I3 403/476

HUMAN COMPUTER INTERACTION NOTES (WEEK 1-WEEK 3)

TOPICS COVERED SO FAR :

1. Basics of hci
2. History of hci
3. Don Norman's interaction principles
4. Usabiltiy, usability engineering
5. dimensions, components, need
6. learnability, memorability
7. Cognitive model
8. Gulf of execution, Gulf of evaluation
9. Norman's 7 stages of actions
10. Conceptual and mental models

What is HCI ?

Human–computer interaction (HCI), alternatively man–machine interaction (MMI) or computer–human interaction (CHI) is the study of interaction between people (users) and computers.

Definition:

"Human-computer interaction 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."

Goals of HCI

- to improve the interactions between users and computers
- to make computing devices more usable and receptive to the user's needs.
- to design systems that minimize the barrier between the human's cognitive model of what they want and what is presented to them in-order to
    - accomplish and the computer's understanding of the user's task

HCI's role is in providing an interface that is as easy and invisible as possible, so the user can focus on the task and not on learning the interface or the software that was used to develop the interface. So HCI designers should aim to help the human feel like they're interacting directly with that task, while the interface, kind of vanishes, in the middle of that interaction.

What is an User Interface?
It is that part of a computing device and its software that people can see, hear, touch, talk to, or otherwise understand or instruct.

The user interface has essentially two components: input and output.

Input is how a person communicates his / her needs to the computer.
– Some common input components are the keyboard, mouse, trackball, one's finger, and one's voice.

Output is how the computer conveys the results of its computations and requirements to the user.
– Today, the most common computer output mechanism is the display screen, followed by mechanisms that take advantage of a person's auditory capabilities: voice and sound.

Differences and Commonalities between terminologies

HCI Vs Human Factors Engineering
- HCI involves designing interactions between humans and products
- Human factors engineering: Is same but it deals with non-computing parts such as car interiors, chairs, tables, headphones, (make, feel, easy of use),

  HCI also looks at human characteristics and how humans perceive or understand the world, what they expect.

However, most non-computerised things are being converted to computerised through concepts from Internet of Things all of which have interfaces to provide interactions for humans. So in one way, the gap between human factors engineering and HCI is shrinking since every single thing is run by a computer. Examples: tesla car, Smart refrigerators, Smart TV, Smart watches etc. In other words, cars have become computers on wheels, watches have become computers on wrists.

Computers are everywhere, so HCI is everywhere.

HCI Vs UI
UI is all about designing flexible interaction with things on screen.
In early days, focus was mainly on the screen. So, many principles were developed on how to design things nicely for a screen. Examples include elctrical panesl for engineers to work and control machines, control panel screens for pilots, displaying news on webpages by borrowing from physical newspapers, journals etc.

However, recent trends in HCI focussed on general methods that apply to any interface and not just a screen.

HCI Vs UX design
Again , HCI is about understanding the interactions between humans and computers.
- User experience design (UX) is about dictating the interactions between users and computers.
- In order to design user experiences very well —> you need to understand the user.
- You need to understand their interactions with interfaces. Understand, design and evaluate.
- If successful, understanding is good else go back figure out again, redesign and evaluate. This is like feedback cycles.

HCI vs Psychology:

- Human cognition looks at how humans understand things or products, and how they relate to them.
- HCI takes clues from human cognitive studies, then applies those lessons learnt into the interfaces.
- Its like in real world how do we use a certain thing, learn and create software that does something close to that and see how it works across people.

Example : psychologists at Apple computers studied how people organized files. They found that users preferred usually piles/stacks of papers, folders., or other related material. (like a less formal filing system). These behaviors or mental models were incorporated into the Mac OS file managing interface design, was evaluated and proved successful. This example can also be linked to conceptual and mental models.

Don Norman's principles : lecture notes and his book chapter on classroom are sufficient

What is Usability ?

Usability is about creating effective user interfaces.
Refer lecture slides for the following concepts

- Why is usability important?
- What are the dimensions of usability?
- How to make interfaces usable ? (refer to Don Norman's principles discussed)

Conceptual Models And Mental Models :
From lecture slides :
What is a conceptual model (CM) ?
What factors need to be considered in a CM ?

- Interaction modes, interface metaphors, interface paradigms

What is a task domain ?

What is a problem space ?
It is the domain area in which one is designing or developing an interface for.

What not to do :

- Trying to design the physical interface and what interaction styles to use (e.g., whether to use menus, forms, speech, icons, or commands).
- Paying attention to critical usability goals but overlooking user needs

Example design problem I : *Need for providing drivers with better navigation and traffic information.*

Usual mistakes :
Thinking straight away about a good technology or kind of interface to use.
For example, one might think that augmented reality, where images are superimposed on objects in the real world would be appropriate. In the context of driving, it could be effective for displaying information to drivers who need to find out where they are going and what to do at certain points during their journey. In particular, images of places and directions to follow could be projected inside the car, on the dashboard or rear-view mirror.

However, there is a major problem with this proposal: it is likely to be very unsafe. It could easily distract drivers, making them switch their attention from the road to where the images are being projected.

What to do :
Ask how your design will support people in their everyday or work activities.

In the above example, this involves finding out what is problematic with existing forms of navigating while driving (e.g., trying to read maps while moving the steering wheel) and how to ensure that drivers can continue to drive safely without being distracted

Example design problem II :
Below is another scenario in which the problem space focuses on solving an identified problem with an existing product. Initial assumptions are presented first, followed by a further explanation of what lies behind these assumptions:

A large software company has decided to develop an upgrade of its web browser. They assume that there is a need for a new one, which has better and more powerful functionality. They begin by carrying out an extensive study of people's actual use of web browsers, talking to lots of different kinds of users and observing them using their browsers. One of their main findings is that many people do not use the bookmarking feature effectively. A common finding is that it is too restrictive and underused .
In trying to understand why this is the case, it was considered that the process of placing web addresses into hierarchical folders was an inadequate way of supporting the user activity of needing to mark hundreds and sometimes thousands of websites such that anyone of them could be easily returned to or forwarded onto other people .

An implication of the study was that a new way of saving and retrieving web addresses was needed.

In working out why users find the existing feature of bookmarking cumbersome to use, a further assumption was explicated:

- The existing way of organizing saved (favorite) web addresses into folders is inefficient because it takes too long and is prone to errors.
- A number of underlying reasons why this was assumed to be the case were further identified, including:
- It is easy to lose web addresses by placing them accidentally into the wrong folders.
- It is not easy to move web addresses between folders .
- It is not obvious how to move a number of addresses from the saved favorite list into another folder simultaneously.
- It is not obvious how to reorder web addresses once placed in folders.

Based on this analysis, a set of assumptions about the user needs for supporting this activity more effectively were then made. These included:

- If the bookmarking function was improved users would find it more useful and use it more to organize their web addresses.
- Users need a flexible way of organizing web addresses they want to keep for further reference or for sending on to other people

To conclude the following questions provide a useful framework with which to begin thinking through the problem space:

- Are there problems with an existing product? If so, what are they?
- Why do you think there are problems?
- Why do you think your proposed ideas might be useful?
- How do you envision people integrating your proposed design with how they currently do things in their everyday or working lives?
- How will your proposed design support people in their activities?
- In what way does it address an identified problem or extend current ways of doing things?
- Will it really help?

Developing CMs :

- To develop a conceptual model involves envisioning the proposed product, based on the users' needs and other requirements identified.
- To ensure that it is designed to be understandable in the manner intended requires doing iterative testing of the
- product as it is developed.
- A key aspect of this design process is initially to decide what the users 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 support this needs 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 effective?
- Decisions about which kind of interaction style to use (e.g., whether to use a menu-based system, speech input, commands) should be made in relation to the interaction mode.
- Another way of designing an appropriate conceptual model is to select an interface metaphor.
    - This can provide a basic structure for the conceptual model that is couched in knowledge users are familiar with. Examples of well-known interface metaphors are the desktop and search engines

CMs based on activities

The most common types of activities that users are likely to be engaged in when interacting with systems are:

1. instructing
2. conversing
3. manipulating and navigating
4. exploring and browsing

Class lecture Video discusses the above points. No other notes required.

What conceptual models are the following applications based on?

(a) a 3D video game, say a car-racing game with a steering wheel and tactile, audio, and visual feedback

(b) the Windows environment

(c) a web browser

(d downloading music off the web

(e) programming

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