



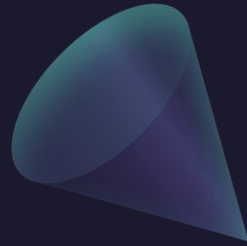
Module-5

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(Ubiquitous Computing and Augmented Realities: Ubiquitous
Computing - Virtual Reality Augmented Reality - Information
Visualization)

Agenda

1. Ubiquitous Computing
2. Virtual Reality (VR)
3. Augmented Reality (AR)
4. Information Visualization
5. Interaction Styles in HCI
6. Case Studies
9. Conclusion





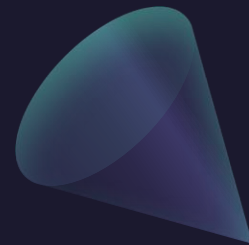
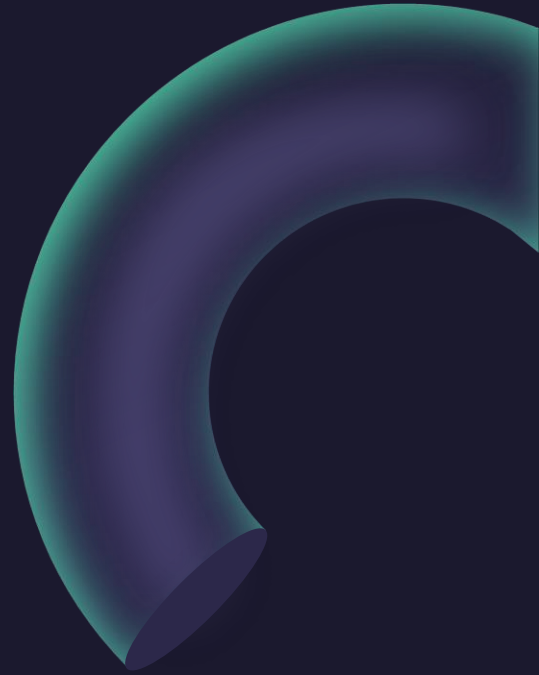
Ubiquitous Computing

Ubiquitous Computing

- Ubiquitous computing (or pervasive computing) refers to the integration of computing capabilities into everyday objects and environments, creating a seamless interaction between users and technology.

Key characteristics

1. Interconnectivity
 2. Context Awareness
 3. Invisible Technology
- Enhances usability by providing context-aware services that anticipate user needs.
 - Promotes intuitive interactions through natural user interfaces (e.g., voice commands, gesture controls).
 - Challenges include ensuring privacy and security while maintaining seamless user experiences.



Virtual Reality (VR)



Virtual Reality (VR)

Virtual Reality (VR) is a technology that creates immersive environments that simulate real or imagined experiences, allowing users to interact with these digital spaces as if they were physically present. Utilizing specialized hardware such as VR headsets, which provide a 360-degree view, and motion controllers that track hand movements, VR enables engaging experiences in gaming, training, education, and more

•Applications in HCI

Training Simulations: Used extensively in fields like healthcare for surgical training, allowing trainees to practice procedures in a risk-free environment.*Example:* VR simulations where medical students perform surgeries on virtual patients.

•Gaming: Provides engaging experiences by immersing players in interactive worlds where they can explore and manipulate their surroundings.*Example:* Games like "Beat Saber" or "Half-Life: Alyx" that utilize VR for immersive gameplay.'

Key Features:

User Experience-

1)Facilitates experiential learning by allowing users to engage with content hands-on.

2)Evokes emotional responses through storytelling and realistic scenarios, enhancing memory retention and skill acquisition.

Virtual Reality Headset Market

Report Segmentation



Regional Outlook

- North America
- Europe
- Asia Pacific
- South America
- Middle East & Africa

End-device Outlook

- Low-end Device
- Mid-range Device
- High-end Device



Application Outlook

- Gaming
- Healthcare
- Media & Entertainment
- Manufacturing
- Retail
- Education
- Others

Product Type Outlook

- Standalone
- Smartphone-enabled
- Standalone PC-connected

Source: www.grandviewresearch.com



Augmented Reality (AR)



Augmented Reality (AR)



Augmented Reality (AR) overlays digital information onto the real world, enhancing the user's perception of their environment through devices such as smartphones, tablets, or AR glasses. By utilizing the device's camera, AR applications display interactive elements that users can engage with in real-time. This technology enriches experiences in gaming, navigation, education, and various industries by providing contextual information directly within the user's view. This version maintains clarity while expanding the definition to three lines.

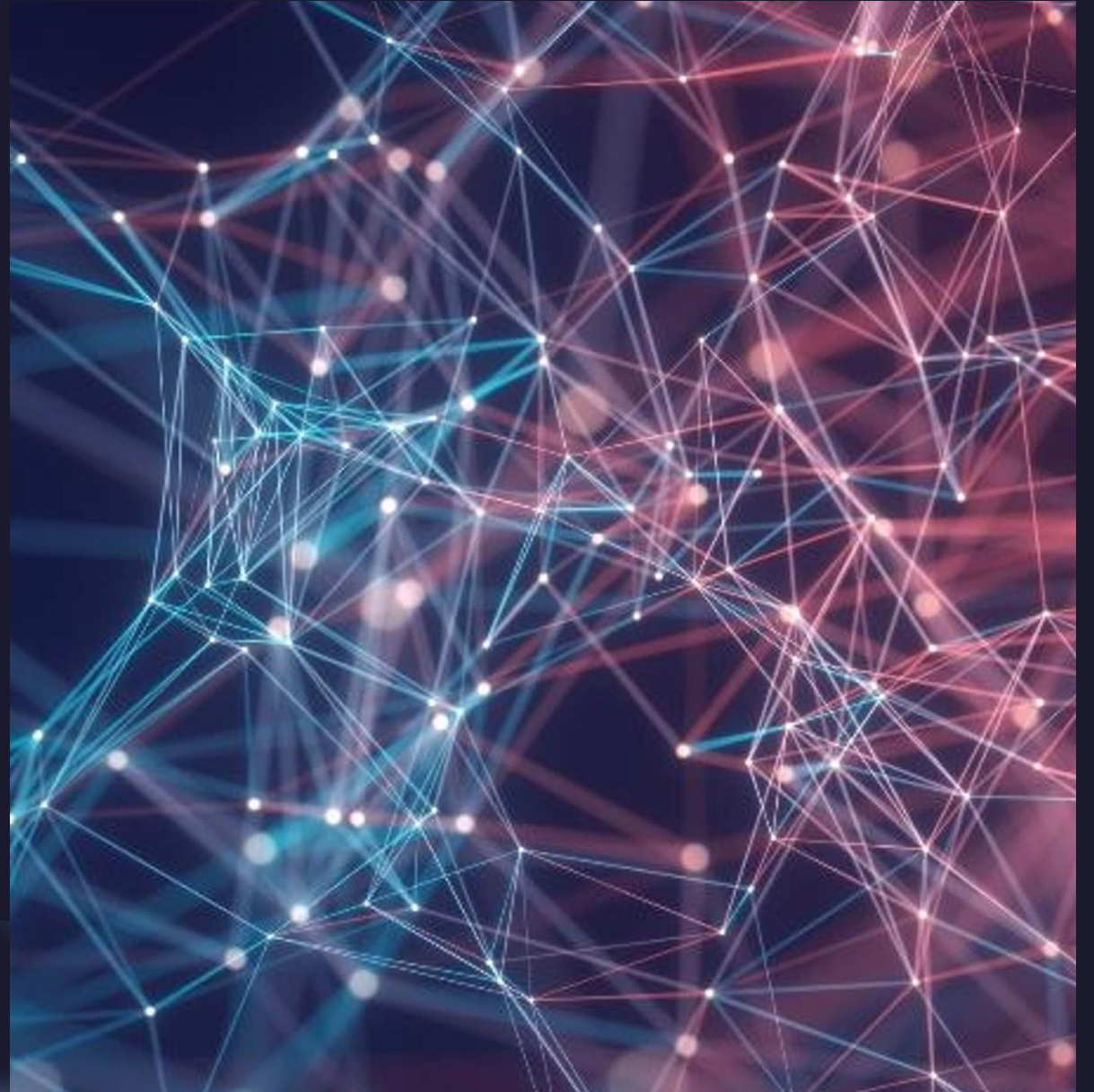
Applications

1. Education: Enhances learning experiences by providing interactive content related to physical objects.*Example:* Apps like "Google Lens" that allow users to point their camera at a textbook to see additional resources or animations related to the material.
2. Retail: Allows customers to visualize products in their own space before purchasing.*Example:* IKEA Place app lets users see how furniture would look in their home using AR.

•User Interaction Enhancement:

- Makes technology intuitive by blending physical and digital elements, allowing for natural interactions that enhance user engagement.
- Encourages exploration and discovery through interactive experiences.

Information Visualization



Information Visualization

Information visualization transforms complex data into visual formats, such as charts, graphs, and maps, making it easier for users to understand and analyze large datasets. By presenting information visually, it facilitates better decision-making by highlighting patterns, trends, and relationships that may not be immediately apparent in raw data.

- Techniques Used:

Various graphical representations such as:

- 1)Charts: Bar charts, pie charts for categorical data comparison.
- 2)Graphs: Line graphs for trend analysis over time.
- 3)Heat Maps: Visualize data density or intensity across geographical areas or datasets.
- 4)Dashboards: Interactive interfaces displaying key performance indicators (KPIs) for quick insights.

Key Features:

- Enhances cognitive processing by allowing users to quickly interpret data relationships and trends through visual representation.
- Supports exploratory data analysis, enabling users to interact with data dynamically (e.g., filtering, zooming).

Information visualization

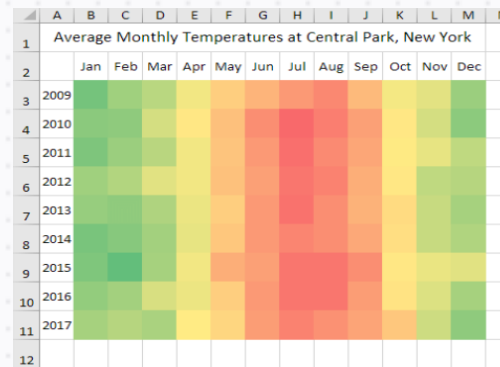
Charts



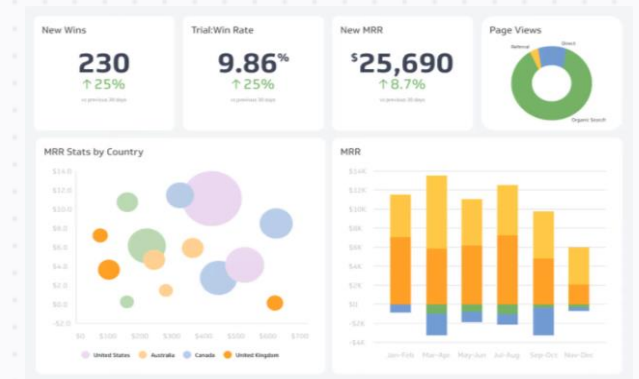
Graphs



Heat Maps



Dashboards



Interaction Styles in HCI



Interaction Styles in HCI

- Different ways users can interact with systems:

1. Visual Interfaces: Graphical User Interfaces (GUIs) where users navigate through icons and menus.

Example: Desktop operating systems like Windows or macOS.

2. Auditory Interfaces: Systems that respond to voice commands or sound cues.

Example: Smart assistants like Amazon Alexa or Google Assistant that allow hands-free control of devices.

3. Gesture-based Interfaces: Users interact through touch screens or motion sensors.

Example: Smartphones using touch gestures or VR systems using hand tracking.

- Examples in Practice:

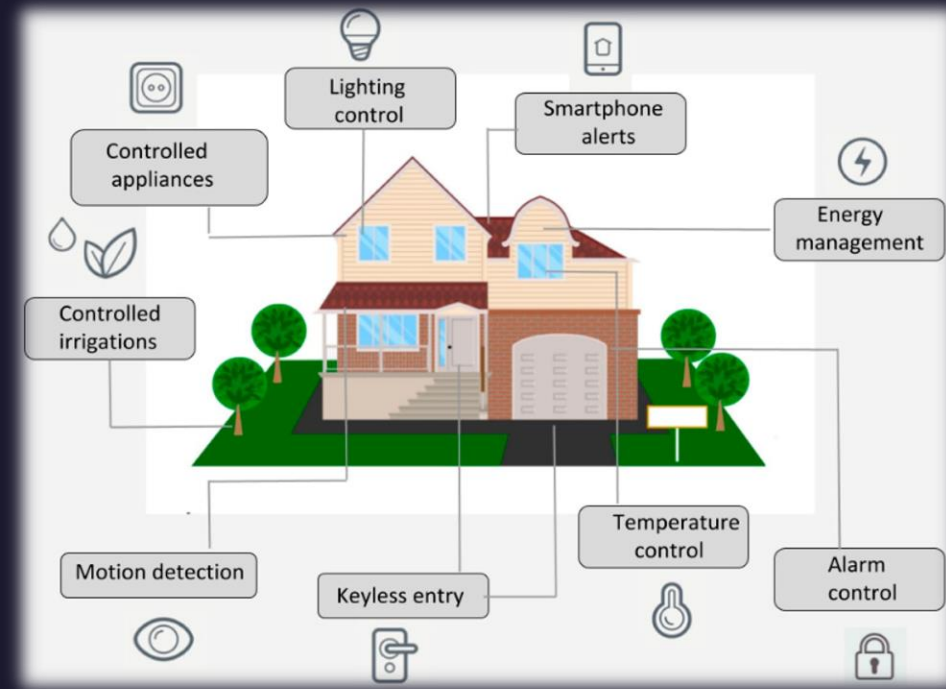
Ubiquitous Computing: Smart home interfaces responding to voice commands or mobile apps controlling IoT devices enhance convenience and accessibility.

VR/AR Applications: Gesture controls for navigating virtual environments or manipulating digital objects seamlessly improve immersion and user experience.

Case Studies

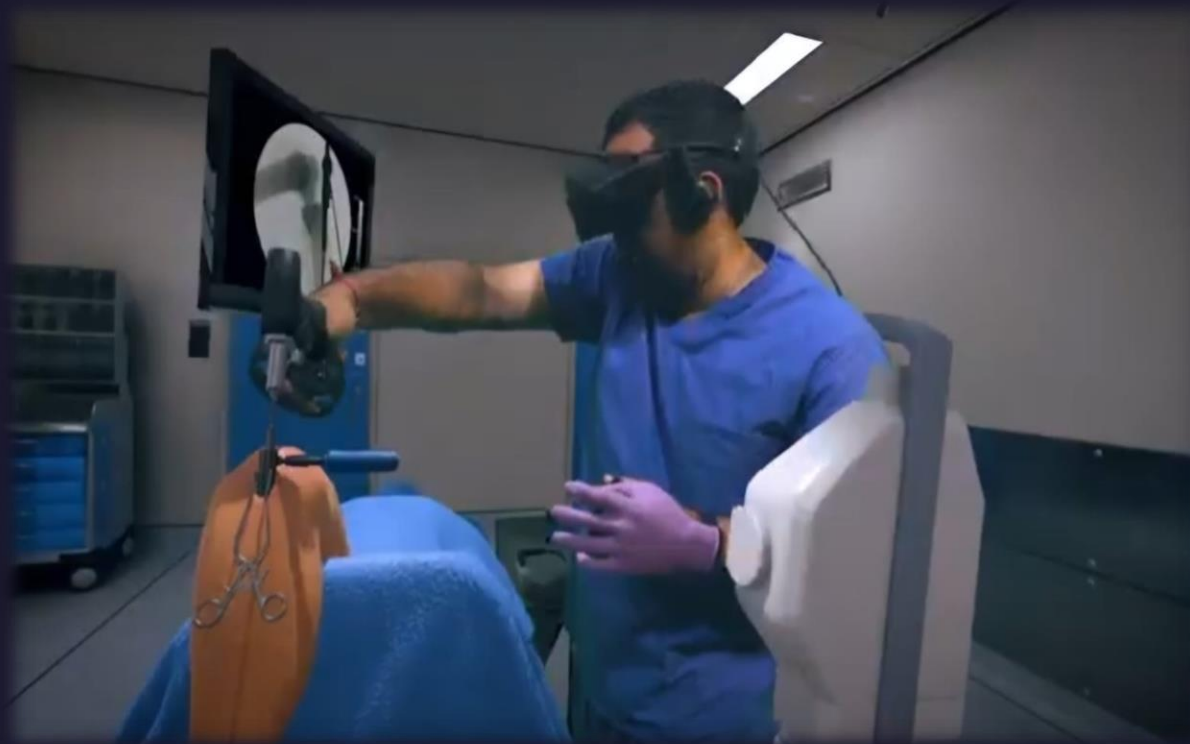
Case Study 1: Smart Home Technology

Smart home technology leverages a network of interconnected devices to enhance daily tasks through intuitive interfaces, such as voice-controlled assistants like Amazon Alexa and Google Home. These devices enable users to control various aspects of their home environment, including lighting, temperature, and security systems, using simple voice commands or mobile apps. The convenience is significant; for instance, smart thermostats learn user preferences to optimize energy usage, leading to cost savings.



Case Study 2: VR Training Programs

Virtual Reality (VR) is transforming medical training by providing immersive simulations that replicate real-life scenarios. Medical students can practice complex procedures in a risk-free environment, such as surgical simulations that enhance their preparedness and confidence. Institutions like Johns Hopkins have integrated VR into their curriculum for training in emergency response and surgical techniques. The benefits include improved decision-making skills and procedural accuracy, as VR offers real-time feedback and the opportunity to repeat scenarios until mastery is achieved, ultimately bridging the gap between theoretical knowledge and practical application.



Challenges in HCI



- Usability Issues: Complexity of interfaces can overwhelm users in ubiquitous computing environments.
- Accessibility Concerns: Ensuring AR/VR applications are usable by individuals with disabilities requires thoughtful design considerations.
- Strategies for Improvement: Conduct user testing with diverse groups to identify pain points and improve designs.



Future Trends in HCI

- Emerging Technologies Impacting HCI:Artificial Intelligence (AI): Personalization of user experiences through adaptive interfaces.
- Predictions for the Future:Increased use of natural language processing for more intuitive interactions.
- Growth of mixed reality applications that combine AR and VR elements for enhanced engagement.

Conclusion

- Summary of Key Points Discussed:

Importance of integrating ubiquitous computing and AR/VR into HCI design to enhance user experiences significantly.

- Final Thoughts:

Continuous research is essential to adapt to evolving technologies; fostering innovation while prioritizing user experience will be key.

Thank You

