FUTURE TRENDS IN HCI

Ubiquitous Computing -

Often referred to as "everywhere computing", refers to integration of computing capabilities into everyday objects & environments. This aims to make technology seamlessly blend into our lives, allowing users to interact with devices in a natural & unobtrusive manner.

Characteristics:-

- Invisibility - technology is designed to be hidden in background, so we don't have to think about it.
- Everywhere - computers & smart devices are found in every objects
- Context Awareness - device understand their surroundings & adapt it
- UCD
- Interoperability - device & appl^n can communicate with each other.

Applications:-

Smart home automation - thermostats & lighting systems.
Wearable Technology - fitness trackers & health monitors
Smart cities.

Design Thinking

It is a creative problem-solving process that focuses on understanding users & their needs. It helps teams come up with innovative solutions by following 5 steps : Empathize, Define, Ideate, Prototype & Test.

① Empathize

Objective - understand the user & their needs by observing & engaging with them.
Activities - Conduct interviews, surveys & obs to gather insights about user behaviours & experiences.
Example - For a new fitness app, observe how users track their workouts & what challenges they face.

② Define

Objective - Clearly articulate the problem you want to solve based on the insights gathered during the empthize stage.
Activities - Analyze user data to identify pain points & create a problem statement that reflects users needs.
Example - Users struggle to stay motivated to track their workouts consistently.

③ Ideate

O- Generate a wide range of ideas & sol^{n}s to address the defined problem.
A- Brainstorming sessions where team members contribute creative ideas without judgement.
Eg - Ideas for features in fitness app could include gamification elements, social sharing options / personalized workout plans.

④ Prototype

O - Create low fidelity representations of your ideas to visualize soln & gather feedback.

A - Develop sketches, wireframes / simple models of the product or features.

Eg - Build a clickable mock-up of fitness app that demonstrates how user can navigate through different features.

⑤ Test

O - Evaluate prototypes with real users to gather feedback & identify areas for improvement.

A - Conduct usability testing sessions where participants interact with the prototype while observers take notes on thier experiences.

Eg - Users test the fitness app prototype & provide feedback on usability, design and features they find helpful or confusing.

Example 2 - Smart Water Bottle

E - Interview users to understand their hydration habits & challenges.

D - Create a problem statement .. "How can we help users remember to drink enough water?".

I - Brainstorm features like reminders, tracking app, color-changing indicators.

P - Develop Basic model of smart water bottle with reminder features.

T - Have users try the prototype & gather feedback on its effectiveness.

Finding Things on Web.

How multimodal input has ~~ew~~ improved the web Experience

Multimodal model input means using different ways to interact with technology. Instead of just typing on a keyboard, users can now use voice commands, images and even gestures.

① More choices - users can choose how they want to search.

Eg. They can type a question, talk to their device / upload a pic of something they want to find.

② Better Results - using different types of input helps search engines understand what users wants more accurately.

Eg. if you upload a pic of shoe, the search engine can show you similar shoes available online.

③ Easier to use - voice searches allow people to ask questions naturally, like talking to friend. This makes searching feel more comfortable and less complicated.

④ Understanding context - multimodal systems can remember what users have searched before. This means they can suggest better results based on previous searches.
Eg, if you often look for recepies recipes, the system might show you new recipe when you ask about dinner ideas.

⑤ Accessibility for everyone - Multimodal input helpful for ppl with different abilities.
Eg. someone who finds it hard to type can use voice commands to search instead.

⑥ Finding Products Easily - Users can discover new items by using images/ voice instead of just text.
Eg. You see a dress online & want to find it, you can take a pic & search for similar dresses.

⑦ Searching in Different Languages - Multimodal systems can understand multiple languages, making it easier for ppl around the world to find what they need in their preffered language.

Augmented Reality (AR)

AR enhances real world by overlaying digital info. ie., it adds digital elements like images, sounds or information to the real world.
Enhances UX by merging physical & virtual environments.
It can be experienced through devices like smartphones, tablets & AR glasses.
How it works - You typically use a smart phone or tablet that has a camera. The device recognizes your surroundings & displays digital content on the screen as if it were part of real world.
Examples -
Pokemon GO - game
IKEA Place App - furniture decor app
Google Lens
Appln -
Gaming, Education, Retail (Purchase / Sell)
Future Prospects -
AR in Remote work - training in AR.
Healthcare Appln - surgeries & trainings.
Integration with IOT - real time visualisations.

Virtual Reality (VR)

Technology that creates a fully immersive digital environments, allowing users to interact with computer generated simulations.

Users experience VR through - headsets / VR goggles, it feels like you are inside a video game / other environment together.

How it works - VR headsets cover your eyes & use screens to show a 3D environment. Sensors track your head movements so that when you look around, you see different parts of this virtual world.

Examples -

Medical Training Simulations

VR Feild Trips

Gaming experience - like Beat Saber

Appln -

Gaming, Training & Simulation, Therapy & Rehabilitation.

Future Aspects -

Advancements in Hardware, Social VR Experience, Integration with AI

AR adds digital elements to your view of real world, allowing interaction with both real & virtual objects.

VR immerses you in a fully virtual environment, isolating you from real world.

Challenges in Designing Interfaces for:

① Smart homes.

① Connectivity Issues - ensuring all smart devices can communicate with each other is a major challenge. Different devices may use various protocols (like WiFi, Zigbee or ZWave), leading to compatibility problems.

② User Interface Complexity - Users expect a simple interface that is easy to navigate. Managing multiple devices and functions can make interface complex & overwhelming.

③ Security & Privacy concerns - Smart homes collect a lot of data. Designers must ensure that users feel secure about how their data is used & stored, which requires clear communication about privacy policy.

④ Context Awareness - Smart homes system should adapt to different situation (like day vs night). Designing interfaces that can change

based on content while remaining user-friendly challenging.
⑤ High-up Front Costs - requires initial investments in technology, which can deter users. Designers need to create value propositions that justify costs.

② Smart Devices
① Diverse User Needs - creating an interface that is accessible & easy to use for everyone is a challenge.
② Multimodal Interaction - Interaction in many ways eg. voice, touch or gesture. Designing an interface that effectively integrates these diff. modes is complex.
③ Hardware Compatibility - Ensuring that app works well with various hardware components (like sensors) from different manufacturers can be difficult due to differing standards.
④ Battery Life Management - Many devices runs on batteries, so designer need to create interface that minimizes power consumption while still providing necessary features.
⑤ Security Vulnerabilities - with increasing connectivity comes the risk of security breaches. Designer must implement robust security measures without complicating UX.

③ Handheld Devices
↳ Limited screen size
↳ Touch interaction design
↳ Performance Optimization
↳ Network connectivity
↳ UX consistency

④ Smart Wristwatches
↳ Limited screen size
↳ Limited interaction methods
↳ Battery Life Constraints
↳ Healthcare & fitness Data Accuracy

Future of HCI
Natural User Interface.
Emotional AI.
Ethical Design
AR & VR
Wearable Technology
IoT
Personalization & Content Awareness