCI) is the study of the principles and methods with which one builds effective interfaces for users. HCI is a field of study that evolves to changes in the technological landscape. During the past decade, the emergence of personal mobile devices, agent-based technologies, and pervasive and ubiquitous computing is motivated by the technique of human computer interaction which has profoundly changed the way people use technology for work and leisure. This course introduces the student to the theory and practice of developing user interfaces. Practical hands-on will be balanced by discussion of relevant literature of computer science e.g. graphics, user interface design, multimedia and visual design of HCI, cognitive psychology, and scientific information design.

Prerequisites

No prerequisites required, however, if the learner is not comfortable with using computers he/she will not do well in this course

Materials

The materials required to complete this course are:

- Computers/Laptops
- Internet connectivity
- Software tools
- Social Networks and Virtual Platforms

Course Website:

This will be supplemented by readings handed out in class. You will also need a book with coverage of Swing (Java's GUI toolkit or Visual Studio) to refer to. Some other good books to own are listed below.

Potential References

- B. Shneiderman, C. Plaisant, M. Cohen, and S. Jacobs, *Designing the User Interface: Strategies for Effective Human-Computer Interaction*, Addison-Wesley, Reading, Mass. 5th Edition 2009
- Michael Kölling. *Introduction to Programming with Greenfoot: Object-oriented programming in Java with Games and Simulations*, Pearson Education.(ISBN 10: 0-13-603753-4). 2010 This book is also available as an eBook through the publisher's website: <http://www.coursesmart.com> using ISBN: 0136025307
- *Introduction to Computer Programming*, e-Book Wiley Charles Dierbach, ISBN: 978-0-470-55515-6, <http://it-ebooks.info/book/2466/> 2013

Course Goals

Upon completion of this course the learner should be able to:

1. Demonstrate the basics of human and computational abilities and limitations.
2. Demonstrate the use of basic theories, tools and techniques in HCI.
3. Perform the fundamental aspects of designing and evaluating interfaces.
4. Use a variety of simple methods for evaluating the quality of a user interface.
5. Apply appropriate HCI techniques to design systems that are usable by people.

Use colors sparingly in designing user interfaces

Evaluate user interfaces using evaluation and/or implementation principles

Units

Unit 0: Pre-Assessment

- Principles of computer programming (JAVA, Python, C++, etc.)
- Any relevant computer graphics application skills

Unit 1: Understanding and Conceptualizing interaction

- Demonstrate the basics of human computational abilities and limitations.
- Demonstrate the use of basic theories, tools and techniques in HCI.

Unit 2: Cognitive Analysis and Framework

- To be able to perform the fundamental aspect of designing and evaluating interfaces.
- Use a variety of simple methods for evaluating the quality of a user interface.

Unit 3: Software development and GUI (Graphical User Interface)

- Apply appropriate HCI techniques to design systems that are usable by people.
Use colours sparingly in designing user interfaces.

Unit 4: Cognitive Skills

- Demonstrate the use of basic theories, tools and techniques in HCI.
- Evaluate user interdaces using evaluation and / or implementation principles.

Assessment

Formative assessments, used to check learner progress, are included in each unit.

Summative assessments, such as final tests and assignments, are provided at the end of each module and cover knowledge and skills from the entire module.

Summative assessments are administered at the discretion of the institution offering the course. The suggested assessment plan is as follows:

1	Assignments / Homework	35%
2	Test	35%
3	End of Term Exams	30%

Schedule

Unit	Activities	Estimated time
Unit:0	Demonstrate abilities of computer programming and basic graphics application skills.	20 Hours
Pre-Assessment		
Unit: 1	Demonstrate the basics of human computational abilities and limitations.	25 Hours
Understanding and Conceptualizing interaction	Demonstrate the use of basic theories, tools and techniques in HCI.	
Unit: 2	To be able to perform the fundamental aspect of designing evaluating interfaces.	25 Hours
Cognitive Analysis and Framework	Use a variety of simple methods for evaluating the quality of a user interface.	

Unit: 3	Apply appropriate HCI techniques to design systems that are usable by people.	25 Hours
Software Development and GUI	Use colours sparing in designing user interfaces.	
Unit: 4	Evaluate user interfaces using evaluation and / or implementation principles.	25 Hours
Cognitive Skills		

Readings and Other Resources

The readings and other resources in this course are:

Unit 0

Required readings and other resources:

- An Introduction to Programming in Go. Copyright © 2012 by Caleb Doxsey, ISBN: 978-1478355823

Optional readings and other resources:

- <https://docs.python.org/2/tutorial/> For additional background reading
- www.tutorialspoint.com/java/ For further interest reading

Unit 1

Required readings and other resources:

- Interaction Design: Beyond Human Computer Interaction, 3rd Edition. by Helen Sharp, Jenny Preece, Yvonne Roger. "Topics: Design, Digital Media, Interaction Design, Web Development" ISBN: 9780470665763. Release Date: June 21, 2011.
- Human Computer Interaction: Concepts, Methodologies, Tools and Applications, Panayiotis Zaphiris and Chee Siang " City University of London (U.K.)

Optimal Readings and other resources

- Virtual Reality: Human Computer Interaction, Xin-Xing Tang, ISBN: 978-953-51-0721-7
- <http://dx.doi.org/10.5772/3333> For background reading
- www.intechopen.com For further interest reading

Unit 2

- Interaction Design: Beyond Human Computer Interaction, 3rd Edition. by Helen Sharp, Jenny Preece, Yvonne Roger. "Topics: Design, Digital Media, Interaction Design, Web Development" ISBN: 9780470665763. Release Date: June 21, 2011.
- Human Computer Interaction: Concepts, Methodologies, Tools and Applications, Panayiotis Zaphiris and Chee Siang " City University of London (U.K.)

Unit 3

Required readings and other resources:

Interaction Design: Beyond Human Computer Interaction, 3rd Edition. by Helen Sharp, Jenny Preece, Yvonne Roger. "Topics: Design, Digital Media, Interaction Design, Web Development" ISBN: 9780470665763. Release Date: June 21, 2011.

Human Computer Interaction: Concepts, Methodologies, Tools and Applications, Panayiotis Zaphiris and Chee Siang " City University of London (U.K.)

Unit 4

Required readings and other resources:

Interaction Design: Beyond Human Computer Interaction, 3rd Edition. by Helen Sharp, Jenny Preece, Yvonne Roger. "Topics: Design, Digital Media, Interaction Design, Web Development" ISBN: 9780470665763. Release Date: June 21, 2011.

Human Computer Interaction: Concepts, Methodologies, Tools and Applications, Panayiotis Zaphiris and Chee Siang " City University of London (U.K.)

Unit 0. Pre-Assessment

Unit Introduction

The purpose of this unit is to determine your grasp of knowledge related to this course. This course teaches the theory, design procedure, and programming practices behind effective human interaction with computers. This unit will teach specific interface success stories and spectacular failures to learn from past experiences. Learners will apply their gained knowledge in a series of practical assignments using sound programming practices and effective tools and techniques to create successful user interfaces.

Unit Objectives

Upon completion of this unit you should be able to:

- Develop basic computer programs using common programming languages.
- Develop computer programs for the ability to apply knowledge of programming to develop and analyze computing systems, example graphical user interfaces.
- Demonstrate the ability to extend current knowledge and/or skills to a computing environment or problem currently unknown to the student.
- Develop your technical knowledge and skills to create computer solutions that accomplish goals important to the industry, government or research area in which they are working.
- Analyze a problem to be able to identify and define the computing requirements for its solution.
- Trouble-shoot an existing computer-based system, process, component or program.
- Have the ability to evaluate, verify, trouble-shoot, test and analyze an existing computer-based system, process, component or program.
- Demonstrate an ability to use current techniques, skills and tools for computing practice.

Key Terms

Application: is a set of one or more programs designed to carry out operations for a specific task.

Arrays: An array is a container object that holds a fixed number of values of a single type.

Code: Computer instructions written in programming languages.

Compiler: Is a computer program (or set of programs) that transforms source code written in a programming language (the source language) into another computer language (the target language).

Programming: Often referred to as computer programming is a process that leads from an original formulation of a computing problem to executable programs

Software: The programs and other operating information used by a computer.

Syntax: The structure of statements in a computer language.

Unit Assessment

Check your understanding!

Quiz

- Who is the "Human" in HCI ?
- What is the "Computer" in HCI?
- What is "Interaction" in HCI ?
- What is the overall goal of HCI ?
- What is the future of HCI?
- How do people use the web?

The quality components of usability in design

Instructions

The evaluation for this course is based on the student's achievement of curriculum expectations and the demonstrated skills required for effective learning. The percentage grade represents the quality of the student's overall achievement of the expectations for the course and reflects the corresponding level of achievement as described in the summative assessment chart. A credit is granted and recorded for this course if the student's grade is 50% or higher. The final grade for this course will be determined as follows:

70% of the grade (Test / Practical Assessments) will be based upon evaluations conducted throughout the course. This portion of the grade will reflect the student's most consistent level

of achievement throughout the course, although special consideration will be given to more recent evidence of achievement.

30% of the grade (Exams) will be based on a final evaluation administered at the end of the course. This final evaluation will be based on an evaluation of achievement from all four categories of the summative assessment for the course and of expectations from all units of the course.

Grading Scheme

Assignments	35%
Test	35%
Exams	30%

Feedback

HCI is abbreviated for human-computer Interaction, a discipline concerned with the study, design, construction and implementation of human-centric interactive computer systems. A user interface, such as a GUI, is how a human interacts with a computer, and HCI goes beyond designing screens and menus that are easier to use and studies the reasoning behind building specific functionality into computers and the long-term effects that systems will have on humans.

The function of computers in HCI is to interface the physical and conceptual boundary between the human user and the input/output devices of a computer. It is through this interface that the human gives instructions or supplies data to the computer and it is through this interface that the human receives feedback and other information from the computer. Most interfaces are dynamic and involve an interaction between the human and the computer.

The goals of HCI are to produce usable and safe systems, as well as functional systems. In order to produce computer systems with good usability, developers must attempt to: understand the factors that determine how people use technology. The future of human-computer interface is becoming more and more pervasive as the way of controlling and interacting with technology. The flight deck on airplanes has become known as the "glass cockpit" as knobs and dials have been replaced with human-computer interfaces. Home lighting and security systems use human-computer interfaces. Communication devices, automatic teller machines (ATMs), personal organizers, medical devices and monitors, educational toys, exercise machines, and so on all make use of the human-computer interface. Consequently, our understanding of the theories, principles, and optimal designs for the human-computer interface are extremely important and the contribution by psychologists is essential.

Unit Readings and Other Resources

The readings in this unit are to be found at the course-level section “Readings and Other Resources”.

Unit1. Understanding and Conceptualizing interaction

Unit Introduction

In this unit, the learner will learn about the principles and procedures to plan, design, and conduct effective evaluation studies (formative, summative, usability) in different settings. The study of this unit will enable the learner to learn evaluation of good human computer interfaces, to conduct try-outs or usability sessions, analyze the data, report the findings, and recommendations of good graphical user interfaces.

Unit Objectives

Upon completion of this unit you should be able to:

- Analyze what interactive design is and how it relates to human computer interaction.
- Evaluate the relationship between the user experience and usability.
- Identify what is involved in the process of interactive design.
- Evaluate the different forms of guidance used in interactive design.
- Appraise an interactive product to identify what is good and bad about it in terms of the goals.
- Evaluate the difference between a good and poor design.

Key Terms

Design: Is the creation of an interface for the construction of an object.

Evaluate: Is the systematic determination of identifying preferred options.

Interactive: Allowing a two-way flow of information between the computer and a computer user; by responding to a user's input.

Interface: A surface regarded as a common boundary of two phases.

Navigation: The science of determining position, location, browsing and course to a known destination.

Visualization: The act of process of interpreting in visual terms or of putting into visual forms.

Learning Activities

For this activity, group projects will generally be completed in groups of three, four or five. To form groups, students review individual project proposals and submit preferences to work on them. Based on the preferences that have been submitted, students will be assigned to groups by the instructor. Some class time will be used to coordinate among group members. Where possible, students are encouraged to communicate with tools such as Skype and chat programs. All group members are jointly responsible for the entire assignment, although the group may assign primary roles to each group member. Generally, each group member will receive the same score on each project.

Activity Details

Explain and Discuss : significance of HCI, conceptual frameworks for HCI, usability, Contexts for HCI (mobile devices, consumer devices, business applications, web, business applications, collaboration systems, games, etc.), multi-disciplinary nature of HCI.	
	5 Hours
User Interfaces: Principles, Standards, UI Interface Events, UI construction.	
Design: design approaches, look-and-feel (layout, color, fonts, menus, labeling), Handling human/system failure, design mistakes, tasks and process modeling, visualization, representations, multimedia interaction (graphics, sound, audio e.t.c), device specific (e.g., cell phones, tablets).	6 Hours
Behavior and form: software posture, flow, navigation, Interaction (command line, menu, voice, gestural, WIMP, data retrieval and feedback), language (metaphors, idioms, tone) and software attributes.	7 Hours
Human and social factors: culture communication with users, human diversity, user documentation, applied psychology, social psychology, social networking.	8 Hours
Evaluation: evaluation paradigms, frameworks, heuristics, usability testing (efficiency, learnability, user satisfaction).	12 Hours

Format:Lectures, Discussion, In-Class Design Exercise

Conclusion

The activity identified a mapping between various forms for the development of an effect recognition as practical technique to argument social presence in computed mediated communications.

Assessment

Name the website that you will refer to, and explain the nature of the information structure that the user creates and interacts with when using this site. Provide a pictorial sketch if necessary.

Describe two aspects of the visual language (marks, symbols, regions, surfaces) used in the design of this site. For each aspect, explain the nature of the correspondence between the visual appearance and its meaning or purpose within the interaction design.

Describe a typical activity in which the user interacts with the information structure presented by the site. You should refer to two different Cognitive Dimensions that are particularly salient in this activity, and explain what effect each of these has on the user's experience.

Propose a way in which the visual design of the site might be modified, that would have an effect on one of the Cognitive Dimensions described in part (c). Consider any trade-offs that might result.

Describe how you could carry out an investigation to evaluate the effects predicted in part.

Classify the method you have described, using the distinctions between qualitative/quantitative, empirical/analytic, and summative/formative methods?

Introduction

The activities of this section is to appreciate established human-computer interaction approaches and techniques, acquire knowledge on the design and presentation of user interfaces and explain selected software evaluation techniques and heuristics. Knowledge of colour, graphic design, animation and texturing with available software is assumed.

Activity Details

There will be one HCI question and one Information management question. You must answer BOTH questions in 1 hour and 15 minutes. This is an example of an HCI question.

- a. Briefly explain what is meant by the terms perception, physiology and cognition.
- b. Identify three different ways in which 'functional ageing' can affect interface development.
- c. Environmental factors can impair users' ability to recall information that is necessary to

operate complex, computer systems. Briefly explain how such disruptions can impair both short-term AND long-term memory.

d. You have been asked to help in the development of a new computerized call center. Customers from a national Bank will ring up if they wish to change the details of their account. For instance, they might want to open a new account, close an old account, they might want to change the address of the person who owns the account and so on. Briefly explain how you might use a number of different requirements elicitation techniques to identify the potential usability problems that might arise for people working with this new system. Identify the principle strength and weaknesses of each technique.

- Use regular interface design tools, example Macromedia Director, Flash MX
- TO reduce design time, it is encouraged to use Apps like : Microsoft Visio, Visual Studio .NET, Borland's JBuilder (screenshot) which comes with supplied widgets

Conclusion

The following questions are intended to provide you with some idea of the content of the class test. Please try to answer them under 'examination conditions' before looking at the sample answers. Upon completion of this activity, the student will be able to visualize/simulate how a user would evaluate usability findings and concerns both in writing and orally.

Assessment

These sample solutions provide some idea of what might be achieved in the time available. Other solutions are possible. They are not 'ideal' solutions because more could be said about each of the issues that are explored. They are, however, sufficient to obtain a high mark in the class test and exam.

Briefly explain what is meant by the terms perception, physiology and cognition.

Perception relates to the use of our five senses to detect changes in our environment. It plays a role in computer systems development because users must be able to detect and respond to changes in a display.

Physiology relates to our physical characteristics, including height, reach and weight. It plays a role in computer systems development because users must be able to physically operate both input and output devices. Problems such as RSI and Carpal Tunnel Syndrome can reduce a user's physical ability to operate some devices.

Cognition relates to the mental processes that can be used to analyse the information that we perceive in our environment. It plays a role in computer systems development because users may be able to read a warning or help message but may be unable to understand what it means.

Identify three different ways in which 'functional ageing' can affect interface development.

Functional ageing relates to the way in which a user's cognitive, perceptual and physiological capabilities may degrade at a rate that is faster than might otherwise be expected for their age. This form of ageing can be a particular problem for certain industries. For example, some commercial aviation pilots suffer significant sinus problems that ultimately may lead to hearing loss. Functional ageing can affect interface development in the following ways:

it can affect an entire workforce and so additional cues and prompts may be introduced for all users who suffer from this problem;

it may only affect certain individuals within a population and so studies will have to be conducted to determine whether initial assumptions about user capabilities hold for the entire group;

the rate of functional aging may vary from individual to individual and so further studies may be needed to determine the extent of the additional support that may be necessary. Ultimately, it may not be possible for some people to use the system even with significant enhancements to the interface, for example in safety-critical applications.

Environmental factors can impair users' ability to recall information that is necessary to operate complex, computer systems. Briefly explain how such disruptions can impair both short-term AND long-term memory.

Short-term memory, typically, requires concentrated effort on the part of the individual concerned. If they become distracted by environmental factors then that concentration can be broken and the content of short-term memory may be lost. For instance, even a momentary distraction can cause a user to forget the name of a file or of a password that they haven't used before.

The impact of disruptions on long term memory is less easy to explain. Typically, it is less easy to remember information that has passed from short-term to long-term memory. In consequence, a greater source of distraction or disruption would be required to impair their memory. A, typically, example is that even expert computer users may make mistakes if they attempt to perform two familiar tasks in parallel. Both may draw upon long-term memory but there can be interference effects.

- a. You have been asked to help in the development of a new computerized call center. Customers from a national Bank will ring up if they wish to change the details of their account. For instance, they might want to open a new account, close an old account, they might want to change the address of the person who owns the account and so on. Briefly explain how you might use two different requirements elicitation techniques to identify the potential usability problems that might arise for people working with this new system. Identify the principle strengths and weaknesses of each technique.

There are many possible answers to this question. You could propose questionnaires, interviews, focus groups. You could also use a summative evaluation technique, walkthroughs and usage diaries to find out the weaknesses of the existing systems. These are techniques that can be applied simply and cheaply given the details that are provided in the question. Alternatively, you could propose the use of a more process-oriented approach such as rapid prototyping and participatory design. These techniques can build on an initial requirements elicitation by trying to identify additional problems and opportunities as the development progresses. In the course we also mentioned Markey survey techniques, such as photo diaries. I'm not sure how these techniques might be applied to this question given that the client is already identified in some detail. However, you could propose more general; studies of the intended user population. In any event, the ideal solution should pick two complimentary techniques. For instance, questionnaires can provide a rough and ready impression of existing usability problems. These might be backed up with more detailed summative evaluations of the existing system etc.

Assignment: Analyse a usability problems of the above solutions

User Interfaces and Evaluations

Introduction

The construction of human interfaces is both a matter of design and engineering. This activity is concerned with the methodology and practice of interface design. Other aspects of the development process include the relationship of interface development to the engineering (both software and hardware) of the rest of the system.

Activity Details

Design Approaches:

The process of design. Relevant topics from other design disciplines.

Apply graphic design basics (e.g. design languages, typographic, use of colour, 2D and 3D spatial organization, temporal sequencing, etc.)

Study and comprehend alternative system development process (e.g. waterfall model, participatory design), lifecycle model, iterative design, choice of method under time and resource constraint.

Use task analysis techniques, (e.g. field studies, analytical methods), task allocation

Learn design analysis techniques (e.g. objects and actions)

Implementation Techniques and Tools

Example: Use relationship among design, evaluation and implementation.

Example: Apply independence and Reusability, application and device independence

Example: Apply prototyping Techniques, storyboarding, video, wizard of OZ, Hypercard and Rapid prototype implementations.

Example: Use dialogue toolkit (MacApp, NextStep, UIMS's Hypercard)

Evaluation Techniques: Specific methods for evaluation example:

Use figures of Merit (e.g. time, errors, learnability, design for guessing, preference, etc.)

Apply usability testing techniques (e.g. linking testing to specifications)

Summative and Formative evaluation techniques for empirical evaluation including field observation methods, participant observation, interviewing techniques, questionnaire design, etc.

Conclusion

Interaction design is a discipline concerned with the design, evaluation, and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them. This activity set out to ask: What are the core issues of interaction design, and to what extent (and how) should we ensure students are trained and researchers, practitioners, and educators are kept abreast of changes in technology and the emergence of state-of-the-art methodologies, theories, and practices that result from those changes.

Describe two problems with formal, lab-based usability evaluations.

Lab-based evaluations can be expensive and time consuming. They usually involve recruiting potential users to interact with a system under carefully controlled conditions. Although this can help with the statistical analysis of any results it can also lead to problems in establishing that an evaluation provides valid insights into the less controlled world of a final implementation etc.

Describe two situations in which a mouse might be preferred over a joystick.

A mouse might be preferable where fine absolute positioning is required in contrast to joysticks that allow a rapid relative movement in relation to the current position of the cursor. In practical terms, a mouse is preferable in most office applications whilst a joystick is useful in games or in other control situations such as aviation or robotics.

What impact does cognition have on human-computer interaction.

Cognition can loosely be interpreted as the mental processes that are used to filter and analyse information that has already been perceived by a user. These processes are significant because

they affect the interpretation of data. This depends on the users previous skills and expertise. It will also affect their ability to interact with many computer applications. Cognition controls issues such as learning and robustness in response to unexpected behaviour etc.

What is the significance of 7 (+ or – 2) for human-computer interaction?

7 is popularly believed to be the number of unrelated items that people can conveniently hold in short term memory. The + or – 2 refer to the impact of performance shaping factors such as noise, fatigue and distraction on that capacity. Interface designers can use knowledge of short-term memory to inform the development of an interactive system. For example; by limiting the number of menu items or form fields on an interface. Techniques such as chunking can be used to extend this capacity.

Describe three techniques that you would use to elicit user requirements for a new e-commerce site selling electrical appliances, such as fridges and televisions, to the public.

There are many different answers to this question. The standard solutions might focus on questionnaires, focus groups, interviews and so on. These could be targeted at the existing customers of high street stores selling similar appliances. Better solutions would focus on elicitation for web sites in particular. This raises novel problems because users need not be geographically concentrated as they would be for a conventional shop in a particular town or city. Elicitation could be focuses on existing users of on-line services. It could be targeted at the on-line users of competitor web sites. In this case there is the obvious problem of identifying these existing users of rival services. Similarly, by focusing on existing web users the results of any analysis might ignore market opportunity for new customers.

- Would you recommend that this web-site be extended to help users to buy good from this site using a 3G telephone rather than a conventional PC? Justify your answer.

Either answer is acceptable. If the solution argued against such a development then the justification should focus on the slow uptake of G3 and similar web-based mobile services. This implies a considerable risk in setting up such a service. Significant development resources may be consumed for a very small number of sales. These resources might be better spent in developing the existing retail site. Alternatively, it might be argued that these new systems offer opportunities and that there are significant benefits from being one of the first retailers in this area. In either case, it would be good to see some consideration of the problems of using a palm-top or mobile telephone device to navigate complex web sites. The card metaphor in WML that was introduced in the lectures can only go so far. If other forms of

more complex, multimedia presentation are used then there remain significant questions about how to access and control these resources using small devices.

The company have decided to go ahead with the development of an extended web-site to provide access via mobile devices, such as 3G telephones. **Write a brief technical report** describing how you would conduct a summative evaluation to assess the usability of a final implementation.

There are several possible solutions to this question. As in the previous part of the question,

there is a distinction between the rote answers that simply consider summative evaluation without consider the application domain and those solutions that directly address summative evaluation for mobile devices, such as G3 systems. Standard summative evaluation might involve formal and informal techniques ranging from lab-based tests through to cooperative evaluation. I would not recommend the use of heuristics here in the summative stages. Better solutions might consider the issues that arise when users are geographically distributed and mobile. Issues such as signal interruption and battery loss might be considered as potential problems. Ethnographic studies and diaries might normally be used but these will tell us more about the use of the devices themselves rather than providing focused insights into the particular ecommerce application. Logs can be kept of access onto the site and this can be linked to ordering information. However, such approaches are probably of greatest use once the site has gone live (i.e., post summative evaluation).

Behaviour and Form, Human and Social Factors

Introduction

This activity typically focus so intently on the enabling technology that they don't carefully consider the human actions required to operate the technology from a goal-directed point-of-view. The result is software that charges its users a tax, or excise, of cognitive and sometimes even physical effort every time it is used.

Activity Details

As the aim of this lecture is to introduce you the study of Human Computer Interaction, so that after studying this you will be able to:

Assessment

Answer all questions.

Please provide BRIEF answers to the following questions:

- How does Task Analysis help with the design of user interfaces?
- Describe two problems with formal, lab-based usability evaluations.
- Describe two situations in which a mouse might be preferred over a joystick.
- What impact does cognition have on human-computer interaction?
- What is the significance of 7 (+ or – 2) for human-computer interaction?
- Describe three techniques that you would use to elicit user requirements for a new e-commerce site selling electrical appliances, such as fridges and televisions, to the public.
- Would you recommend that this web-site be extended to help users to buy goods from this site using a 3G telephone rather than a conventional PC? Justify your answer.
- A company has decided to go ahead with the development of an extended web-site to provide access via mobile devices, such as 3G telephones. Write a brief technical report describing how you would conduct a summative evaluation to assess the usability of a final implementation.

Solutions

How does Task Analysis help with the design of user interfaces?

The term task analysis refers to a range of techniques that can be used to assess the demands that particular activities place upon the user of an interactive system. Hierarchical task analysis breaks a complex activity into its simpler component steps. Cognitive task analysis can establish the ways in which users can reach particular key goals.

Understand the narratives and scenarios

Define requirements using persona-based design

Issues in ethics and decision-making as they relate to technology, design, design research, HCI, and the design industry.

Choosing among usability methods

Investigation of problems of special interest in human computer interaction.

Conclusion

Upon completion of this activity, the student will be able to quickly use heuristic analytical method to identify interaction usability issues. Upon the successful completion of the study of unit 1, the student will be able to:

- Apply established human-computer interaction approaches and techniques.
- Produce conceptual and physical designs using prototyping methods.
- Evaluate software interfaces using learnt heuristics.
- Identify usability actions, and use a simple development tool to design an appropriate model.

Assessment

Evaluate the GUI again of user interfaces

Propose a better GUI (Presentation)

GUI Design Techniques

Use of GUI Architecture and Tools

SUMMARY

This encompasses not only ease of use but also new interaction techniques for supporting us user tasks, providing better access to information, and creating more powerful forms of communication. It involves input and output devices and the interaction techniques that use them; how information is presented and requested; how the computer's actions are controlled and monitored; all forms of help, documentation, and training; the tools used to design, build, test, and evaluate user interfaces; and the processes that developers follow when creating Interfaces.

Unit Assessment

Check your understanding!

Demonstrate how interface design is ultimately dependent on human perception and cognition.

Analyse the role of well designed, usable interfaces in market success, reliability, and accessibility.

Explain the role of systems software, distributed systems design, and GUI program efficiency in achieving acceptable system response times.

Specify the desired behavior of an interface or interface component with a state transition diagram.

Assignment, Presentations and Test

Goals of Evaluation

Evaluation Design

Evaluation Techniques

Analysis of Data

Transformations in Interaction

Instructions

There will be a number of structured assignments, designed to give experience with various usability engineering activities Example: Taloyrism: Minimize Time and Errors, Internal Consistency of Displays and Interactions. Most assignments will be done in teams. Assignments due at the start of class will be collected after a one minute grace period; late assignments will receive at most two – thirds credit.

Grading Scheme

Approximate weighting:

Assignments, Participation	35%
Test, Quiz	35%
Exams	30%

Feedback

Students will receive their course and assessment feedback through the AVU course management system and or portal platform. Depending on the circumstances, remediation and second attempts may be offered

Unit Readings and Other Resources

The readings in this unit are to be found at course level readings and other resources.

Unit 2. Cognitive Analysis and Framework

Unit Introduction

The objectives of this unit is to introduce interface designers and user test specialists to the principal methodologies used by cognitive psychologists to measure cognitive content, structures and processes, and demonstrate how these methods are applied to interface design and testing, to provide hands-on, active training in selected methodologies, and to give designers and test specialists sufficient background and reference materials that they will be able to continue learning about these and related methods on their own.

Unit Objectives

Upon completion of this unit you should be able to:

- Define what is cognition and why it is important for interaction design.
- Distinguish what attention is and its effects on our ability to multitask.
- Define what mental models are.
- Differentiate between classic internal cognitive frameworks (e.g. mental models) and more recent external cognitive approaches (e.g. distributed cognition) that have been applied to HCI.
- Evaluate a mental model and be able to understand what it means.

Key Terms

Cognition: The mental action or process of acquiring knowledge and understanding through thought, reasoning, and judgment.

Task Analysis: The development of tasks that require cognitive activity from the user, such as decision-making, problem-solving, memory, attention and judgment.

Design: Development of interfaces that create effective visualizations based on cognitive design principles.

HCI: Human-computer interaction (HCI) involves the study, planning, design and uses of the interfaces between people (users) and computers.

Model: Is a simplification of some aspect of human–computer interaction intended to make it easier for designers to predict and evaluate alternative designs.

Framework :Is a set of interrelated concepts and/or a set of specific questions.

Mental Models: Is the physiological representation of the real or imaginary situations, or an explanation of someone’s thought process about how something works in the real world.

User Testing: The point of testing is to anticipate what will happen when real users start using your system.

Learning Activities

In-class exercise and Directed learning

In Class Practicals:

- Participatory Design
- Activity Theory
- Distributed Cognitio

Introduction

Upon the successful completion of this course, the learner will be taught human perceptual and cognitive abilities, how people can be supported when they interact with computers and computer-assisted artifacts, and finding better ways of designing these interactions to improve the overall effectiveness and user experience. The learner will be engage in the process of interaction design (ID) or user experience design (UxD). The learner will also be introduced to the fundamental components involved in interaction design, that is, designing human-computer interfaces from a human perspective as opposed to a technology-centered one.

Activity Details

Visual design applications

Design strategies: State transition diagrams, storyboarding, event modelling, prototyping, layout of forms including details of design and properties of the objects

Interface Design: Using design strategies

- Existing problems and ongoing challenges
- Current benefits and successes to be leveraged

- Unmet client/customer needs
- Changing client/customer behaviors and attitudes
- Emerging ideas and trends

Form and Visual Development Environment

Identification of features: investigation of current advanced tools and development methods

Employment of features: Use of advanced features to satisfy the requirements of an application. Features available will vary greatly between different development environments, but typical examples might be the use of drag and drop, and simple animation techniques.

Design approaches: e.g., User-Centered Design (UCD) vs. Genius (aka Rapid Expert) Design: compare & contrast, pros & cons

Format:

- Analysis of good/bad design examples? Why (not) effective
- Case studies
- Online Class Discussions

Conclusion

Upon the completion of this course, the learner will have a deep understanding of what it means to be a user and how to implement user-center design for the best possible results. The learner will be equipped with background and theoretical knowledge of human-computer interaction and how to apply it in a practical setting and have a deep understanding of the human behind the term 'user' and what they need in a design.

Assessment

Group Assignment

Group Presentation

Cognitive System Engineering

Introduction

Cognitive systems engineering is a design discipline that addresses the way we interact with technology and the way we use technologies to interact with each other. Cognitive techniques seek to design systems that are more effective and more robust. The focus is on amplifying the human capability to perform cognitive work by integrating technical functions with the human cognitive processes they need to support and on making that cognitive work more reliable.

Having completed this activity, the learner will understand the nature of naturalistic decision making and macro-cognition and will have developed some skill with basic techniques, specifically the critical decision method and decision-centered design.

Activity Details

Cognitive Task Analysis Part 1

- Naturalistic Decision Making
- Macro-Cognition

Cognitive Task Analysis Part 2

- Decision Centered Design
- Summary Review of Cognitive Task Analysis

What is Cognitive Systems Engineering?

- a. Spot the cognition
- b. Movie; Houston,
- c. Summary review of activity

Conclusion

Cognitive systems engineers assist with the design of human interfaces, communication systems, training systems, teams and management systems. They employ principles and methods that bear on the design of procedures, processes, training and technology. The focus is on amplifying the human capability to perform cognitive work by integrating technical functions with the human cognitive processes they need to support and on making that cognitive work more reliable. Examples of systems that will benefit are military command and control, civil air traffic control, transportation, communication, process control, power generation, power distribution, health care and large-scale project infrastructure.

Assessment

Case Study with examples of scenarios and problem statements

Presentation of assignments and case scenarios

Practical implementation of case projects

The Process of Cognitive Interaction Design

Introduction

The objective of this activity is to give an introduction to the key areas, approaches and developments in the field of HCI. The main objective is to get students to think constructively and analytically about how to design and evaluate interactive technologies. Basically, the course will introduce them to key areas, theoretical frameworks, approaches and major developments in HCI.

Activity Details

The three practical approaches of Cognitive Design:

User Centered design

Early focus on users and tasks: directly studying cognitive, behavioral, anthropomorphic & attitudinal characteristics.

Empirical measurement: users' reactions and performance to scenarios, manuals, simulations & prototypes are observed, recorded and analyzed.

Iterative design: when problems are found in user testing, fix them and carry out more tests.

Activity centered design

- Establishing requirements of activity design
- Designing alternatives for activity design
- Prototyping
- Evaluating

Systems design: Practical Issues

Discuss and identify who are the users?

Discuss and identify what do we mean by 'needs'?

Discuss how to generate alternatives

Discuss how to choose among alternatives

Discuss how to integrate interaction design activities with other models?

Conclusion

This activity in Interaction Design deals with the relation between people and IT. The discipline of Interaction Design is the ability to design both the cognitive and physical interface and integrate them into a successful whole. The focus of this activity is to enable designers to create sustainable, comprehensible and pleasurable information based products, services and environments.

Assessment

Evidence can be obtained from investigating a wide range of HCI applications. Learners should show that they are capable of identifying the main features of a given HCI, that they can diagnose the failings of the interface and propose improvements in the light of user needs. An HCI prototype can be chosen for any suitable application. Evidence can be generated in parallel with other units concerned with software development.

Exercise

- Time - scales and the Illusion of Multi-Tasking
- GOMS Keystroke - Level Modeling
- Hypothesis Testing and Statistical Significance

SUMMARY

Upon the successful completion of the study of unit 2, the student will be able to:

Assign functions appropriately to the human and to the machine.

Break down a graphical user interface (GUI) activity sequence into the component actions.

Identify these actions, and use the GOMS keystroke - level model to estimate the time required.

Unit Assessment

Check your understanding!

As an interface designer in a company, you have assigned a task to design a computer-based system that will encourage autistic children to communicate and express themselves better. Create a simple interactive design that is eligible and user friendly for such an environment.

What type of interaction would be appropriate to use at the interface for this particular user group?

Explain the difference between good and poor cognitive interaction design.

Describe what is cognitive interaction design is and how it relates to human-computer

interaction and other fields.

Explain what usability is.

Describe what is involved in the process of interaction design.

Outline the different forms of guidance used in interaction design.

Enable you to evaluate an interactive product and explain what is good and bad about it in terms of the goals and principles of interaction design

One of the main design principles especially for website design, is simplicity. It is appreciated that designers go through all of their design elements and remove them one by one at a time. If a design works just as well without an element, then remove it. Do you think this is a good design principle? If you have your own website, try doing this and seeing what happens. At what point does the interaction break down?

Solution

Simplicity is certainly an important design principle. Many designers try to cram too much into a screenful of space, making it unwieldy for people to find what they are interested in. Removing design elements to see what can be discarded without affecting the overall function of the website can be a salutary lesson. Unnecessary icons, buttons, boxes, lines, graphics, shading, and text can be stripped, leaving a cleaner, crisper, and easier-to-navigate website. However, a certain amount of graphics, shading, coloring, and formatting can make a site aesthetically pleasing and enjoyable to use.

Assignment

This assignment is intended for you to put into practice what you have read about in this chapter. Specifically, the objective is to enable you to define usability and user experience goals and to use design and usability principles for evaluating the usability of an interactive product. Find a handheld device (e.g. remote control, handheld computer, or cell phone) and examine how it has been designed, paying particular attention to how the user is meant to interact with it.

Grading Scheme

Approximate weighting:

Assignments, Participation:	35%
Test, Quiz:	35%
Exams:	30%

Feedback

- Interaction design is multidisciplinary, involving many inputs from wide-reaching disciplines and fields.
- Interaction design is now big business: many companies want it but don't know how to do it.
- Optimizing the interaction between users and interactive products requires taking into account a number of interdependent factors, including context of use, type of task, and kind of user.
- Interactive products need to be designed to match usability goals like ease of use and learning.
- User experience goals are concerned with creating systems that enhance the user experience in terms of making it enjoyable, fun, helpful, motivating, and pleasurable.
- Design and usability principles, like feedback and simplicity, are useful heuristics for analyzing and evaluating aspects of interactive product.

Unit Readings and Other Resources

The readings in this unit are to be found at course level readings and other resources.

Rocket surgery made easy: the do-it-yourself guide to finding and fixing usability problems" (2010) by Steve Krug. New Riders, ISBN: 9780321702821 (also available online through SFU library here)

100 Things every designer needs to know about people (2011) by Susan Weinschenk
Understanding Psychology (2013 (2007 or later edition is also fine to use)) (by Charles G. Morris & Albert A. Maisto. ISBN 0205845967

The Design of Everyday Things" (2002) by D. Norman; Harper Collins; ISBN 0465067107 (also available online through SFU library here)

"Don't Make Me Think: A Common Sense Approach to Web Usability"(2005) by Steve Krug, New Riders Press. (also available online through SFU library

Unit 3. Software development and GUI (Graphical User Interface)

Unit Introduction

In this unit the learner will study the techniques for developing software / systems for GUI. He /She will be also study the best practices of system maintenance and appropriate ways to organize and protect data; and the most appropriate interfaces to be presented to a user. This unit will also clearly demonstrate to the learner the process of developing various software and its usability for different development environments and peoples (audience) regardless of their age and academic background.

Unit Objectives

Upon completion of this unit you should be able to:

Identify software requirements needed to design the GUI and quality

Implement a graphical interface that obeys all GUI-oriented software engineering principles.

Correct the design of poorly designed systems according to the techniques used in the analysis of processes and lifecycle modern systems;

Create systems interfaces that are simple, efficient and offer better interaction with the user.

Evaluate a GUI

Key Terms

GUI: Graphical User Interface.

Interaction: Allows two way flow of information between the user and the computer, a response to the user input.

Interface: The area considered frontier between the two layers or levels.

Rate: The systematic identification of preferred options.

Re-generation: Update process for better optimization strategy and development of an obsolete system.

Re-engineering: Any activity of understanding to improve and facilitate maintenance on software, reuse or develop to expand its teaching to life using transformations on existing systems and also for better technical and functional quality.

Learning Activities

Life cycle review of software and practical exercises

Introduction

The activities in this section include the theoretical examination of the life cycle of the software architecture and quality of graphical interfaces. "The most important thing to design is the user's conceptual model. Everything else should be subordinated to making that model clear, obvious, and substantial. That is almost exactly the opposite of how most software is designed."

Activity Details

A key aspect of this design process is initially to decide what the user will be doing when carrying out their tasks. For example, will they be primarily searching for information, creating documents, communicating with other users, recording events, or some other activity? At this stage, the interaction mode that would best supports this need to be considered.

For example, would allowing the users to browse be appropriate, or would allowing them to ask questions directly to the system in their native language be more affective? Decision about which kind of interaction style use (e.g., whether to use a menu-based system, speech inputs, commands) should be made in relation to the interaction mode. Thus, decision about which mode of interaction to support differ from those made about which style of interaction to have; the former being at a higher level of abstraction. The former are also concerned with determining the nature of the users' activities to support, while the later are concerned with the selection of specific kinds of interface.

As the aim of this lecture is to introduce you the study of Human Computer Interaction, so that after studying this you will be able to:

Describe the advantages and disadvantages of different Software Development Lifecycles.

Different design models used for development of software and we also consider their flaws. We start from where we left in last lecture, design Case study analysis classes, exercises,

Mini-projects presented in class by students by comparing performance and utilization of existing systems

Design and classroom exercises

Understanding what activities are involved in interaction design is the first step to being able to do it, but it is also important to consider how the activities are related to one another so that the full development process can be seen. The term lifecycle model is used to represent a model that captures a set of activities and how they are related. Sophisticated models also incorporate a description of when and how to move from one activity to the next and a description of the deliverables for each activity. The reason such models are popular is that they allow developers, and particularly managers, to get an overall view of the development effort so that progress can be tracked, deliverables specified, resources allocated, targets set, and so on.

The life cycle models in HCI

- The Star Lifecycle model
- The Usability Engineering lifecycle
- The Goal-Directed Design Process

Conclusion

At the end of this activity, the learner will be able to assess and identify an efficient user friendly GUI system, and allowing an inverse re-engineering / engineering.

Exercise 1

What is the distinction between a process-oriented and a structure-oriented design rationale technique? Would you classify psychological design rationale as process- or structure-oriented? Why?

Answer 1

The distinction between process- and structure-oriented design rationale resides in what information the design rationale attempts to capture. Process-oriented design rationale is interested in recording an historically accurate description of a design team making some decision on a particular issue for the design. In this sense, process-oriented design rationale becomes an activity concurrent with the rest of the design process. Structure-oriented design rationale is less interested in preserving the historical evolution of the design. Rather, it is more interested in providing the conclusions of the design activity, so it can be done in an ad hoc and reflective manner after the fact.

The purpose of psychological design rationale is to support the task-artifact cycle. Here, the tasks that the user community performs are changed by the systems on which they perform the tasks. A psychological design rationale proceeds by having the designers of the system record what they believe the tasks are that the system should support and then building the system to support the tasks. The designers suggest scenarios for the tasks which will be used to observe new users of the system. Observations of the users provide the information needed for the actual design rationale of that version of the system. The consequences of the design's assumptions about the important tasks are then gauged against the actual use in an attempt to justify the design or suggest improvements.

Exercise 2

Do a keystroke level analysis for opening up an application in a visual desktop interface using a mouse as the pointing device, comparing at least two different methods for performing the task. Repeat the exercise using a trackball. Discuss how the analysis would differ for various positions of the trackball relative to the keyboard and for other pointing devices.

Answer 2

We provide a keystroke level analysis for three different methods for launching an application on a visual desktop. These methods are analyzed for a conventional one-button mouse, a trackball mounted away from the keyboard and one mounted close to the keyboard. The main distinction between the two trackballs is that the second one does not require an explicit repositioning of the hands, that is, there is no time required for homing the hands between the pointing device and the keyboard.

Exercise 3

Complete the tea-making manual in Figure 7.7. Do you think it would be useful? Think of situations where such a manual would be helpful and where a more conceptual manual would be better.

Answer 3

Although a manual for the tea making might be regarded as a little extreme, such manuals are useful in several situations. You could pose this exercise, together with the initial task analysis, for different domains where more of the following situations are pertinent. The first situation where a procedural manual is useful is for the absolute novice who has no idea of the conceptual background. This might be a first time user or may be for an infrequently performed activity. A good example of the latter is the installation of computer equipment, which most users perform only once every couple of years. Similarly, recipe books are laid out in a highly procedural fashion, although unfortunately not always clear.

Exercise 4

Observe an office, note the actions performed and the objects used depending on the available equipment, use different recording techniques as described in Chapter 11. Then use the different task analysis techniques to structure your findings. (Note, this could be a group project.)

Answer 4

The easiest starting point for the students is simply to go around the office noting down what is there: typewriter, corrector fluid, desk diary, pen, pencil, scissors, envelopes, paper clips, typing paper, post-it notes, telephone, telephone directory (internal and external), filing cabinet containing folders, clock, wall calendar. This list can then be used to begin to build both a knowledge based or an entity-relation description. However, the later will also require at least a list of actors. In a university office this might include the following: secretary, lecturer, student (undergraduate), research student, research staff, administrator. However, the roles that they take may not be simple. For example, we may find that a lecturer comes into the office to use the typewriter. That is the lecturer acts in the role of typist. Neither of these descriptions can be complete, nor can an HTA begin, without a list of activities. This can be obtained in two main ways. First, the students can simply make an unstructured list of all the activities they see and then add structure to it. Alternatively, they can follow specific tasks noting what is done in what order. In the later case, they should be encouraged to write the list of activities in a purely sequential manner – they are observing. Only later will they build upon this an hierarchical interpretation.

Exercise 5

Imagine a calculator, normal except it displays A for 0, B for 1, up to J for 9. So the number 372 would appear as DHC . Does this affect the formal transparency of the calculator? Should it?

Answer 5

Formally, this would not affect the transparency property of a calculator. Any function from display to effect which held for the numbers would also hold for their alphabetic counterparts by just composing it with the code A for 0, B for 1, up to J for 9. Of course, most people would probably find using the encoded calculator quite a bit more difficult than one which used the normal ten digits. The important lesson here is that the formal expression of the transparency property does not indicate how difficult it is for a human to decide determine the function between display and effect. The formal expression just requires that there be some function. In practice, human users would probably judge the encoded calculator as unpredictable (that is, not transparent). The moral is that even though we can capture a usability property formally does not mean that we have captured the entire intent of the property. The transparency property would have to be augmented in order to measure the complexity from the user's perspective of the function between display and effect.

Implementation and prototyping of GUI

Introduction

In this section the activities will be practical in nature and students will implement various interfaces user systems taking into account a number of situations that may occur. Several methods of representation and interface design, will be created and discussed by considering a variety of media / devices, and content to present.

Activity Details

Practical exercises in class and homework on GUI implementations utilities in a programming language and other graphical tools that will provide frameworks for drawing different interfaces.

Prototyping and development of test interfaces to presentation, class discussion using projectors and computers. Comparison of existing interfaces on the market considering the various electronic equipment, including web pages.

Conclusion

At the end of this course, the learner will be able to implement in practice several graphical interfaces for various equipment (devices) that can be easily and conveniently used by anyone.

Assessment

Ergonomic / Dynamic interaction with GUI

Task: Individual analysis of cases for people with special needs, but also with people who do not have special needs.

Task: Analyze a problem usability and designate specific solutions for each case

User Interface Design and Implementation

Introduction

The objective of this activity is to learn all the aspects of design and development of interactive systems, which are now an important part of our lives. The design and usability of these systems leaves an effect on the quality of people's relationship to technology. Web applications, games, embedded devices, etc., are all a part of this system, which has become an integral part of our lives. Let us now discuss on some major components of this system.

Activity Details

For end-users, the interface is the system. So design in this domain must be interaction-focused and human-centered. Students need a different repertoire of techniques to address this than is provided elsewhere in the curriculum.

Contexts for HCI (anything with a user interface: webpage, business applications, mobile applications, games, etc.)

Processes for user-centered development: early focus on users, empirical testing, iterative design.

Different measures for evaluation: utility, efficiency, learnability, user satisfaction.

Physical capabilities that inform interaction design: colour perception, ergonomics

Cognitive models that inform interaction design: attention, perception and recognition, movement, and memory. Gulfs of expectation and execution.

Social models that inform interaction design: culture, communication, networks and organizations.

Principles of good design and good designers; engineering tradeoffs

Accessibility: interfaces for differently-abled populations (e.g blind, motion-impaired)

In-Class Activity 1

The point of this activity is to start thinking about what it means for an interface to be usable. At right is a familiar user interface design:

List some of the aspects of this design that have good usability, and some that have poor usability. Think about the aspects of usability we've discussed (learnability, memorability, efficiency, errors, satisfaction), and write down which aspect(s) of usability are involved in each good or bad point you cite.

In-Class Activity 2

Some people believe that you can heat a room faster by setting the thermostat to a higher temperature than you really want, as if the thermostat were a valve for the heating system that lets more heat into the room the higher you set it. In fact, the thermostat is simply an on/off switch for the heat. It turns on as long as the room temperature is below the thermostat setting, and turns off when the thermostat setting is reached.

Design a thermostat user interface that communicates its conceptual model to the user more effectively, so that users are less likely to make this mistake. Sketch your idea on a whiteboard, but don't stop with your first design. Critique it, and generate more designs. Don't worry too much about size, cost, difficulty of installation, or other tradeoffs.

In-Class Activity 3

The goal of this activity is to explore some of the main structuring patterns of GUI software: the view tree, listeners, and model-view-controller. We'll do it using HTML, Javascript, and jQuery, along with a handy online HTML editor:

SquareFree's HTMLEdit

You'll also need a modern standards-compliant web browser with developer tools installed in it. We recommend either:

Google Chrome (which has developer tools baked in, at View >> Developer >> Developer Tools)

Mozilla Firefox (which needs Firebug installed to be useful for development)

Make and Inspect a View Tree

Use the editor to construct the simple HTML user interface you see on the right. You'll need to use HTML elements like div, textarea, button, and a. Wrap the whole thing in a div element.

Use the developer tools in your browser to display the HTML tree and find the text area node you just created.

Attach a Listener

Add jQuery to your web page, which you can do with the following line of code:

```
<script src="http://code.jquery.com/jquery-1.5.min.js"></script>
```

Attach an event listener to your Send button that calls `console.log()` to display the text area's contents in your developer console. You will find it useful to:

put `id` attributes on your HTML elements

use the selector `$("#id")` to find an element with a particular `id`

use the jQuery `.click()` method to attach an event handler. (There are also ways to declaratively attach an event handler in the HTML code, such as the `on click` attribute, but it's generally better to do it procedurally.)

use the jQuery `.val()` method to get the value of a text area

Modify the View Tree

Now we want to display a log of sent messages in the UI itself. First add the following HTML code to the end of your UI, so that you have a place to put the messages:

```
<div id="sent" style="font-style: italic">
  <div>Sent messages appear here.</div>
</div>
```

Enhance your event listener on the Send button so that it appends the text area's contents to this list. For example, if the text area has "message 1" in it, then pressing Send should change the page as follows:

```
<div id="sent" style="font-style: italic">
  <div>Sent messages appear here.</div>
  <div>message 1</div>
</div>
```

There are several ways to do this. You may find the following jQuery methods useful:

the `.html()` method to get or set the subtree under a node

the `.text()` method to get or set the text inside a node

the `.append()` method to add children to a node

the `$("#html")` function to create a subtree of HTML

Conclusion

This activity introduces the principles of user interface development, focusing on the following areas:

Design

We looked at how to design good user interfaces, covering important design principles (learnability, visibility, error prevention, efficiency, and graphic design) and the human capabilities that motivate them (including perception, motor skills, color vision, attention, and human error).

Implementation

We learned techniques for building user interfaces, including low-fidelity prototypes, Wizard of Oz, and other prototyping tools; input models, output models, model-view-controller, layout, constraints, and toolkits.

Evaluation

We learned techniques for evaluating and measuring interface usability, including heuristic evaluation, predictive evaluation, and user testing.

Research

We will learn how to conduct empirical research involving novel user interfaces (graduate level only).

Assessment

Discuss why human-centered software development is important (knowledge)

Summarize the basic precepts of psychological and social interaction (knowledge)

Develop and use a conceptual vocabulary for analyzing human interaction with software: affordance, conceptual model, feedback, and so forth (comprehension)

Define a user-centered design process that explicitly recognizes that the user is not like the developer or her acquaintances (comprehension) Create and conduct a simple usability test for an existing software application (application)

Collaboration

You may discuss assignments with other people, but you are expected to be intellectually honest and give credit where credit is due. In particular, for all individual assignments:

you should write your solutions entirely on your own;

you should not share written materials or code with anyone else;

you should not view any written materials or code created by anyone else for the assignment; you should list all your collaborators (everyone you discussed the assignment with) on your hand in.

Assignment 1

Help populate the UI Hall of Fame and Shame! Find two examples of user interfaces, one that you consider a good design and one that you consider a bad design . Note that the good design does not have to be uniformly good, since you may discover problems with it on closer inspection. Likewise, the bad design does not have to be uniformly bad. Probably the most interesting examples will be mixed. Your interfaces might be desktop software, web applications, smartphone apps, consumer devices, car dashboards, building entrances, traffic intersections, shower controls, etc.

For each interface, you should:

describe the purpose of the interface and its intended users

analyze its good and bad points of usability with reference to all the dimensions of usability discussed in lecture:

- learnability
- visibility
- efficiency
- errors

you may discuss other aspects of usability if you have space and consider them important illustrate your analysis with appropriate screenshots or photographs Limit to one page of text (roughly 50 lines) for each interface, for a total of 2 pages (100 lines) for your entire report. You can include as many images as are helpful.

Assignment 2

This problem set asks you to build a small user interface that searches a list of words using the set of core technologies that drive most modern web applications, namely HTML, CSS, and JavaScript. We provide some backend code that does the heavy lifting (actually loading the word list and searching it). We also specify the design of the user interface. Your job is to implement it using HTML, CSS, and JavaScript.

To do this assignment, you'll need to know how to:

- write HTML: create correct HTML pages that display in modern browsers
- use HTML form elements (like `<button>` `<input>` , and `<select>` to create a web application
- use CSS to layout and style HTML elements
- use Javascript (and jQuery) to add event handlers and bindings to respond to user input;

Here are some useful reference sources for HTML/CSS/Javascript:

- HTML Dog (a fairly good guide for both HTML and CSS)
- W3Schools (a reference for learning HTML, CSS, and Javascript)
- CSS Tutorial (a tutorial for learning CSS)
- How jQuery Works (a beginning tutorial on jQuery, the Javascript library we are using for this assignment)
- jQuery Documentation (the official documentation for jQuery is an excellent resource)
- O'Reilly Safari has several e-books on HTML, CSS, and Javascript.
- Dynamic HTML: The Definitive Reference, 3rd Edition is a good one to start with.

SUMMARY

We have now learnt the basic aspects of human computer interface in this tutorial. From here onwards, we can refer complete reference books and guides that will give in-depth knowledge on programming aspects of this subject. We hope that this tutorial has helped you in understanding the topic and you have gained interest in this subject.

Unit Assessment

Check your understanding!

The impact of the activity was measured with a pre / post test of student performance on a limited set of subject matter and with a survey of the student's perception of the course. This evaluation is limited by low enrollment in the course (7 students). However, the findings are informative. Student Performance Student performance was examined by evaluating responses to three questions:

1. Explain the importance of a properly designed user interface.
2. Describe at least three principles of good interface design.
3. Explain the process of good interface design. These three questions cover the breadth of the topics in the course.

Accessibility and User Center Design

Instructions

An integrated assessment approach across several Units is encouraged particularly where there may be common themes such as design, graphics, games design and implementation

Grading Scheme

Course project	42%
Problem sets (HW)	30%
Nano quizzes	24%
Class participation	4%

Feedback

Visual design, also commonly known as graphic design, user interface design, communication design, and visual communication, represents the aesthetics or look-and-feel of the front end of any user interface. Graphic treatment of interface elements is often perceived as the visual design.

There are many key factors to understanding interaction design and how it can enable a pleasurable end user experience. It is well recognized that building great user experience requires interaction design to play a pivotal role in helping define what works best for the users. High demand for improved user experiences and strong focus on the end-users have made interaction designers critical in conceptualizing design that matches user expectations and standards of the latest UI patterns and components.

While working, interaction designers take several things in consideration. A few of them are:

- Creating the layout of the interface
- Defining interaction patterns best suited in the context
- Incorporating user needs collected during user research into the designs
- Features and information that are important to the user
- Interface behavior like drag-drop, selections, and mouse-over actions
- Effectively communicating strengths of the system
- Making the interface intuitive by building affordances
- Maintaining consistency throughout the system

Unit Readings and Other Resources

The readings in this unit are to be found at course level readings and other resources.

- Norman, D. A. (2002). "Emotion & Design: Attractive things work better". *Interactions Magazine*, ix (4). pp. 36–42. Retrieved 20 April 2014.
- Wolf, Lauren (23 May 2012). "6 Tips for Designing an Optimal User Interface for Your Digital Event". INXPO. Retrieved 22 May 2013.
- Ann Blandford. "Semi-structured qualitative studies". *The Encyclopedia of Human-Computer Interaction*, 2nd Ed. Interaction Design Foundation. Retrieved 20 April 2014.
- Karen Holtzblatt and Hugh R. Beyer. "Contextual design". *The Encyclopedia of Human-Computer Interaction*, 2nd Ed. Interaction Design Foundation. Retrieved 20 April 2014.
- "The role of context in perceptions of the aesthetics of web pages over time". *International Journal of Human-Computer Studies*. 2009-01-05. Retrieved 2009-04-02.
- "The HUMANOID model of interface design". *Proceedings CHI'92*. 1992.
- "Creating user interfaces using programming by example, visual programming, and constraints". *ACM*. 1990-04-11. Retrieved 2009-04-02.

Unit 4. Cognitive Skills

Unit Introduction

In Model Human Processor (MHP) to machine Interaction - man is at the heart of activities; and is the always the focal point. The result of product quality is based on the judgment of MAN. From conception to evaluation of interfaces, involves a great influence of cognitive behaviors. For example, sight, hearing, touch, reasoning, memory, emotions are elements that deserve attention in studying interactive design. In order to understand human –machine – interaction, one has to understand and appreciate how man interacts with different interfaces it works with. This is a representation of the user while he/she interacts with the machine.

Unit Objectives

Upon completion of this unit you should be able to:

- Quote three cognitive models and describe them.
- Describe the different types of memory.
- List the different steps in the theory of action.
- Decompose a given action into subtasks.
- List the advantages and disadvantages of three models to choose from.

Key Terms

Task: A task is a couple of procedure or purpose

Mneme: Cognitive unit for short memory

MHP: Model Human Processor is a cognitive modeling method

Sensory: In connection with the sense organs

Engine: In relation to movements

Cognitive: In relation to the right to perceive

Learning Activities

Model Human Processor

Introduction

The designers of human machine interfaces wish to base their work on science rather than whimsical notion of how an interface should look like. They would like to quantify why one interface design is better than the other. In that regard, the answer to that solution is cognitive

psychology; the science of understanding how people think, perceive, remember and learn. A key part of cognitive psychology is to develop models of human behavior, and one of the more useful models is called Model Human Processor (MHP).

The key motivation of studying cognitive skills is to make the interface fit perfectly well the users' way of doing things.

It suggests that the human, as the information processing system consists of three subsystems: sensory, motor, cognitive. Each subsystem has a memory and a processor.

For memory, there exist: Memory capacity (μ),

Persistence of Memory (τ)

For the processor, there exist: CPU basic cycle (τ)

Activity Details

Cognitive subsystem: In this case there are 2 memories:

Memory court term: a limited number of memories stores (approx.7), duration limited to a few tens of seconds.

$\mu = + / - 2$ memories (short-term memory processing unit)

$\tau = 10-100$ sec

$\tau = 70$ msec

Long-term memory: Stocakge knowledge: infinite capacity, infinite storage time

$\mu = \infty$ $\tau = \infty$

$\tau = 70$ msec

It is not recommended to utilize length menus exceeding the short-term memory capacity (7 + or - 2 memories).

Engine Subsystem: controls movement. It is recommended for direct manipulation must increase the size of the target or reduce the labor target distance for more effective for moving (Fits Act)

Act Fits: $T = a + b \log (D / L)$ (D: distance to the target, L: size target, a and b, the characteristics of the interaction technique)

Conclusion

On completion of this course activity, the learner will learn about the properties of sub - systems in the human - computer interaction. The learner will also achieve knowledge about how optical illusions, acoustic and hepatic can be limited to a number of items in not more than 7 menus in order not to force man to remember the state of the system. It has been noticed that in a very long list, we (man) retains only the first and last item. Here the user's task is ignored.

Assessment

- Describe the three subsystems in the model human processor
- Give the capabilities of each subsystem
- Case studies

Students will be expected to present and critique

classic and recent research articles from the cognitive modelling literature, chosen from a list provided by the instructor.

- Home to work

Questions

What are the fundamental differences between action-centered and non-action-centered knowledge?

What is the advantage of bottom-up learning?

What is working memory in Clarion?

Why is the motivational subsystem necessary?

Can the meta-cognitive subsystem be considered a part of the action-centered subsystem, since their processes are similar?

Answers

1. Most importantly, these are two different kinds of knowledge for two different kinds of purposes: action-centered knowledge is (mostly) for directly controlling actions, while non-action-centered knowledge is used for reasoning etc. Consequently, action-centered knowledge is (mostly) used in one direction from condition to action. Non-action-centered knowledge tend to be more flexible in terms of its use and manipulation.
2. The main computational advantage is that it enables learning in complex domains where there is no or very little a priori domain-specific knowledge. This is because implicit learning may be capable of dealing with more complex situations (see the answers to the relevant question), and the bottom-up process makes learning explicit knowledge easier by learning implicit knowledge first (through reducing search by utilizing implicit statistical information to guide the search for explicit knowledge; see the answers to the related questions).
3. First, the specific component named "working memory" in Clarion is narrower in scope than the general notion of working memory as has been used in the

psychological literature. This re-definition is necessary for precisely specifying a cognitive architecture, because the notion of working memory has been vague in the literature and it has been used to denote a number of quite different phenomena.

Second, despite the narrower definition of working memory in Clarion, the cognitive architecture can account for many “working memory” phenomena, either through using the working memory component as defined in Clarion or through using other components or mechanisms in Clarion. (For example, it accounts for the limited capacity of working memory, the need for refreshing working memory, the limited number of explicit hypotheses that can be entertained at the same time, the limited ability to deal explicitly with long-range temporal dependencies, etc.)

Third, the working memory as defined in Clarion is neither solely implicit nor solely explicit. It is both at the same time.

The motivational subsystem is necessary, because first and foremost it represents the intrinsic motivations of human behavior, which have been forged through a very long evolutionary process (and it also represents other, derived motivations that add to the human behavioral complexity and flexibility). In essence, it represents the innate inclinations and capacities of the humankind — the crystallized history of the struggle to survive by the humankind.

Computationally speaking, with the motivational subsystem, the whole Clarion system together carries out so-called unsupervised learning, as opposed to supervised learning or reinforcement learning, because the supervision or reinforcement needed for the various learning algorithms used within Clarion is hence generated entirely internally, within Clarion itself. This feature makes Clarion much more cognitively realistic.

It is true that the functionalities of the two subsystems are somewhat similar: Both involve making (internal or external) action decisions based on input information. However, content-wise, they are quite different:

The meta-cognitive subsystem is solely concerned with a limited range of meta-cognitive control actions (as described before), while the action-centered subsystem is concerned with other types of actions. If we ignore that content difference, then indeed the meta-cognitive subsystem maybe considered (standalone) modules of the action-centered subsystem. However, for conceptual clarity, it might be better off to view it as a separate subsystem.

Either way of seeing the meta-cognitive subsystem is fine and does not change the essential structure and the essential operations of Clarion

Theory of Norman Action

Introduction

Presentation

This cognitive theory which was developed by DA Norman provides a theoretical framework measures running the complexity of using a man-machine interface. It also describes cognitive

steps for performing a task. There is a goal to be achieved: a mental representation of the state of the system that the user wants to have.

Activity Details

Any action executed with a goal to determine a return cycle which consists of two steps: execution of a command assessment of the fixed goal, modification produced by the command for the realization of a task.

Remote execution

1. Establishment of the goal
2. Formation of an intention
3. Specifying a sequence of actions
4. Enforcement actions

Distance evaluation

5. Perception of system status
6. Interpretation of system status
7. Évaluation of the state to the goal set

There are back and forth between these two distances to a user satisfaction

Conclusion

The main output of this activity is to enable the learner to model dif, i.e. to explore a small number of cognitive domains in depth rather than to aim for broad coverage, as in Computational Cognitive Science. The course focused on how to evaluate and compare models against each other and experimental data..

Assessment

The assessment will be based on:

Oral presentation: students will (in pairs or small groups, depending on course enrolment) choose 2-3 papers on a given topic to present (topics and papers will be selected from a list provided by the instructor; students may choose a different topic if approved by the instructor).

Brief paper responses: For each class other than the one with their own presentation, students will submit a brief (1 paragraph) summary of the main content of one paper presented that day, as well as any comments or questions arising from their reading.

Essay: students will choose an area of cognitive modeling and write an essay based on one or more articles approved by the instructor.

Interacting Cognitive Subsystems (ICS)

Introduction

Interacting Cognitive Subsystems (ICS) is a comprehensive systemic model of the organization and function of the resources underlying human cognition. It is also regarded as a refinement of the human processor model, and based a multi-process parallel architecture. The model does not explain the nature of the information processed nor the mechanisms of information processing, but instead builds approximate models of cognitive operations by the use of cognitive resources. It is much more interested to sensory phenomena than reasoning. That is why it is more suitable for multimodal interfaces and multimedia.

Activity Details

The ICS structure of the human information processing system is divided into a sets of nine subsystems: morphono – lexical, propositional, implicational, object, sound, articulation, physical, visual and movement. The Description of each subsystem has: input, output, processing capacity of information, and local memory.

Conclusion

A model element which has the semantics of a package (it can contain other model elements) and a class (it has behavior). The behavior of the subsystem is provided by classes or other subsystems it contains. A subsystem realizes one or more interfaces, which define the behavior it can perform. The reason for using a subsystem instead of a package is that subsystems completely encapsulate their contents, providing behavior only through their interfaces. The benefit of this is that, unlike a package, the contents and internal behaviors of a subsystem can change with complete freedom so long as the subsystem's interfaces remain constant. Subsystems also provide a 'replaceable design' element: any two subsystems (or classes, for that matter) which realize the same interfaces are interchangeable.

Assessment

- Quote subsystems of ICS model.
- Describe each sub -system
- Establishing connections between subsystems
- List the benefits of ICS model

SUMMARY

To this end, Design Subsystems provide an ideal way to represent components in the Design Model: they are design elements which encapsulate the behavior of a number of classes (as components encapsulate the behavior of a number of class instances), and their behavior is only accessed via the interfaces they realize (as is the case with components).

Design Subsystems are used to encapsulate behavior inside a “package” which provides explicit and formal interfaces, and which (by convention) does not expose any of its internal contents. It is used as a unit of behavior in the system, which provides the ability to completely encapsulate the interactions of a number of class and/or subsystems. The ‘encapsulation’ ability of design subsystems is contrasted by that of the Artifact: Design Package, which does not realize interfaces, and may expose contents which are marked ‘public’. Packages are used primarily for configuration management and model organization, where subsystems provide additional behavioral semantics.

Since the perception of our environment are essential elements for the realization of an effective interface, a better understanding of the user’s cognitive activities is important for a successful interface design.

Unit Assessment

Check your understanding!

Demonstrate how interface design is ultimately dependent on human perception and cognition.

Analyse the role of well designed, usable interfaces in market success, reliability, and accessibility.

Distinguish the roles of HCI professionals and practitioners of related disciplines in the workplace.

Explain the role of systems software, distributed systems design, and GUI program efficiency in achieving acceptable system response times.

Specify the desired behavior of an interface or interface component with a state transition diagram.

Cognitive Modeling

Instructions

Using computers, memory retention test for a menu with more than 7 items describe all the processes of theory of action with a specific computer task (eg word processing, calculations, sorting) Apply the Fitts law to specific cases.

In a group, not necessarily in class, make an application for all models in practice

Questions

1. Discuss the two approaches to model human cognition.
2. Define cognitive architecture. What is a production system?
3. Discuss in brief the organization and working of the Model Human Processor (MHP).
4. What are the two principles of operations most important for the working of MHP? Explain those briefly.
5. How the process of cognition is implemented in MHP?

Answers

1. The two broad approaches to model human cognition are (a) the computational approach, in which human cognition is modeled using computer metaphors, such as processor, memory etc., and (b) the connectionist approach, in which biological metaphors, such as neurons, are used.
2. A cognitive architecture is defined as a broad theory of human cognition based on a wide selection of human experimental data, and implemented as a running computer simulation program. These belong to the computational approach of modeling cognition. Production systems are one type of cognitive architectures, in which the cognition is implemented with the help of a set of production (IF - ELSE) rules.

The MHP contains three interacting subsystems: (a) the perceptual subsystem representing the process of taking sensory input from the environment , (b) the cognitive subsystem representing the process of cognition and (c) the motor subsystem representing the motor actions in response to some perceptual or cognitive stimulus . Each of these subsystems has their own memory and processors. The perceptual subsystem consists of two types of memory, namely the visual (decay time ≈ 200 ms) and the auditory (decay time ≈ 1500 ms) stores.

The perceptual cycle takes about 100 ms. The cognitive subsystem depends on the short term (working) memory with limited storage capacity (decay time $\approx 7s$ for each chunk of information) and the long term memory (infinite storage capacity, no decay). A cognitive cycle takes about 70 ms. The working memory also acts as the memory component of the motor subsystem. Execution of a motor action (cycle) takes about 70 ms. There are ten principles of operations that govern the working of the subsystems in the MHP, as listed below.

1. P0 -- Recognize-Act cycle of the cognitive processor
2. P1 -- Variable perceptual processor rate
3. P2 – Encoding specificity principle
4. P3 -- Discrimination principle
5. P4 -- Variable cognitive processor rate principle
6. P5 -- Fitts's law

7. P6 -- Power law of practice
8. P7 -- Uncertainty principle
9. P8 -- Rationality principle
10. P9 -- Problem space principle

The principles P8 and P9, in the listing of principles in Q3, are the two most important principles governing the working of MHP. The principle P8, the rationality principle, states that the human behavior is determined by a set of factors that include goals, task, inputs and knowledge. The problem space principle or P9 states that any goal directed activity can be described in terms of a set of states of knowledge, operators for changing one state into another, constraints on applying operators and control knowledge for deciding which operator to apply next.

In MHP, the cognition is implemented using the notion of "cognitive cycles", which are essentially pattern -matching processes. The long term memory contains two types of knowledge: procedural containing a set of IF -ELSE (production) rules and declarative, where facts about the world are stored. In a cognitive cycle, the procedural memory is activated. The IF parts are then matched with the content of the working memory. If a match is found, the rule is "fired" (i.e., the THEN part is executed by the cognitive process, which may involve retrieving knowledge from the declarative memory). There can be multiple rule firings for the same input. The result of rule firing is a change in the working memory (and possible also of the declarative memory) content, which may instigate further rule firings. This way the cycle continues till no more rules are fired. As we mentioned before (Q3), on an average these cycles take about 70 ms to complete. The process described above is also known as the "recognize act cycle" (principle P0 in the set of principles of operations).

Grading Scheme

Test, participation quiz:	35%
Test project:	35%
Exams	30%

Feedback

The range of modeling tools in cognitive science are vast, and include production systems (sequential rule firing), neural networks, Bayesian probabilistic models, and pure mathematical theories. All of these tools share the following virtues:

Models force you to be explicit about your hypotheses and assumptions.

Models provide a framework for integrating knowledge from various fields.

Models allow you to observe complex interactions among hypotheses.

Models provide the ultimate in controlled experimentation.

Models lead to empirical predictions.

Models provide the sort of mechanistic framework that will ultimately be required in a theory of cortical computation.

Models can be built at many levels of the reductionist hierarchy. Single cell models characterize the details of neural function: ion flow, membrane depolarization, neurotransmitter release, action potentials, neuromodulatory interactions. Network models focus on neurophysiology and neuroanatomy of cortical regions, cell firing patterns, inhibitory interactions, and neural mechanisms of learning.. Functional models characterize the operation and interaction of components of the cognitive architecture and emphasize the transformation of representations. Finally, models at the computational level focus on the input-output behavior of the system and provide a mathematical characterization of cognition and learning. In this seminar, we'll emphasize the functional and computational level models. Randy O'Reilly and Yuko Munakata in psychology teach an outstanding course that focuses on the single-cell and network levels.

Unit Readings and Other Resources

The readings in this unit are to be found at course level readings and other resources.

Designing the User Interface, 5th Edition. Ben Shneiderman and Catherine Plaisant. Addison Wesley, 2010 (hereunder "sp"). We will be skipping back and forth in the book as we follow the topics listed above.

Models of Working Memory, Mechanisms of Active Maintenance and Executive Control Edited by AKIRA MIYAKE AND PRITI SHAH, Published by the Press Syndicate of University of Cambridge, The Pitt Building, Trumpington Street, Cambridge, United Kingdom

MODULE SUMMARY

The study of human-computer interaction enables system architects to design useful, efficient, and enjoyable computer interfaces. This course teaches the theory, design procedure, and programming practices behind effective human interaction with computers, and - a particular focus this quarter: smart phones and tablets.

In this module learners are introduced to the broad, inter-disciplinary area of human-computer interaction (HCI) with special emphasis on iteration design and user interface design.

Lectures cover the design, development and evaluation of computing technologies, including desktop computing, mobile computing and human interface technologies like mixed/augmented reality, to be used for either work or leisure purposes. The module is a combination of lectures and group work experiences. Students' will complete design and/or evaluation tasks, literature reviews and presentations as part of the practical requirement of this module.

Module Assessment

This module teaches the theory and practice of effective user interface design. This class teaches the theory and practice of effective user interface design. You will learn about principles, procedures, and programming approaches. You will create, judge, and evaluate interaction designs.

There will be one exam (in week 8 or 9), as well as a series of design, prototype, evaluation, and implementation assignments that lead up to individual or group class projects. We will continuously assign reading material from the book and assorted handouts, which is supposed to help your design efforts and to stimulate class participation. Here is how your final grade will be determined:

Exam (tentatively 40%)

Up to 6 (likely 5) one to two - week homework assignments (tentatively 40%)

Final project implementation, documentation, and presentation (tentatively 20%)

Class participation and activities [paper summaries, UI critiques, etc.] will be noted and can influence your grade

In case you disagree with any grade, submit your grievance in writing (email or paper) to the grader responsible, explaining and documenting your case.

We will examine interaction design, implementation, and evaluation. The design process requires a solid understanding of the theory behind successful human-computer interaction, as well as an awareness of established procedures for good user interface design, including the 'usability engineering' process.

Iterative evaluation is an important aspect of this procedure, and we will learn and practice prototyping and evaluation using scenario-based case studies. We will look at specific interface success stories and spectacular failures to learn from past experiences. Students will apply their gained knowledge in a series of practical assignments using practical local scenarios that highlight selected portions of the design cycle, as well as familiarize them with sound programming practices and effective tools and techniques to create successful user interfaces. The course also touches upon novel interfaces that go beyond what we normally see in today's graphical user interfaces.

Module References

Required readings and other resources:

- An Introduction to Programming in Go. Copyright © 2012 by Caleb Doxsey, ISBN: 978-1478355823

Optional readings and other resources:

<https://docs.python.org/2/tutorial/> For additional background reading

www.tutorialspoint.com/java/ For further interest reading

Interaction Design: Beyond Human Computer Interaction, 3rd Edition. by Helen Sharp, Jenny Preece, Yvonne Roger. "Topics: Design, Digital Media, Interaction Design, Web Development" ISBN: 9780470665763. Release Date: June 21, 2011.

Human Computer Interaction: Concepts, Methodologies, Tools and Applications, Panayiotis Zaphiris and Chee Siang " City University of London (U.K.)

Interaction Design: Beyond Human Computer Interaction, 3rd Edition. by Helen Sharp, Jenny Preece, Yvonne Roger. "Topics: Design, Digital Media, Interaction Design, Web Development" ISBN: 9780470665763. Release Date: June 21, 2011.

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Human Computer Interaction: Concepts, Methodologies, Tools and Applications, Panayiotis Zaphiris and Chee Siang " City University of London (U.K.)

Optimal Readings and other resources

- Virtual Reality: Human Computer Interaction, Xin-Xing Tang, ISBN: 978-953-51-0721-7
- <http://dx.doi.org/10.5772/3333> For background reading
- www.intechopen.com

For further interest reading

<https://docs.python.org/2/tutorial/> For additional background reading

www.tutorialspoint.com/java/ For further interest reading

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