



Department of Computer Science and Engineering

UE22CS352A: OBJECT ORIENTED ANALYSIS AND DESIGN

Lab 5 : State Diagram

Problem Statement: Autonomous Spacecraft Mission from Earth to ISS

Odyssey-1's Space Adventure: From Earth to the International Space Station

The Odyssey-1 spacecraft is about to embark on an exciting journey—carrying astronauts and cargo all the way to the International Space Station (ISS)! To get there, it must go through two major phases:

1. **Launch and Ascent Phase** – The powerful moment when the spacecraft blasts off from Earth and reaches outer space.
2. **Docking Phase** – A delicate, careful process of getting close to the ISS and locking into place safely.

Phase 1: Liftoff – Heading to Space!

At the very start, Odyssey-1 is on the launchpad, ready for takeoff. All systems are powered up, and the astronauts are waiting eagerly inside. The countdown begins... 10, 9, 8... When it reaches zero, it means everything is good to go!

First, the spacecraft runs through a final checklist of tests. If any serious issues pop up, the launch is canceled for safety. But if everything checks out, it's time for liftoff!

With a mighty roar, the engines ignite, and Odyssey-1 races into the sky. As it soars higher, it builds up speed until it reaches the right velocity. As the spacecraft reaches the planned altitude, its engines shut down, ending the powered ascent. Moments later, the launch vehicle detaches, completing its role. Now separated, the spacecraft moves on its own floating in low Earth orbit (LEO)—a huge milestone!

Phase 2: Docking – The Precise Approach to the Space Station

Once Odyssey-1 reaches orbit, it transitions into Docking Mode, which includes a sequence of precisely controlled states that governs its movement toward the ISS.

Since the ISS is also moving around Earth at thousands of kilometers per hour, Odyssey-1 must match its speed and position in a step called Initial Orbit Synchronization. This ensures they move together in harmony.

Next, the Approach Sequence begins. The spacecraft slowly moves toward the ISS, pausing at three key checkpoints: Holding Point 1 (~10 km away) – It checks its position and confirms communication with the ISS.

Holding Point 2 (~1 km away) – Final system checks are done to make sure everything is working perfectly.
Holding Point 3 (~100 m away) – Tiny adjustments are made for a flawless approach.

When everything looks good, Odyssey-1 attempts Soft Capture—a gentle touch against the ISS docking port. If something isn't right, it moves back to Holding Point 3 to try again. But if the docking is successful, it moves to Hard Capture, where strong locks secure it firmly in place.

Finally, it's time for Pressure Equalization—adjusting air pressure so astronauts can safely open the hatch. Once the pressure matches, the doors unlock, and the crew can float into the ISS! 🎉