EMBEDDED SYSTEMS
(CMPE 30274)

Quality of Embedded Systems

Quality of an Embedded System

1. Reliability
2. Performance
3. Real-Time Operation
4. Scalability
5. Safety
6. Security
7. Maintainability
8. Power Efficiency
9. Cost-Effectiveness
10. User Experience

Quality of an Embedded System:

1.Reliability: The system must perform consistently over time without failures and should handle faults gracefully.

2.Performance: This encompasses speed, responsiveness, and efficient use of resources such as CPU, memory, and power.

3.Real-Time Operation: Many embedded systems are required to meet specific timing constraints, ensuring that they process inputs and produce outputs within defined time limits.

Quality of an Embedded System:

4.Scalability: The system should be capable of adapting to increased loads and expanding in terms of functionality and performance.

5.Safety: In critical applications, such as automotive or healthcare, the system must guarantee safe operation under all conditions.

6.Security: Robust protection against unauthorized access and cyberattacks is essential, especially for systems connected to networks.

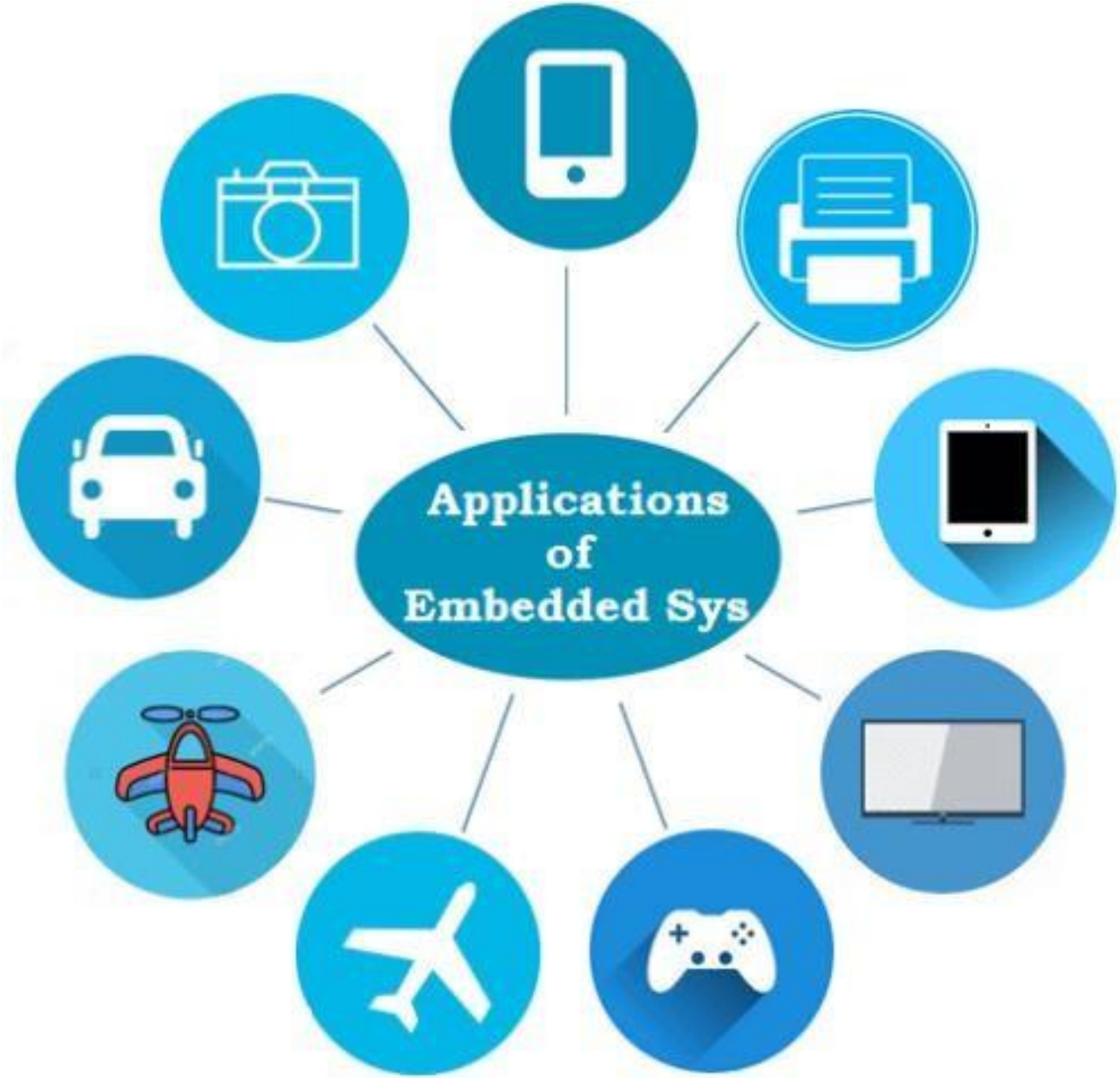
Quality of an Embedded System:

7.Maintainability: The system should allow for easy updates, repairs, or modifications after deployment.

8.Power Efficiency: For portable or battery-operated devices, minimizing power consumption is essential.

9.Cost-Effectiveness: The overall cost of the system should be considered, including development and production expenses.

10.User Experience: The system must offer a user-friendly interface and effectively meet user needs.


Applications
of
Embedded Sys

Applications

Some real-life applications of Embedded Systems are as follows:

- **Consumer Electronics**: Examples include televisions, digital cameras, computer printers, video game consoles, and home entertainment systems like the PS4.

- **Household Appliances**: This category encompasses refrigerators, washing machines, microwave ovens, and air conditioners.

Applications

Applications of Embedded Systems:

•**Medical Equipment**: Includes scanners such as MRI and CT machines, ECG devices, and monitors for blood pressure and heartbeat.

•**Automobiles**: Features fuel injection systems, anti-lock braking systems, music and entertainment systems, and air-conditioning controls.

•**Industrial Applications**: Comprises assembly line automation, feedback systems, and data collection systems.

•**Aerospace**: Encompasses navigation and guidance systems, including GPS.
•**Communications**: Involves routers and satellite phone

Advantages of Embedded Systems

Advantages

- **Cost-Effective for Mass Production**: Embedded systems are designed for large-scale manufacturing, leading to a lower cost per unit.
- **High Stability and Reliability**: These systems are known for their consistent performance and dependability.
- **Task-Specific Design**: Embedded systems are tailored for specific functions, enhancing efficiency and effectiveness.

Disadvantages of Embedded System

Disadvantages

- Limited Flexibility
- Maintenance Challenges
- Difficult Troubleshooting
- Limited Hardware

Disadvantages

- **Limited Flexibility**: Once configured, these systems cannot be altered, making it challenging to implement improvements or upgrades after design and creation.

- **Maintenance Challenges**: Embedded systems can be difficult to maintain, and backing up embedded files is often problematic.

Disadvantages

- **Difficult Troubleshooting**: Diagnosing issues in embedded systems can be complex, and transferring data between systems is often problematic.

- **Limited Hardware**: Since these systems are designed for specific tasks, their hardware capabilities are often restricted.

End of Lesson