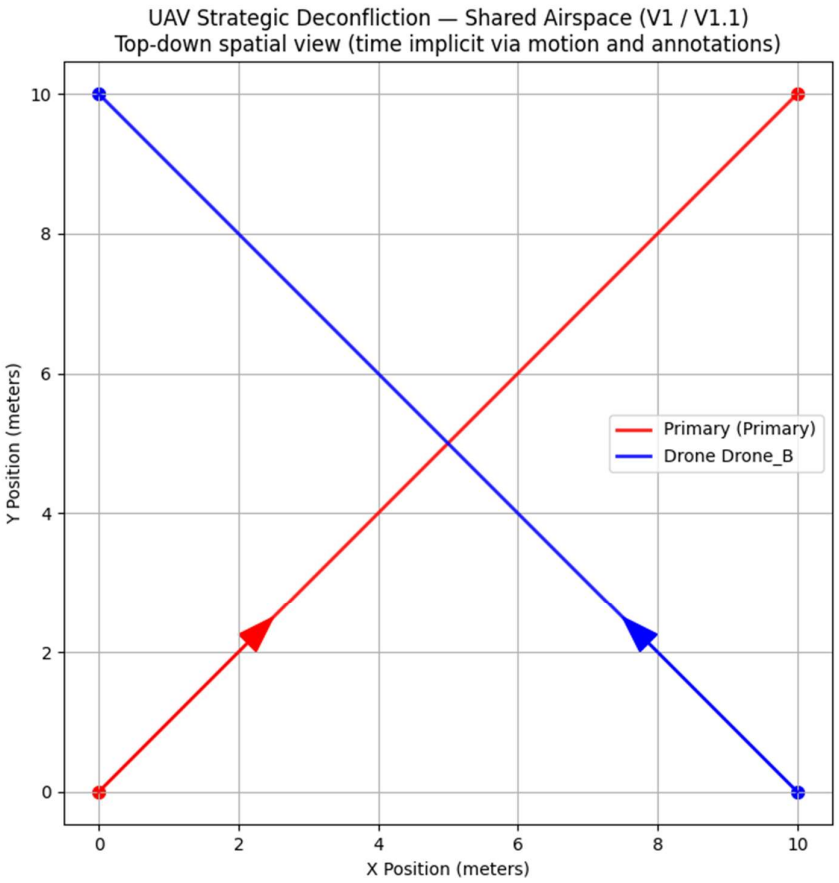
Official Test Case

The official test case consists of two drones operating in the same shared airspace with different start times and different constant velocities.

- The **Primary drone** follows a straight-line path from the bottom-left corner to the top-right corner.
- **Drone_B** follows a straight-line path from the top-left corner to the bottom-right corner.
- Although their spatial paths intersect, the system evaluates whether they occupy the **same location at the same time**, not just whether the paths cross.

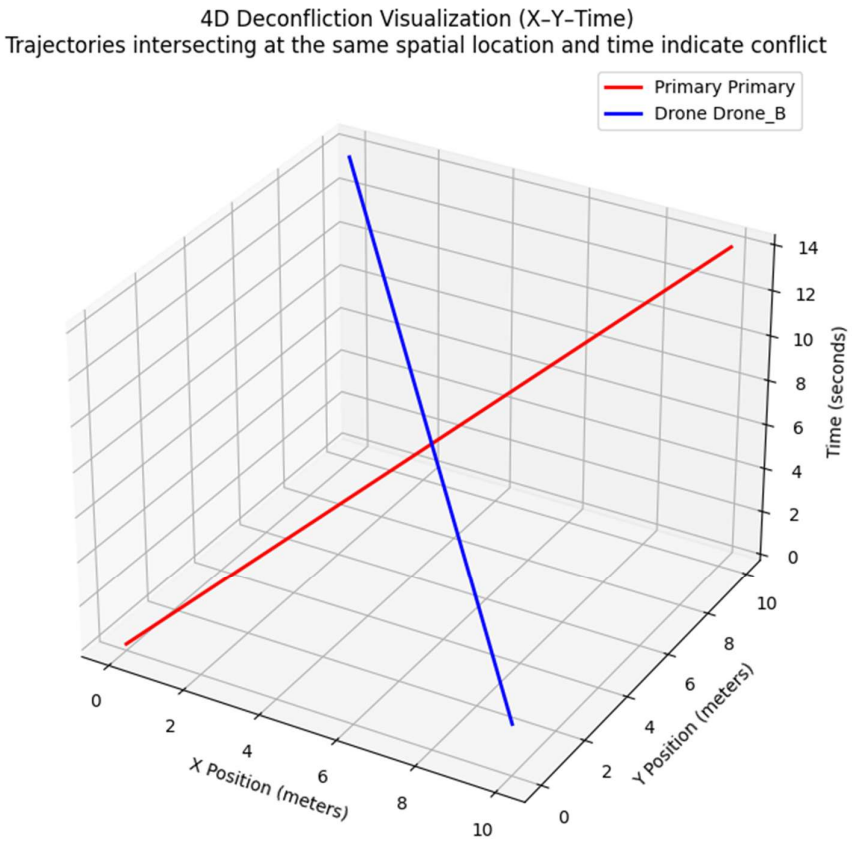


❖ 2DSpatial Visualization (Top-Down View)

The 2D visualization shows a top-down view of the airspace:

- Red line represents the Primary drone's path.
- Blue line represents Drone_B's path.
- Direction arrows indicate the direction of motion along each path.

From a purely spatial perspective, the two paths intersect near the center of the airspace. However, this view alone does not indicate whether a collision occurs, because time is not explicitly represented.



❖ 3D / 4D Space–Time Visualization (X–Y–Time)

The 3D visualization introduces **time as the vertical axis**:

- X-axis: X position (meters)
- Y-axis: Y position (meters)
- Z-axis: Time (seconds)

Each drone's motion is represented as a trajectory in space–time.
A collision would appear as both trajectories intersecting at the same spatial location and the same time value.

In this test case:

- The two trajectories intersect in space but do not intersect at the same time**.**
- This confirms that the drones pass through the intersection point at different moments.