This document contains information about library or dictionary generation, which acts as columns of the A matrix. The setup is still a 6:1 scaled option from real-life to simulation/ experiment setup.

**Library 1:**

The simulation domain size is The imaging domain is limited within this simulation domain to be between coordinates for and respectively. The image (and included object) discretization and frequency settings are:

**Lib1**.mat: The voxel size for object discretization during library generation is Thus, there will be some discretization error. Freq = [1.7006;1.7591;1.8185;1.8779;1.9364;1.9958;2.0543;2.1137;2.1722;2.2316;2.2901]\*1e9.

There are two ellipsoidal objects. The object’s principal axes (diameter, **not** semi-axes) sizes in decreasing order are:

* Object 1: [ = {1,2,3} axes
* Object 2: = {1,2,3} axes

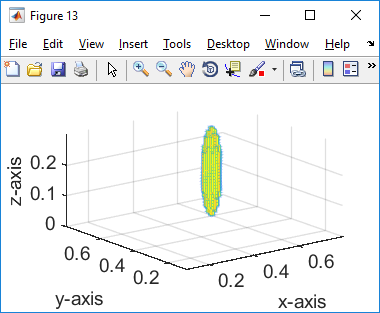


Fig. 1: Ellipsoidal object (Object 1) is placed corresponding to case 13.

The library has total 100 cases. One of the cases is shown in Fig. 1. For each case, information is given as following:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Case | Object | Center () | Order of axes in \* | Angle from in plane (Degrees) | Detected Case Number1 |
|  | 1 | 0.4500 0.4500 0.1500 | {2,1,3} | 0 | 1 |
|  | 1 | 0.5175 0.4500 0.1500 | {2,1,3} | 0 |  |
|  | 1 | 0.5850 0.4500 0.1500 | {2,1,3} | 0 |  |
|  | 1 | 0.6525 0.4500 0.1500 | {2,1,3} | 0 |  |
|  | 1 | 0.7200 0.4500 0.1500 | {2,1,3} | 0 |  |
|  | 1 | 0.4500 0.5175 0.1500 | {2,1,3} | 0 | 6 |
|  | 1 | 0.5175 0.5175 0.1500 | {2,1,3} | 0 | 7 |
|  | 1 | 0.5850 0.5175 0.1500 | {2,1,3} | 0 |  |
|  | 1 | 0.6525 0.5175 0.1500 | {2,1,3} | 0 |  |
|  | 1 | 0.7200 0.5175 0.1500 | {2,1,3} | 0 |  |
|  | 1 | 0.4500 0.5850 0.1500 | {2,1,3} | 0 | 11 |
|  | 1 | 0.5175 0.5850 0.1500 | {2,1,3} | 0 | 12 |
|  | 1 | 0.5850 0.5850 0.1500 | {2,1,3} | 0 | 13 |
|  | 1 | 0.6525 0.5850 0.1500 | {2,1,3} | 0 | 14 |
|  | 1 | 0.7200 0.5850 0.1500 | {2,1,3} | 0 | 15 |
|  | 1 | 0.4500 0.6525 0.1500 | {2,1,3} | 0 | 16 |
|  | 1 | 0.5175 0.6525 0.1500 | {2,1,3} | 0 | 67 |
|  | 1 | 0.5850 0.6525 0.1500 | {2,1,3} | 0 | 18 |
|  | 1 | 0.6525 0.6525 0.1500 | {2,1,3} | 0 | 19 |
|  | 1 | 0.7200 0.6525 0.1500 | {2,1,3} | 0 | 69 |
|  | 1 | 0.4500 0.7200 0.1500 | {2,1,3} | 0 |  |
|  | 1 | 0.5175 0.7200 0.1500 | {2,1,3} | 0 |  |
|  | 1 | 0.5850 0.7200 0.1500 | {2,1,3} | 0 |  |
|  | 1 | 0.6525 0.7200 0.1500 | {2,1,3} | 0 |  |
|  | 1 | 0.7200 0.7200 0.1500 | {2,1,3} | 0 |  |
|  | 2 | 0.4500 0.4500 0.1200 | {2,1,3} | 0 | 26 |
|  | 2 | 0.5175 0.4500 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.5850 0.4500 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.6525 0.4500 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.7200 0.4500 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.4500 0.5175 0.1200 | {2,1,3} | 0 | 31 |
|  | 2 | 0.5175 0.5175 0.1200 | {2,1,3} | 0 | 32 |
|  | 2 | 0.5850 0.5175 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.6525 0.5175 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.7200 0.5175 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.4500 0.5850 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.5175 0.5850 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.5850 0.5850 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.6525 0.5850 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.7200 0.5850 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.4500 0.6525 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.5175 0.6525 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.5850 0.6525 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.6525 0.6525 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.7200 0.6525 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.4500 0.7200 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.5175 0.7200 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.5850 0.7200 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.6525 0.7200 0.1200 | {2,1,3} | 0 |  |
|  | 2 | 0.7200 0.7200 0.1200 | {2,1,3} | 0 |  |
|  | 1 | 0.4500 0.4500 0.1500 | {2,1,3} | 45 | 51 |
|  | 1 | 0.5175 0.4500 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.5850 0.4500 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.6525 0.4500 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.7200 0.4500 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.4500 0.5175 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.5175 0.5175 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.5850 0.5175 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.6525 0.5175 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.7200 0.5175 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.4500 0.5850 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.5175 0.5850 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.5850 0.5850 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.6525 0.5850 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.7200 0.5850 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.4500 0.6525 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.5175 0.6525 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.5850 0.6525 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.6525 0.6525 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.7200 0.6525 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.4500 0.7200 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.5175 0.7200 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.5850 0.7200 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.6525 0.7200 0.1500 | {2,1,3} | 45 |  |
|  | 1 | 0.7200 0.7200 0.1500 | {2,1,3} | 45 |  |
|  | 2 | 0.4500 0.4500 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.5175 0.4500 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.5850 0.4500 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.6525 0.4500 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.7200 0.4500 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.4500 0.5175 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.5175 0.5175 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.5850 0.5175 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.6525 0.5175 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.7200 0.5175 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.4500 0.5850 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.5175 0.5850 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.5850 0.5850 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.6525 0.5850 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.7200 0.5850 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.4500 0.6525 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.5175 0.6525 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.5850 0.6525 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.6525 0.6525 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.7200 0.6525 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.4500 0.7200 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.5175 0.7200 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.5850 0.7200 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.6525 0.7200 0.1200 | {2,1,3} | 45 |  |
|  | 2 | 0.7200 0.7200 0.1200 | {2,1,3} | 45 |  |

\*This is before rotation of the object. After rotation, the ellipsoid’s axes will **not** be along .

1This is by using OMP algorithm, with the stopping condition that only one object is present.

**Test cases with multiple objects2**

|  |  |
| --- | --- |
| Objects Placed (Case numbers) | Detected cases |
| 1, 11 | 10, 56 |
| 1, 19 |  |
|  |  |

2Stopping criteria is assuming knowledge that two objects are present.