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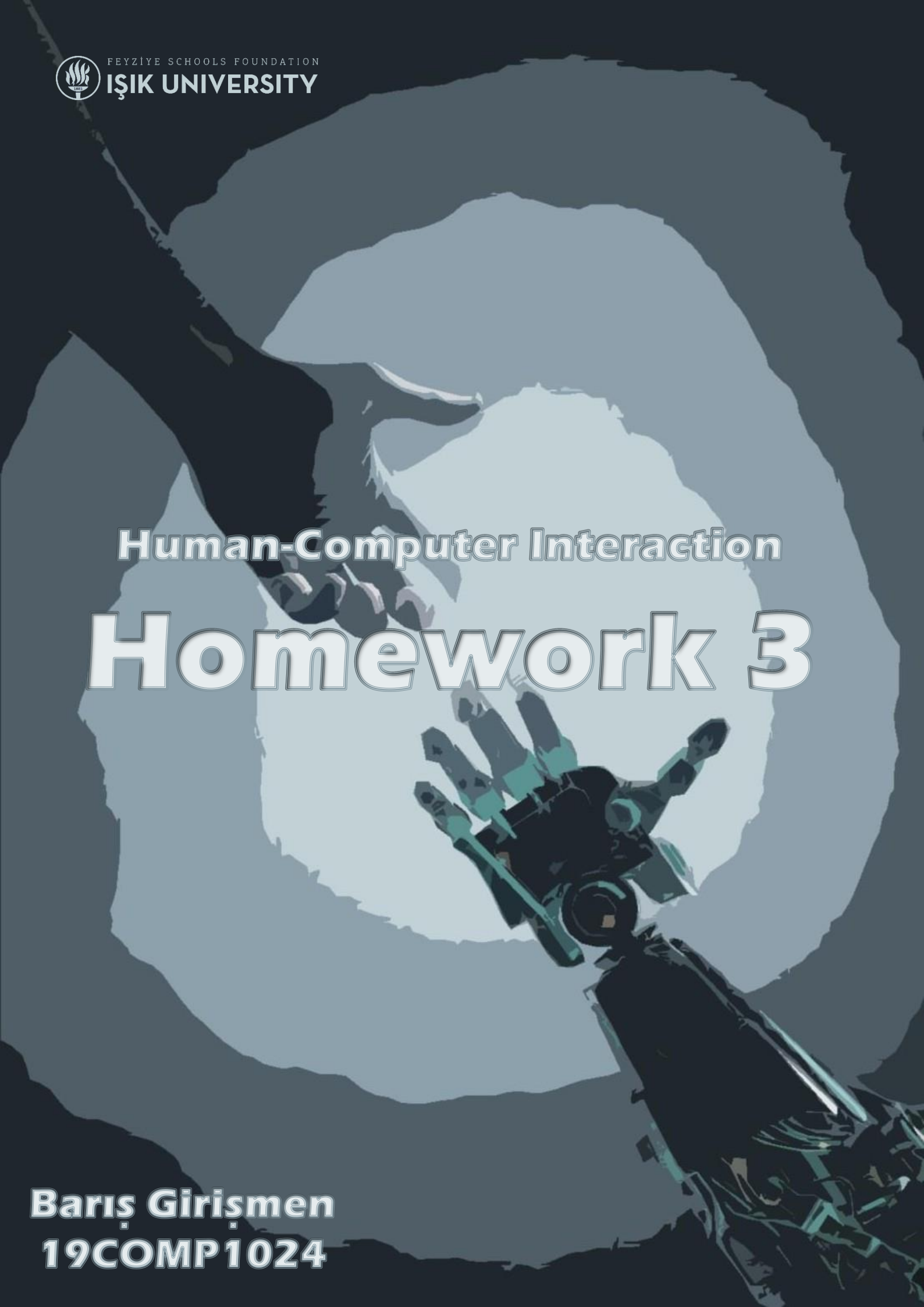

Human-Computer Interaction

Homework 3

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19COMP1024

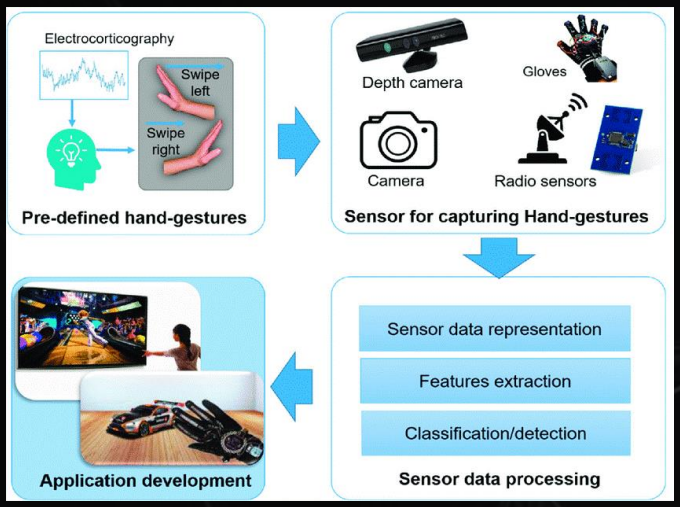
Overview

In the broadest context, human–machine interaction occurs when a human user and a computer system collaborate to achieve a goal. Usability is the part of HCI dedicated to ensuring that human–computer interaction is accurate, productive, and satisfying for the user, among other things. As a result, usability encompasses qualities like ease of use, productivity, reliability, effectiveness, learnability, retention, and user satisfaction.

The study of human-computer interaction is primarily concerned with developing methods that will improve and simplify how users communicate with their machines. The use of physical objects for human-computer interaction, such as a mouse or keyboard, reduces the intuitiveness and naturalness of the interface by creating a high barrier between the user and the computer. With the advancement of technology, today's human-computer interfaces are becoming more sophisticated. It is no longer possible to communicate with a computer solely through the use of a keyboard and mouse. In many areas of human-computer interaction, the ability to communicate naturally with the machine is becoming increasingly necessary.

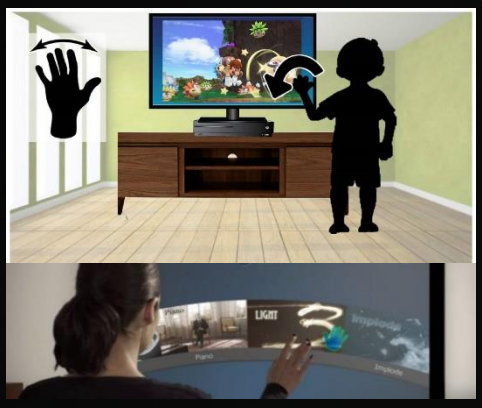
There are a variety of methods in Human Computer Interaction (HCI), and in this homework report, I'll focus on the methodologies for hand gesture recognition and gaze gesture with a head-mounted display including its applications.

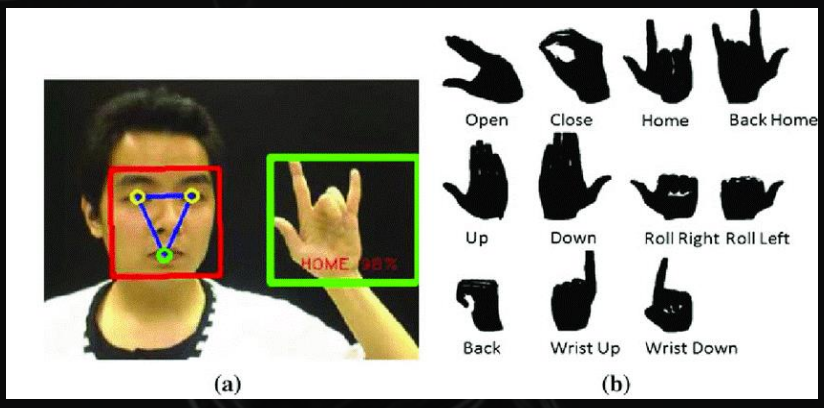
Methodology For Hand Gesture Recognition In HCI



The direct use of hands as an input device, rather than conventional text-based interfaces by graphical-based user interfaces, is an appealing method for providing natural human-computer interaction. Despite the huge demand for hand gesture-based interface design, conventional vision-based approaches still struggle to develop a reliable hand gesture recognition framework.

As a result, this hand gesture recognition device, which can monitor both static and dynamic hand movements, can provide users with a natural and intuitive interface to their computers. With very little hardware, this device converts the detected gesture into acts such as opening websites, launching applications, and many others.





Advantages:

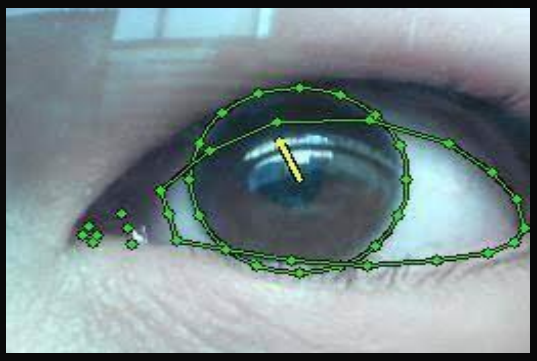
- It's a normal and intuitive way of interacting.
- It's easier to use.
- Both static and dynamic hand gestures are recognized.
- As a recognition method, it is both fast and reliable.
- Simple to integrate into real-time systems.
- These movements can be customized, and each one can be assigned to a different mission.
- It only necessitates a small amount of hardware.
- The price is low.

Disadvantages:

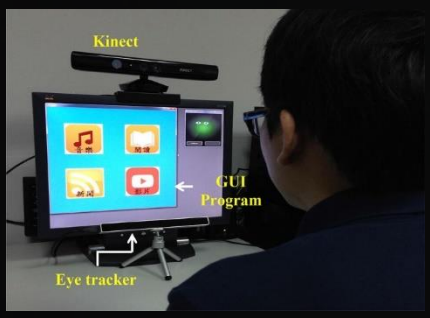
- If there is some presence of a complex context, identification accuracy can suffer.
- Irrelevant objects held in the hand may cause the recognition system to be deceived.
- It's possible that the device would require the hand to be vertical and the fingers to be pointed directly at the camera.
- As the gap between the user and the camera grows, the system's output suffers.
- Color detection is hampered by ambient light, which reduces device efficiency.
- It is also unable to create a user interface capable of replacing physical controllers.

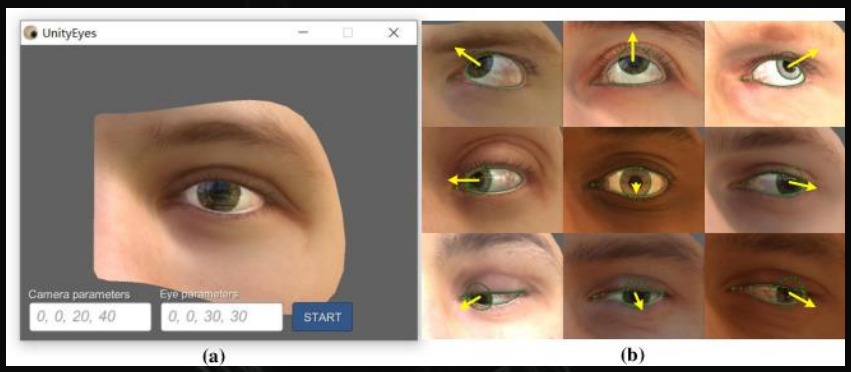
Methodology For Gaze Gesture And Their Applications In HCI With A Head-Mounted Display

Since humans can freely regulate their eye movements, this technique is efficient and simple to use. Thus, eye-tracking technology can be used as an HCI tool. HCIs are well known for gestures and voice input at this time, but this type of gesture-based HCI system is unsuitable when both hands are occupied or when speech is not available.



As a result, a more straightforward and reliable approach to HCI with HMDs is critical. This device also achieves HMD-based gaze interaction by using an HMD webcam to detect and monitor the user's aim based on gaze in real-time at a close range. HCI research that uses gaze movements has exploded in popularity in recent years.





Advantages:

- This system is extremely reliable and simple to use. Any other motion movement is slightly slower than eye gaze movement.
- When your hands are occupied and you can't talk, this is a great tool to have. For gesture recognition, this technique collects a large amount of accurate and precise data.
- With the aid of a neural network, the recognition accuracy has been improved.
- To ensure consistency between the obtained results, two neural networks are used in parallel to map different features.
- Can adapt to a variety of lighting conditions, both indoors and out.
- Disabled people will be able to use it as an app.

Disadvantages:

- New users may have a tendency to draw erroneous patterns.
- It takes some time for the user to become accustomed to the gui.
- From person to person, the relative locations of the eyes and camera differ.
- Contact lenses, glasses, and other eyewear can all affect the camera's ability to detect eye movements.
- It can be costly to monitor the eyes and train the data set for the neural network.It is also unable to create a user interface capable of replacing physical controllers.

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