Accessibility Framework for Determining Collisions and Coverage for Radiation Scanning.

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Manual Frisking

[1]

[2]

Automate Frisking

Collaborative Robot

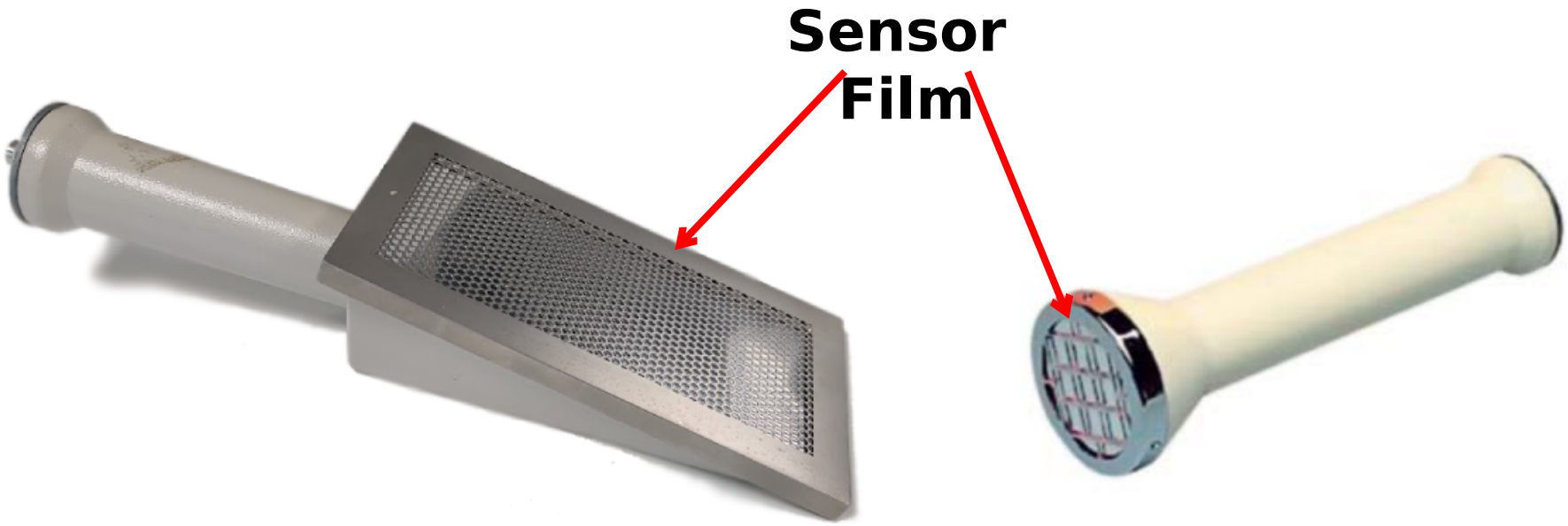
Path Planning

Accessibility Framework

Contribution of this work

[1] M. E. Cournoyer, “Contamination control monitoring at the Los Alamos National Laboratory’s Plutonium Facility,” Journal of Chemical Health & Safety, vol. 25, no. 2, pp. 28–32, Mar. 2018. doi:10.1016/j.jchas.2017.10.008
[2] A. Shimbun, Nuclear fears at fukushima, [Accessed 26-05-2024], Mar. 2011. [Online]. Available: https://www.reuters.com/news/picture/nuclear-fears-at-fukushimaidUSRTR2JTMQ/

Radiation Probes

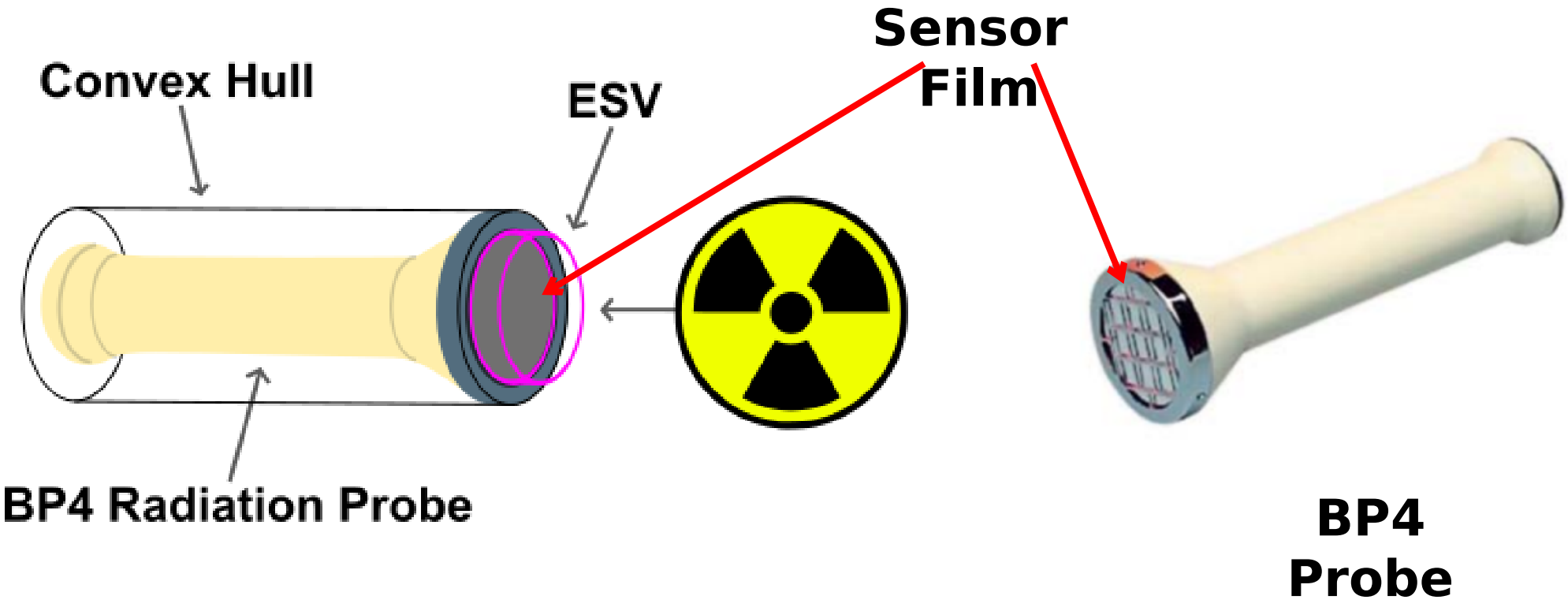


DP6 Probe

BP4 Probe

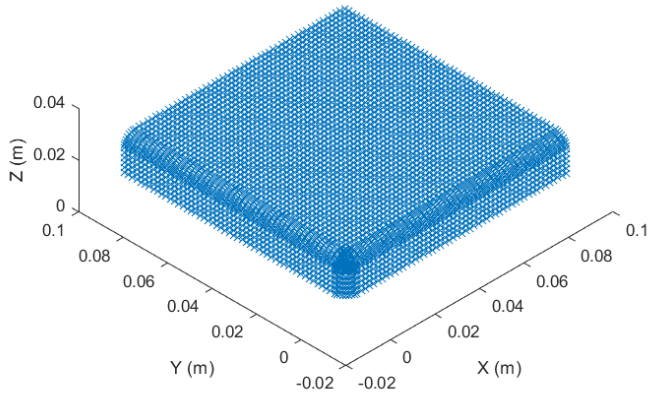
Thermo FisherScientific: Non-Intelligent and Intelligent Scintillation Probes Instruction Manual (8 2006)

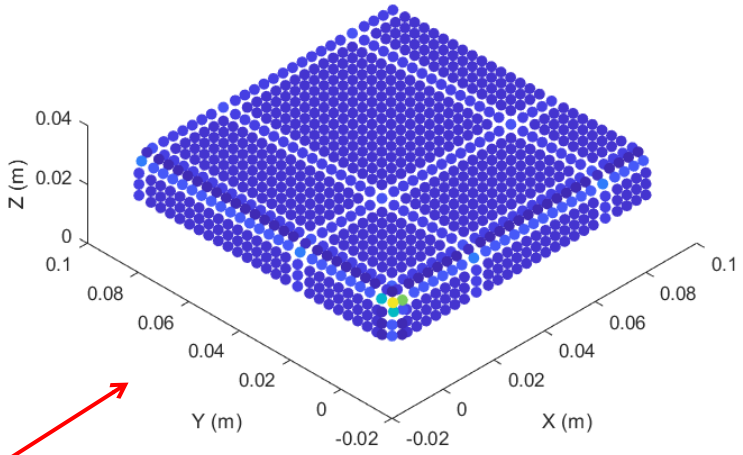
Effective Scan Volume



Thermo FisherScientific: Non-Intelligent and Intelligent Scintillation Probes Instruction Manual (8 2006)

Accessibility Framework

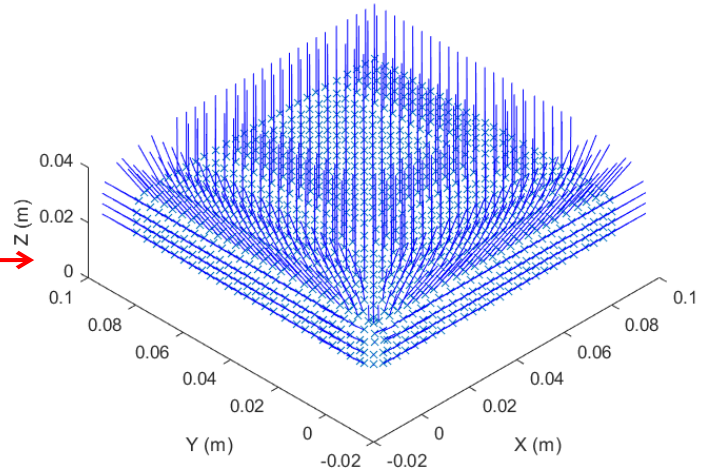




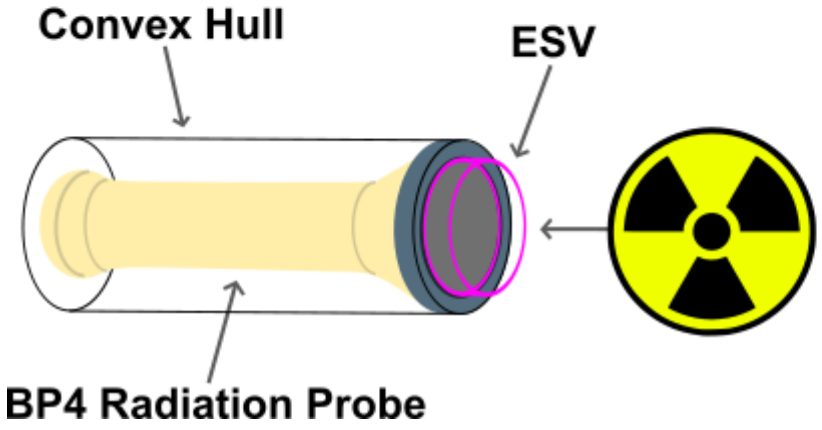
Unorganised PC

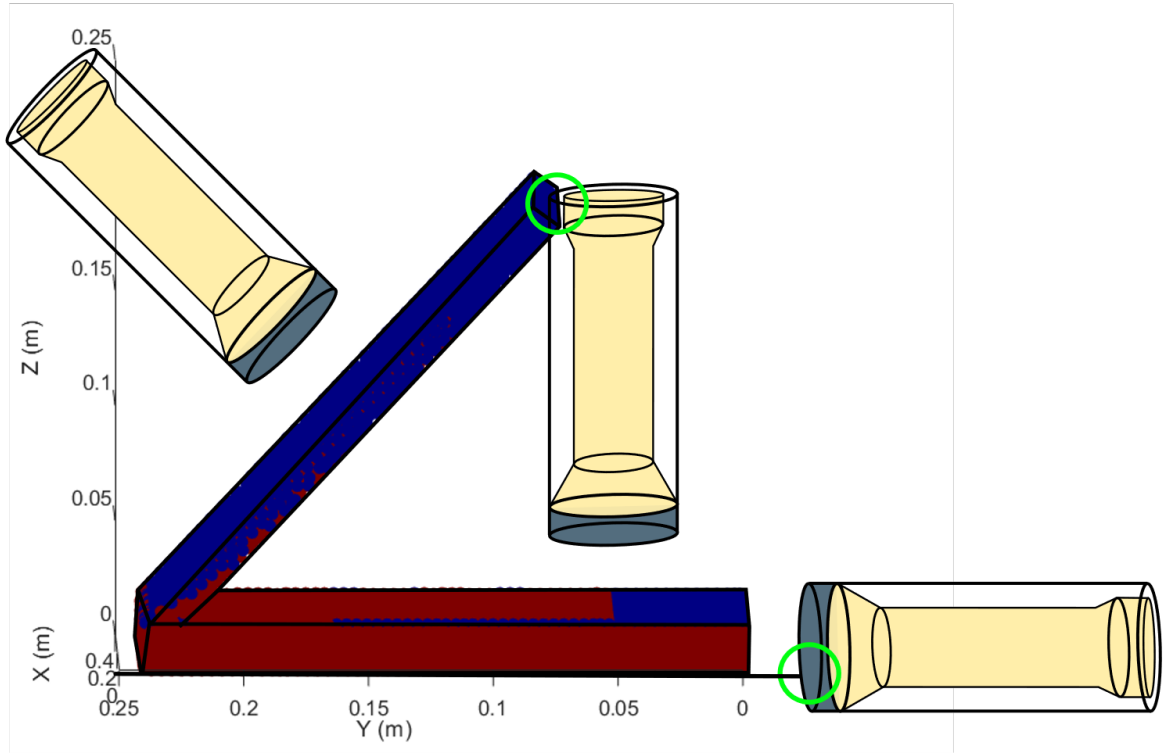
Spatial Partitioning using Octrees

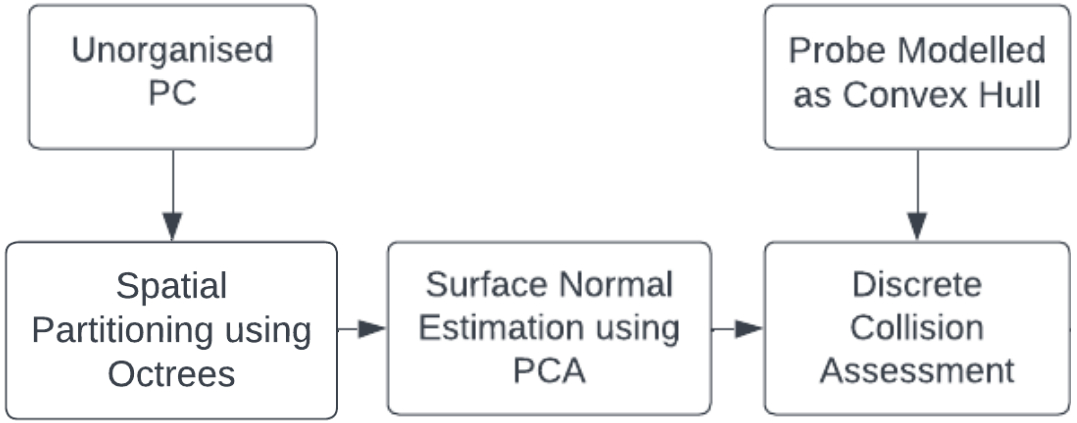
Surface Normal Estimation using PCA



Accessibility Framework







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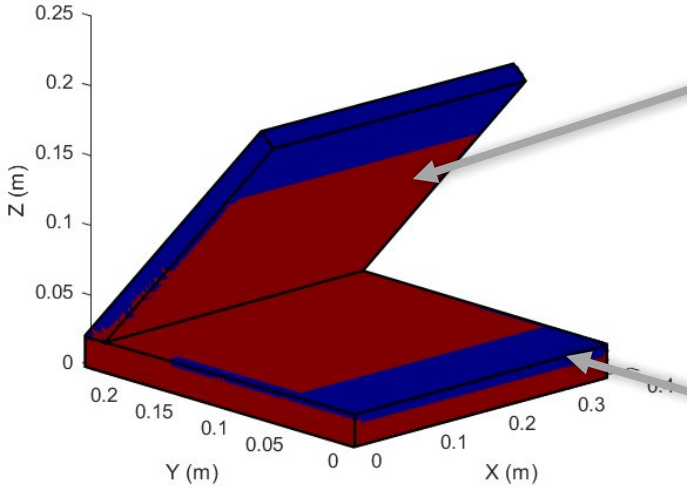
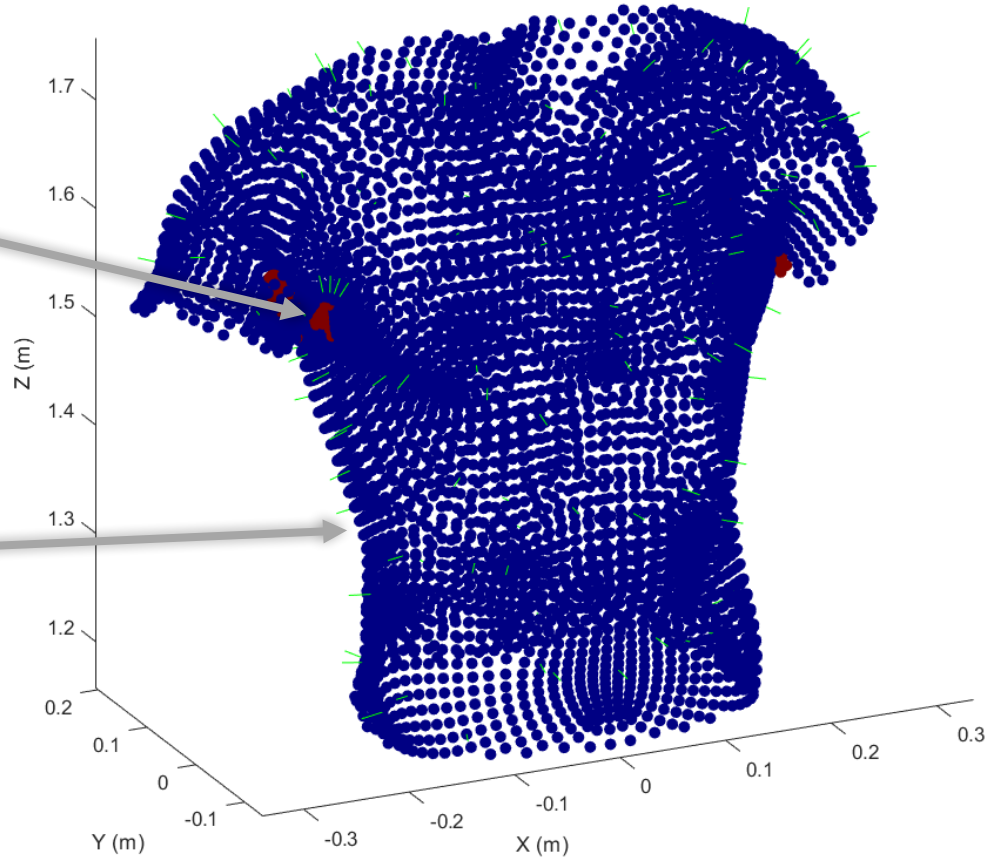
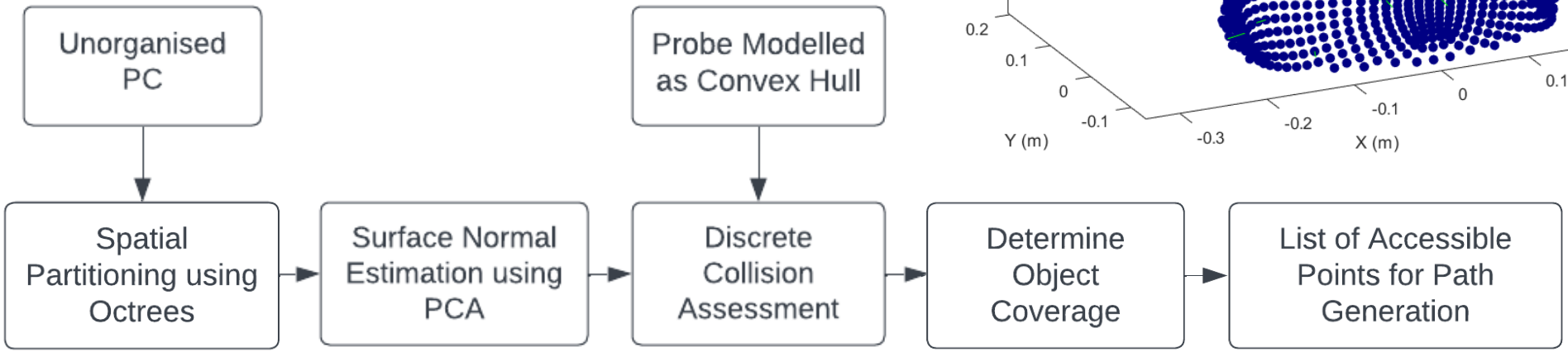


Inaccessible

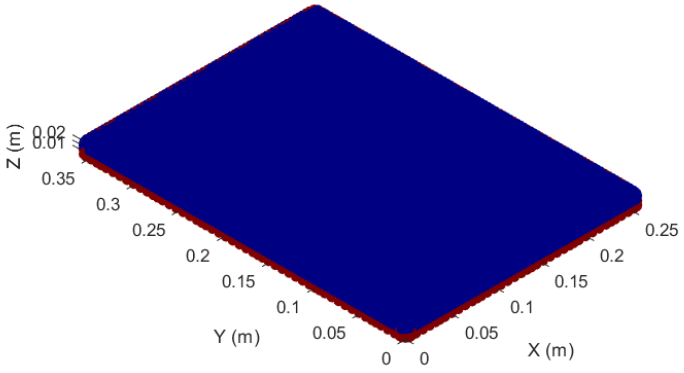
Accessible

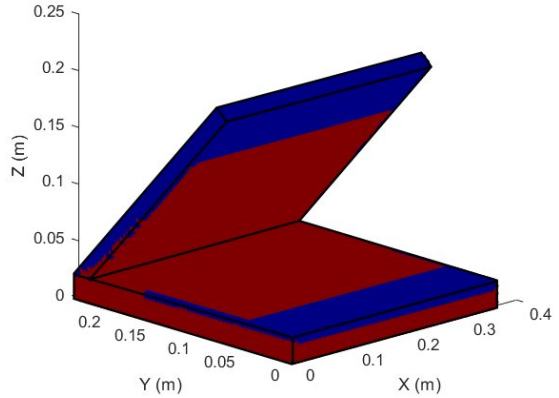


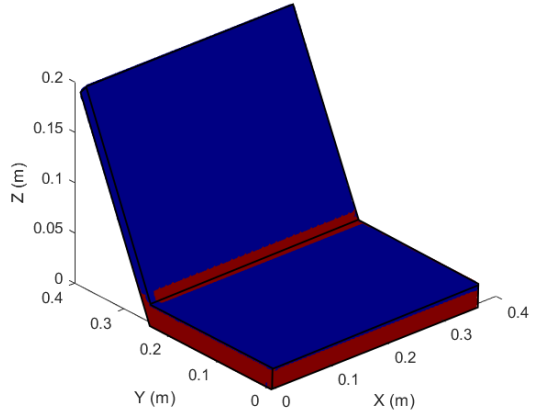


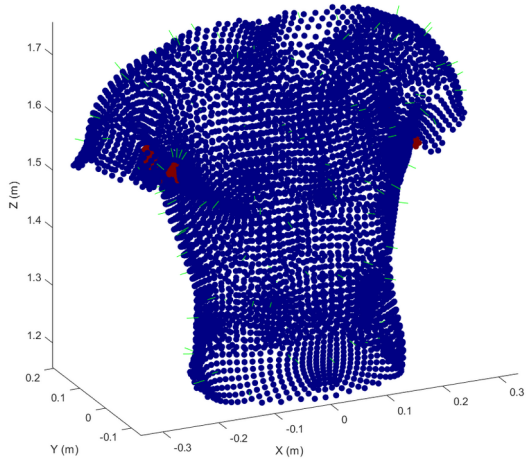
Results

1. Provides an understanding of object coverage by a probe
2. Identifies regions of potential unknown contamination
3. Generates a set of accessible points
4. Performs over complex geometries
5. Determines collisions with constraints









Model	Leaf Octants	Accessible (%)	Coverage (%)	Assessment Time (S)
Flat Box	7339	89.33	94.96	0.62
Laptop (1)	18722	43.11	53.90	3.86
Laptop (2)	17460	61.23	75.84	3.76
Torso	5398	70.84	90.08	0.5

Conclusion:

1. Effectively distinguishes accessible from inaccessible areas within point clouds
2. Provides an insight and understanding of object coverage
3. Provides a basis for planning scan paths over objects for a robot to execute

Future work:

1. Determining minimum required scan points
2. Generate and execute paths over the objects to be examines
3. Generalising the framework for other applications and probes

Thank you for Listening

Questions?

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