

Unit 10 – Collaborative Discussion

Summary of Discussion on Object-Oriented Design Metamodels for IoT Systems

This discussion significantly enhanced my understanding of how object-oriented design principles must evolve to meet the demands of modern IoT systems, particularly through evaluating Baskara et al.'s (2024) T-UFF warehouse tracking system, where I learned that effective metamodels require more than technical functionality as they must anticipate scalability challenges and environmental complexity from the outset.

My analysis of the T-UFF system revealed that simplicity and modularity, whilst valuable for prototyping, become liabilities in dynamic environments, as the system's reliance on Bluetooth and fixed LED infrastructure demonstrated how hardware-centric designs quickly become obsolete. This realisation led me to propose integrating LiDAR-based SLAM for spatial awareness (Badue et al., 2021), Edge AI for autonomous decision-making (Shi et al., 2016), and LoRaWAN for scalable connectivity (Mekki et al., 2019), representing a fundamental shift from reactive systems to adaptive architectures capable of responding to unpredictable conditions.

Victor's feedback proved particularly valuable in highlighting what I had overlooked regarding software design patterns, as his emphasis on the Strategy and Observer patterns (Gamma et al., 1994) taught me that architectural elegance extends beyond hardware integration into code structure itself. The concept of cyclomatic complexity (McCabe, 1976) was especially enlightening because it quantifies maintainability in ways I had not previously considered, whilst understanding that energy efficiency correlates directly with algorithmic efficiency (Pinto and Castor, 2017) reframed my perspective on sustainable IoT development.

Additionally, considering OPC UA integration (Leitner and Mahnke, 2006) and RTOS requirements (Kopetz, 2011) taught me that practical IoT solutions must bridge legacy systems whilst guaranteeing real-time performance, which fundamentally changed how I approach system design by moving from isolated technical solutions toward holistic, maintainable architectures that balance innovation with operational reality.

References

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