**Appendix D**

# Grid Size Calculation

The grid size calculation is done by hand. The following approach has been used in our work.

For *Sensor Field* there is *effective sensor boundary* given as set:

*Boundary*(*Sensor* ∈ *SensorField*) = {*points* ∈ *polarCoordinates*} (D.1)

The *Boundary* for sensor fields is then given as *union of all singe sensor boundaries*:

## ) (D.2)

Depending on boundary properties it can be projected into maximal avoidance grid boundary values:

max(*distanceRange*)

*Boundary*(*SensorField*) → *AvoidanceGrid* : max(*horizontalRange*) (D.3)

max(*verticalRange*)

Our approach taken worst LiDAR performance into account [1] and following parameters for avoidance grid were calculated:

1. distance range [0*m,*10*m*],
2. horizontal range ] ],
3. vertical range [

The *count of layers* is derived from *average distance traveled by one movement application*:

|*distanceRange*|

*layerCount* = (D.4) avg. *length*(*movement* ∈ *MovementSet*)

The *layer length* is based on *our movement set* (tab. **??**, **??**) the average movement length is 1 m; therefore the *layer count* is 10.

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2 Appendix D. Grid Size Calculation

The *efficient boundary* is given by *Reach Set*. Estimate reach set coverage space using *ellipsoidal toolbox* [2] up to given *sensor field* maximal distance:

*Boundary*(*ReachSet*) = *Ellipsoid*(*UASSystem,distance*) (D.5)

The values for *Reach Set Boundary* with distance 10 m was following:

1. distance range [0*m,*10*m*],
2. horizontal range [],
3. vertical range [],

The *Avoidance Grid* boundary is given as *intersection* of all boundaries:

*Boundary*(*AvoidanceGrid*) = *Boundary*(*ReachSet*) ∩ *Boundary*(*SensorField*) (D.6)

The values for *Avoidance Grid Boundary* for our UAS system (sec. **??**) following:

1. distance range [0*m,*10*m*],
2. horizontal range [],
3. vertical range [],
4. layer count 10, layer distance 1m.

The *horizontal cell count* and *vertical cell count* was estimated by the *rule of thumb* to have value 7 and 5.

# Bibliography

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2. Alex A Kurzhanskiy and Pravin Varaiya. Ellipsoidal toolbox (et). In *Decision and Control, 2006 45th IEEE Conference on*, pages 1498–1503. IEEE, 2006.

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