7.2 Testing Configuration

All *simulations* are run with the configuration described in this *section*. The UAS used for the purposes is given by *model and control* (sec. **??**).

UAS parameters: An *UAS system* (tab. 7.2) is modeled after small scale toy model with maximal body radius 30 cm, maximal speed 4 $m.s^{-1}$, weight 450 $g.$, maximal flight duration 20 min, maximal turning rate 15 $deg.s^{-1}$. The *body margin* is set to $0.3m$; the *near-miss radius* is double of *body margin*; thus 0.6 m, the *well clear radius* is set to 5 m. Margins can be set to any value if they are complaint with condition (7.1).

$$0 < bodyMargin \leq nearMissRadius \leq wellClearRadius \leq gridDistance \tag{7.1}$$

Note. The *safety margin* is broad term used to describe the *minimal distance* between UAS and *adversarial object*. The *Safety margin* is:

1. *Near miss radius* in case of *non-controlled airspace* or *emergency avoidance mode*.

2. *Well clear radius* in case of *controlled airspace* and *navigation mode*.

Decision time: Decision time can be set by the user to any positive non-zero value (7.2). The *Decision time* is equal 1 s, and *Decision frames* are synchronized.

$$maxAlrogithmCalculationTime \leq decisionTome \leq \infty \tag{7.2}$$

Speed: For *all movements* constant speed 1 $m.s^{-1}$ is used. Speed can be changed to any value in the given boundary (7.3).

$$0 \leq speed \leq \min \begin{pmatrix} 0.5 \times (navigationGrid.distance/decisionFrame) \\ 0.5 \times (avoidanceGrid.distance/decisionFrame) \end{pmatrix} \tag{7.3}$$

Movement automaton: The *movement set* is given in (tab. 7.1). The *movement* set contains horizontal, vertical, and, combined movements.

Grids: Used *Navigation grid parameters* are given in (tab. 7.3).Selected *Navigation Reach set* is *ACAS-like* with enabled horizontal/vertical separation. Used *Avoidance grid parameters* are given in (tab. 7.4). Selected *Avoidance Reach set* is *combined* because of high *coverage ratio*.

The user can define own grid parameters according to the *space discretization rules* (sec. **??**) and chose own *reach set type* according to preference (sec. **??**).

Movement	Roll	Pitch	Yaw
Straight	0°	0°	0°
Left	0°	15°	0°
Right	0°	−15°	0°
Up	0°	0°	−15°
Down	0°	0°	15°
UpLeft	0°	15°	−15°
UpRight	0°	−15°	−15°
DownLeft	0°	15°	15°
DownRight	0°	−15°	15°

Table 7.1: Movement orientations.

UAS parameters	
speed	$1\,ms^{-1}$
horizontal turning r.	$3.82\,m$
vertical turning r.	$3.82\,m$
body radius	$0.3\,m$
near miss r.	$0.6\,m$
well clear r.	$5\,m$

Table 7.2: *UAS* parameters.

Navigation Grid	
RSA type	ACAS-like
distance range	$0 - 10\,m$
layer step	$1\,m$
horizontal range	±45°
horizontal cells	7
vertical range	±30°
vertical cells	5

Table 7.3: *Navigation Space* parameters.

Avoidance Grid	
RSA type	combined
distance range	$0 - 10\,m$
layer step	$1\,m$
horizontal range	±45°
horizontal cells	7
vertical range	±30°
vertical cells	5

Table 7.4: *Avoidance Space* parameters.

Coloring		
Airc.	Executed	Planned
UAS 1	blue	red
UAS 2	cyan	magenta
UAS 3	green	yellow
UAS 4	black	green

Table 7.5: *UAS* coloring.

Bibliography