

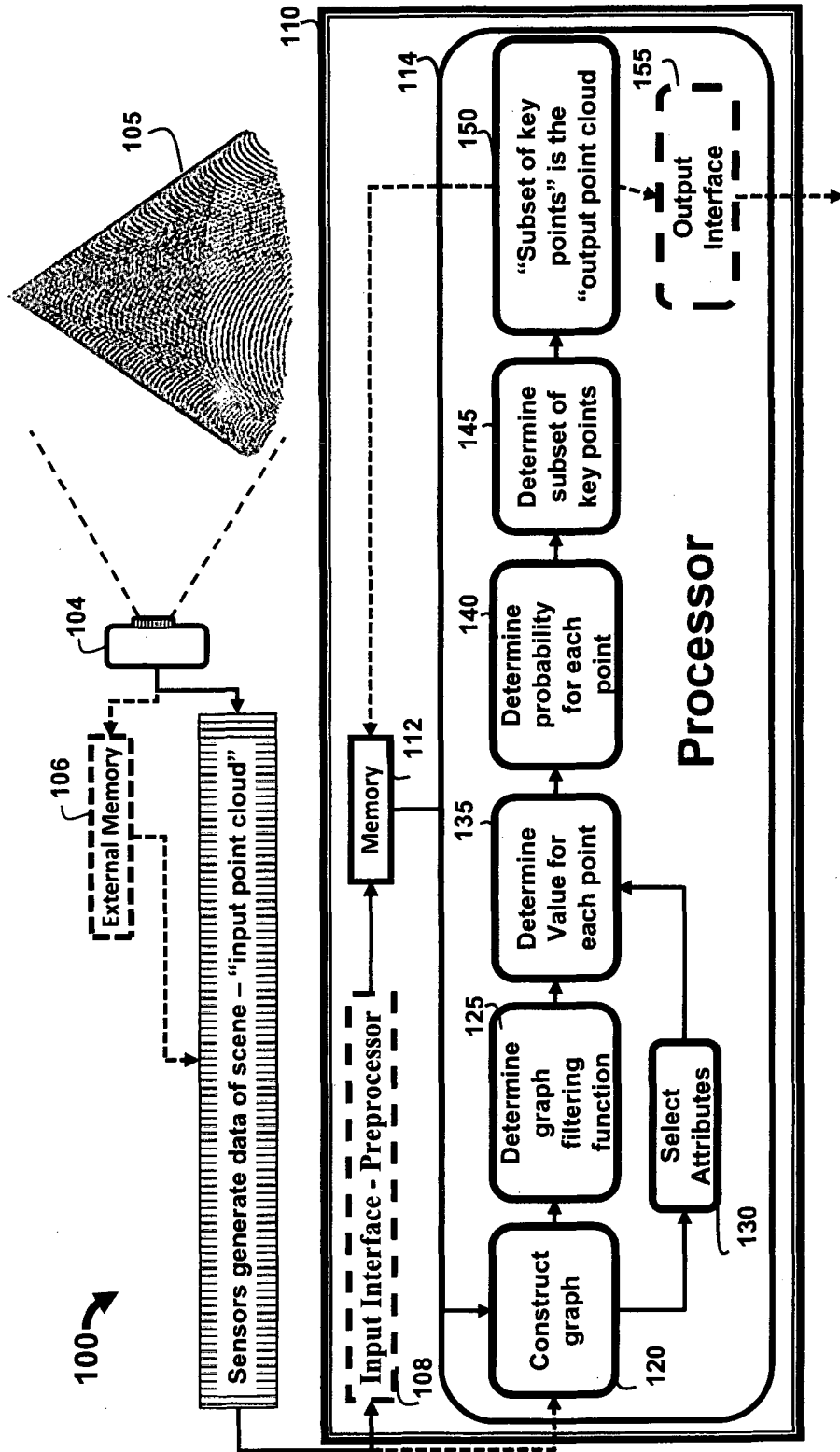


FIG. 1

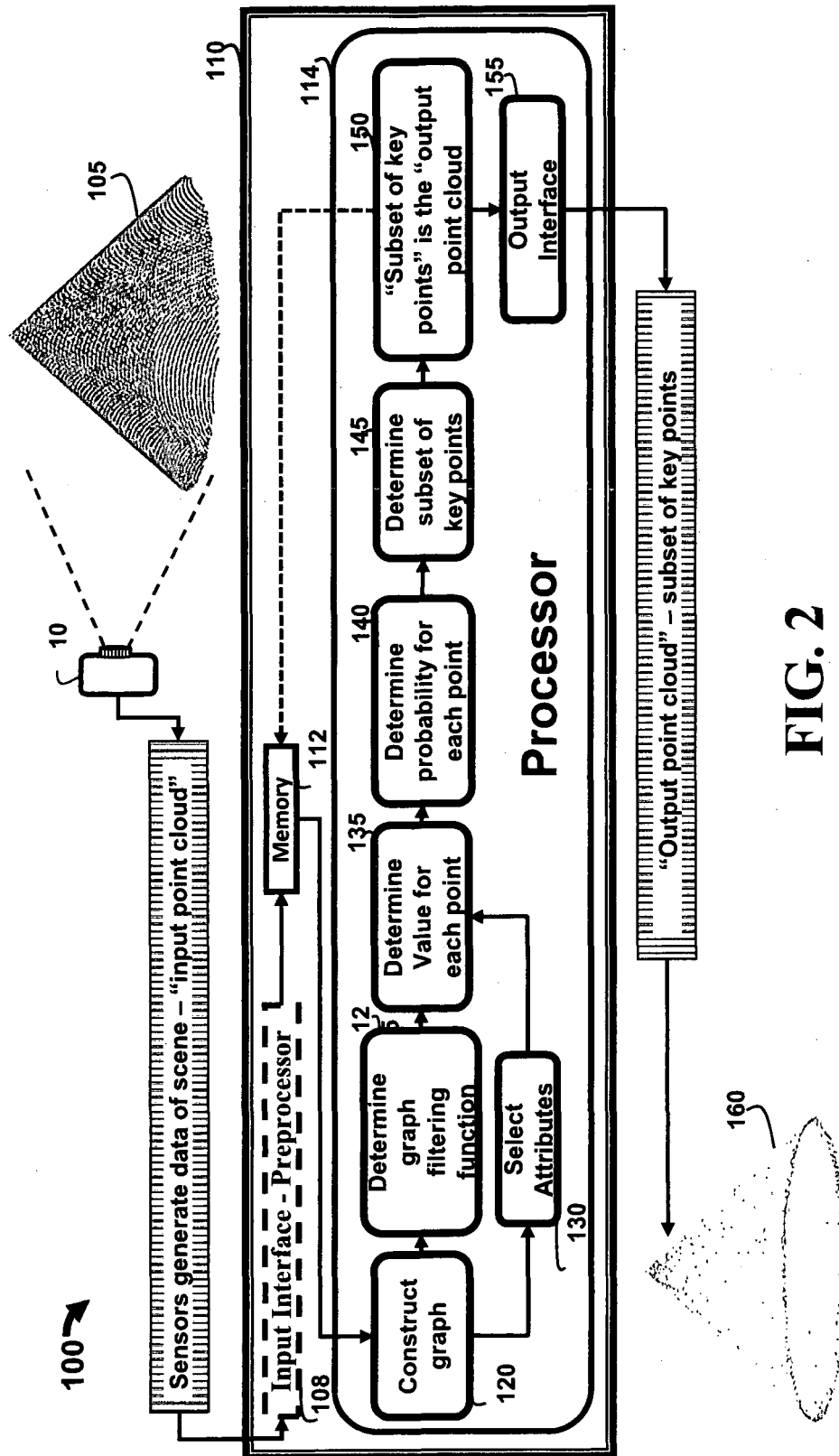


FIG. 2

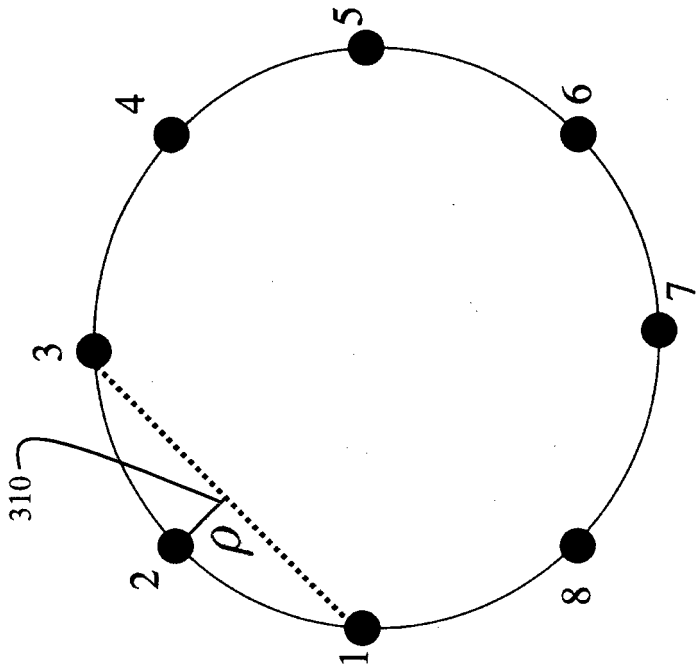


FIG. 3B

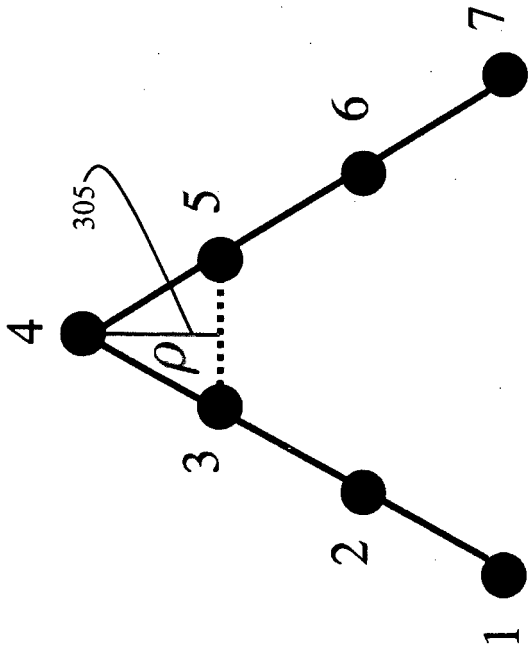


FIG. 3A

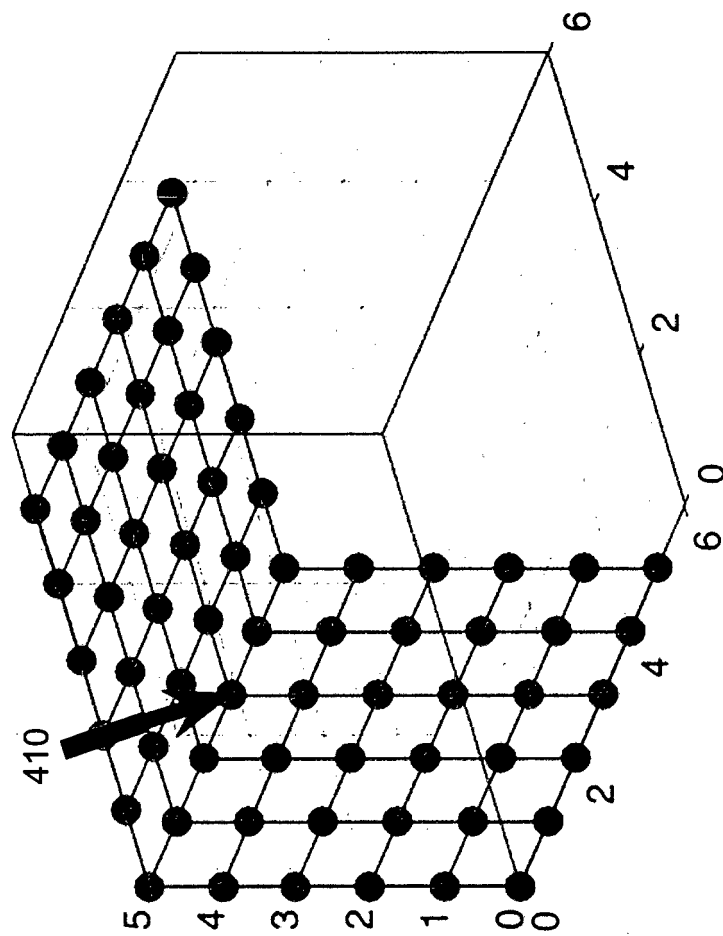


FIG. 4

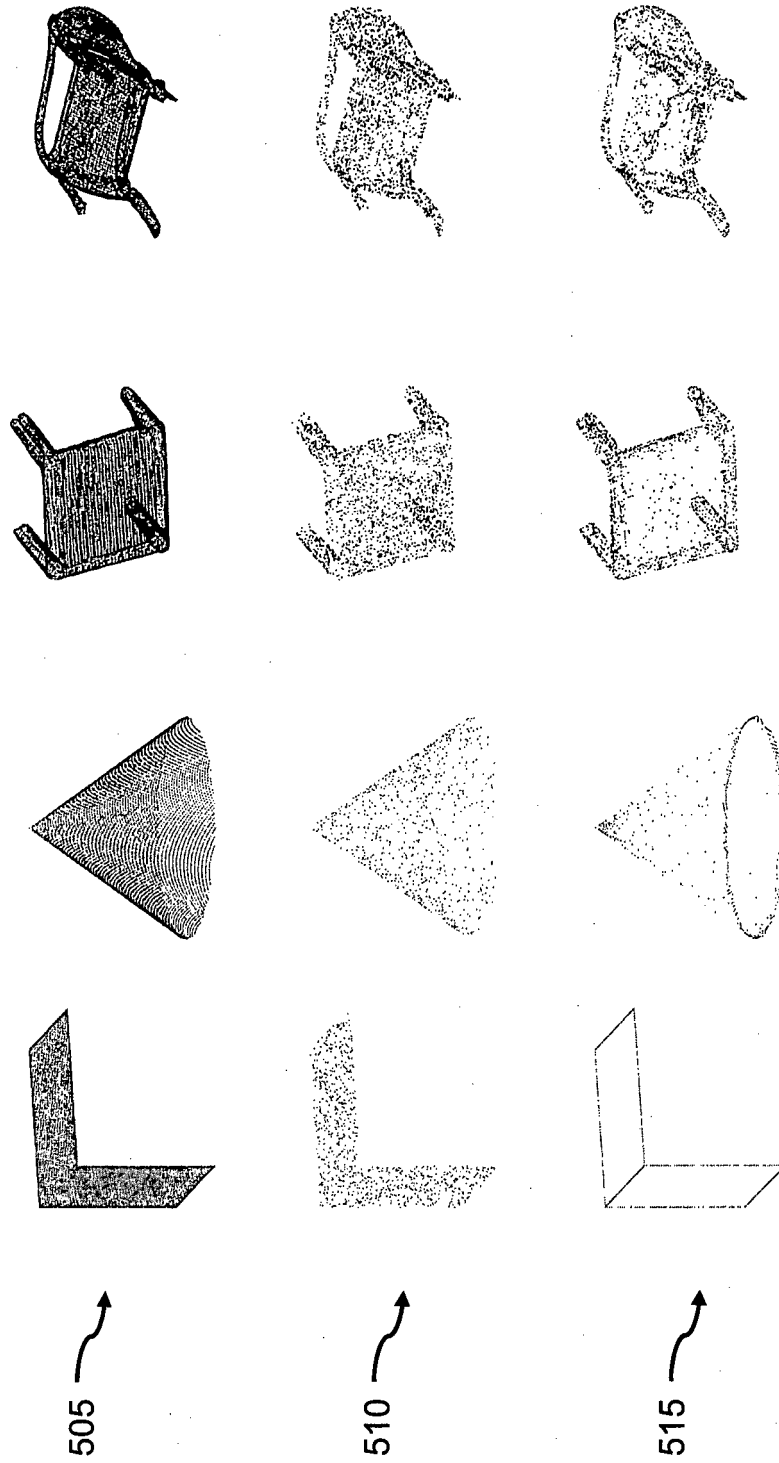
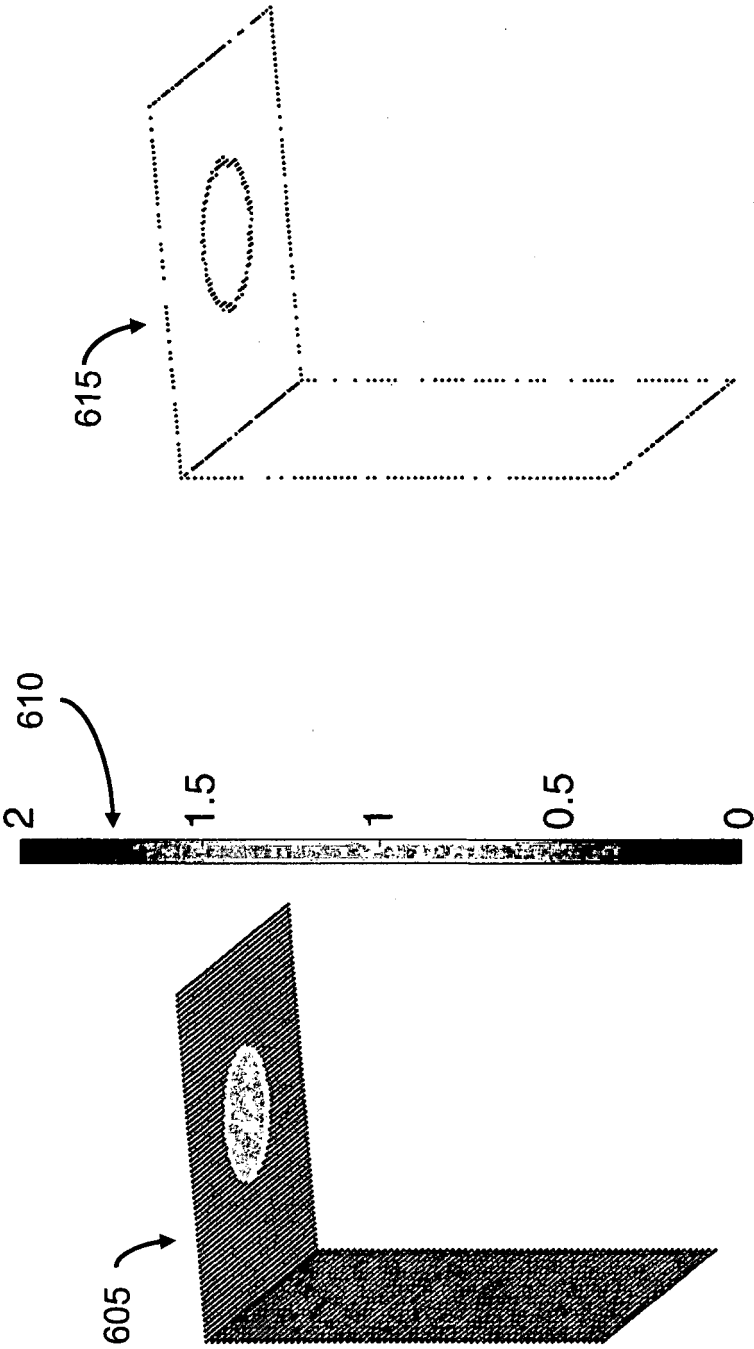


FIG. 5



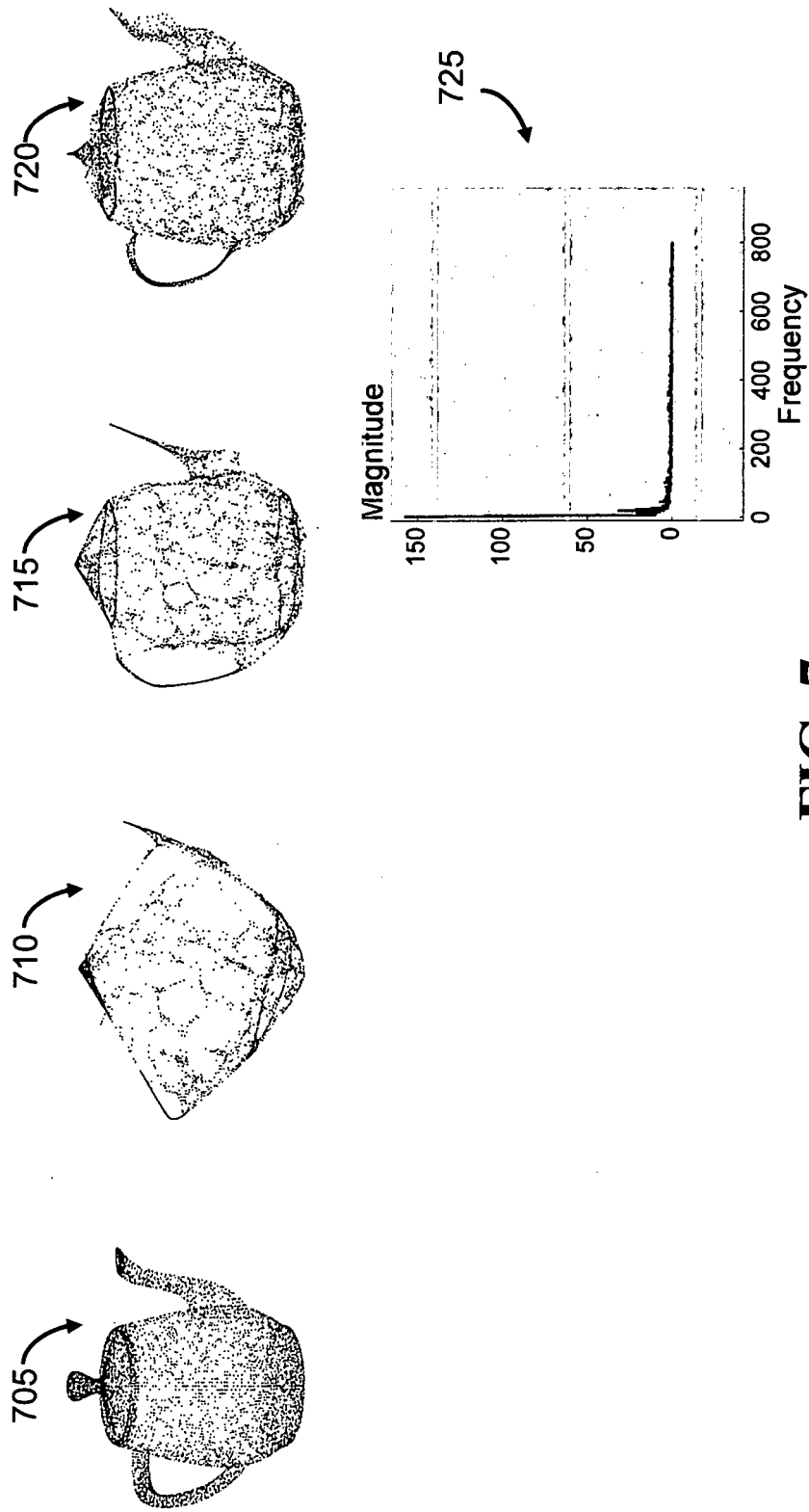


FIG. 7

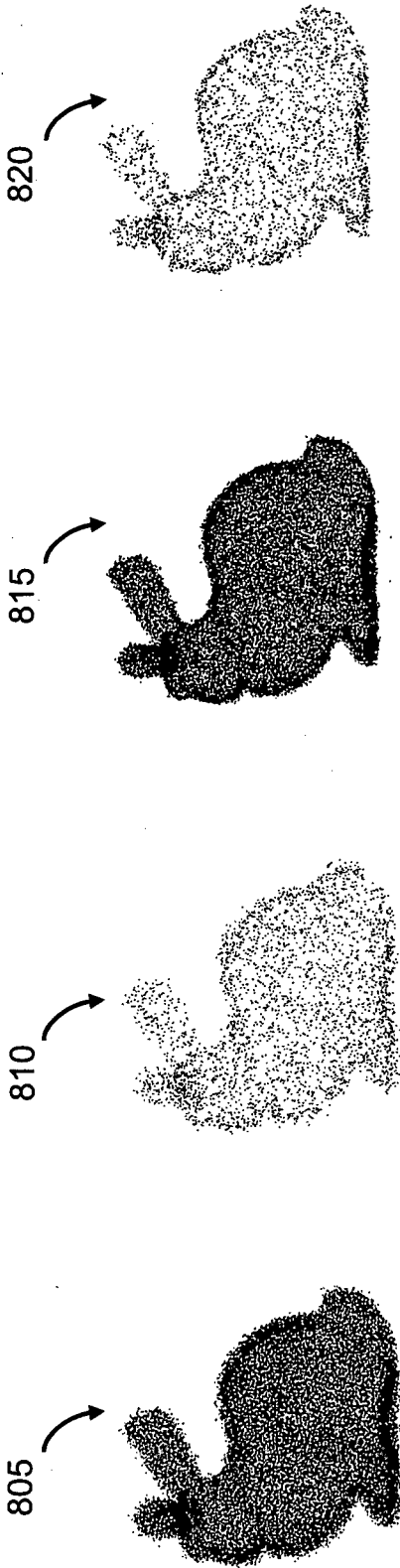


FIG. 8

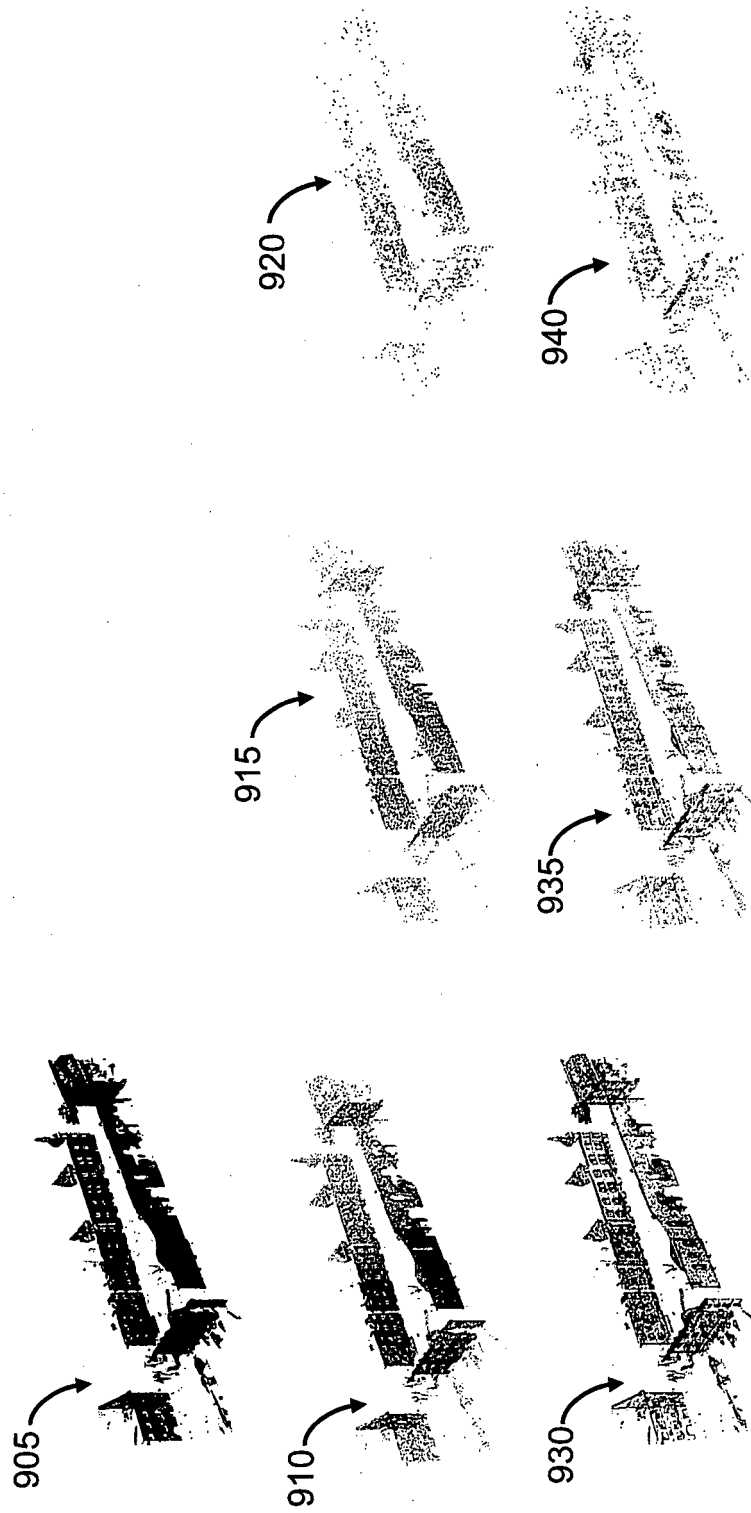


FIG. 9

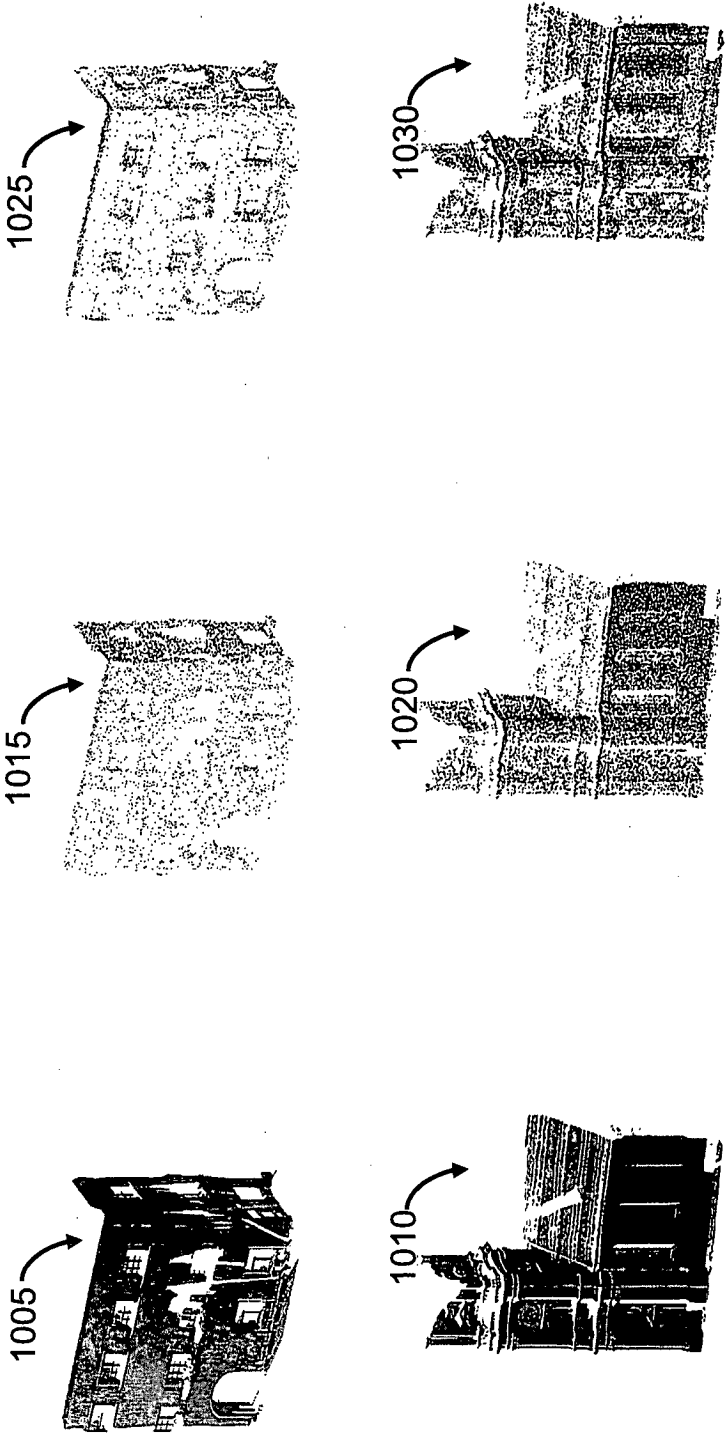


FIG. 10

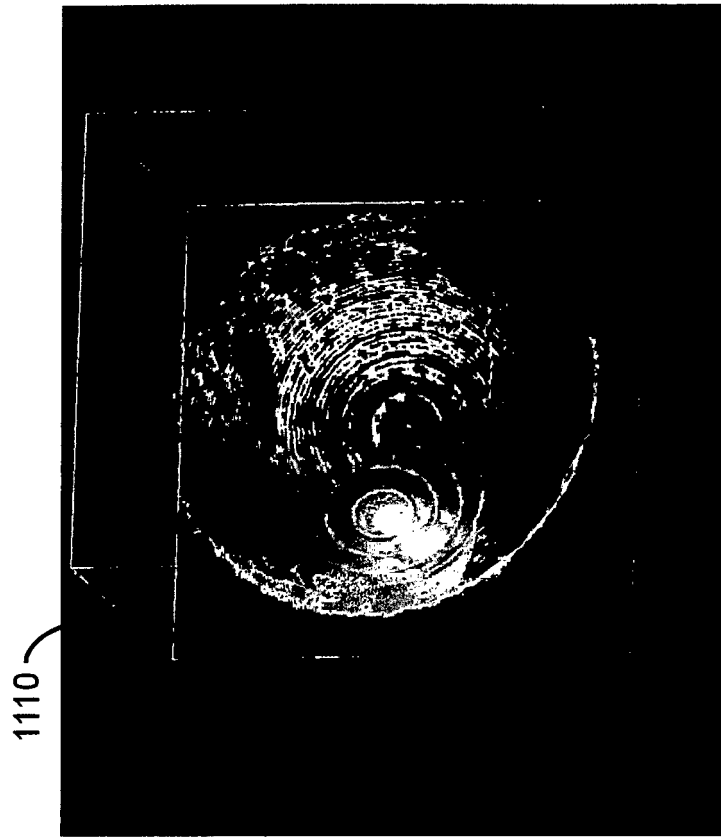
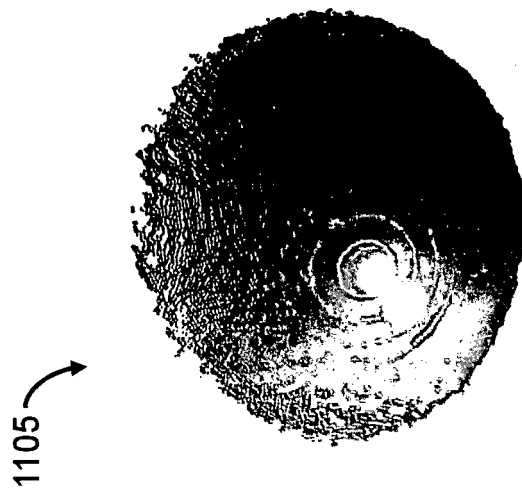
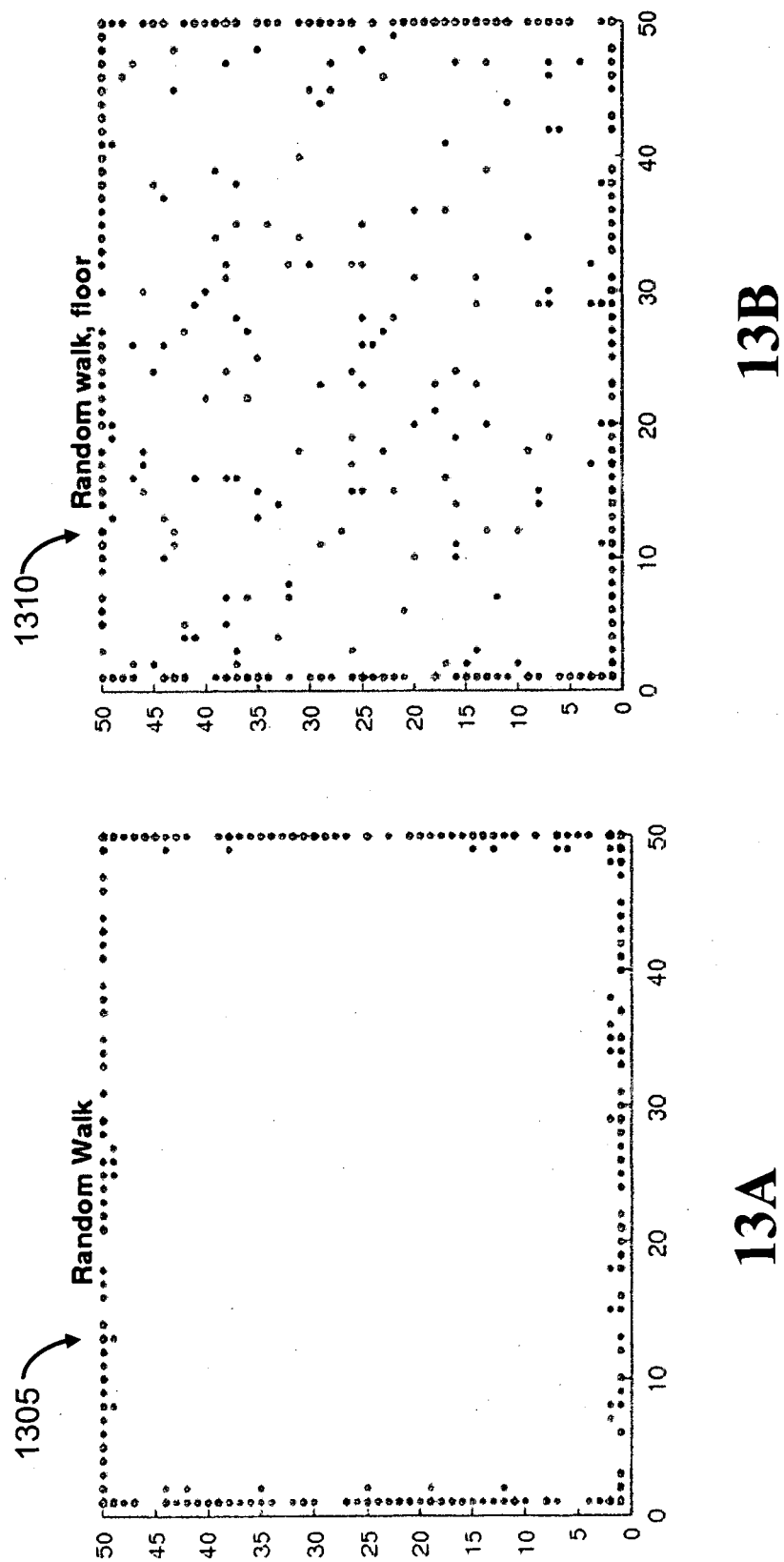


FIG. 11



	Original ball	Noisy ball	Uniform sampling	Denoised ball	Resampling based on low-pass graph filtering
Radius	0.3182	0.3478	0.3520	0.3143	0.3199
Center- <i>x</i>	0.0833	0.0903	0.0975	0.0799	0.0849
Center- <i>y</i>	0.1903	0.2136	0.1794	0.1866	0.1783
Center- <i>z</i>	1.1725	1.3803	1.1530	1.1618	1.1613

FIG. 12



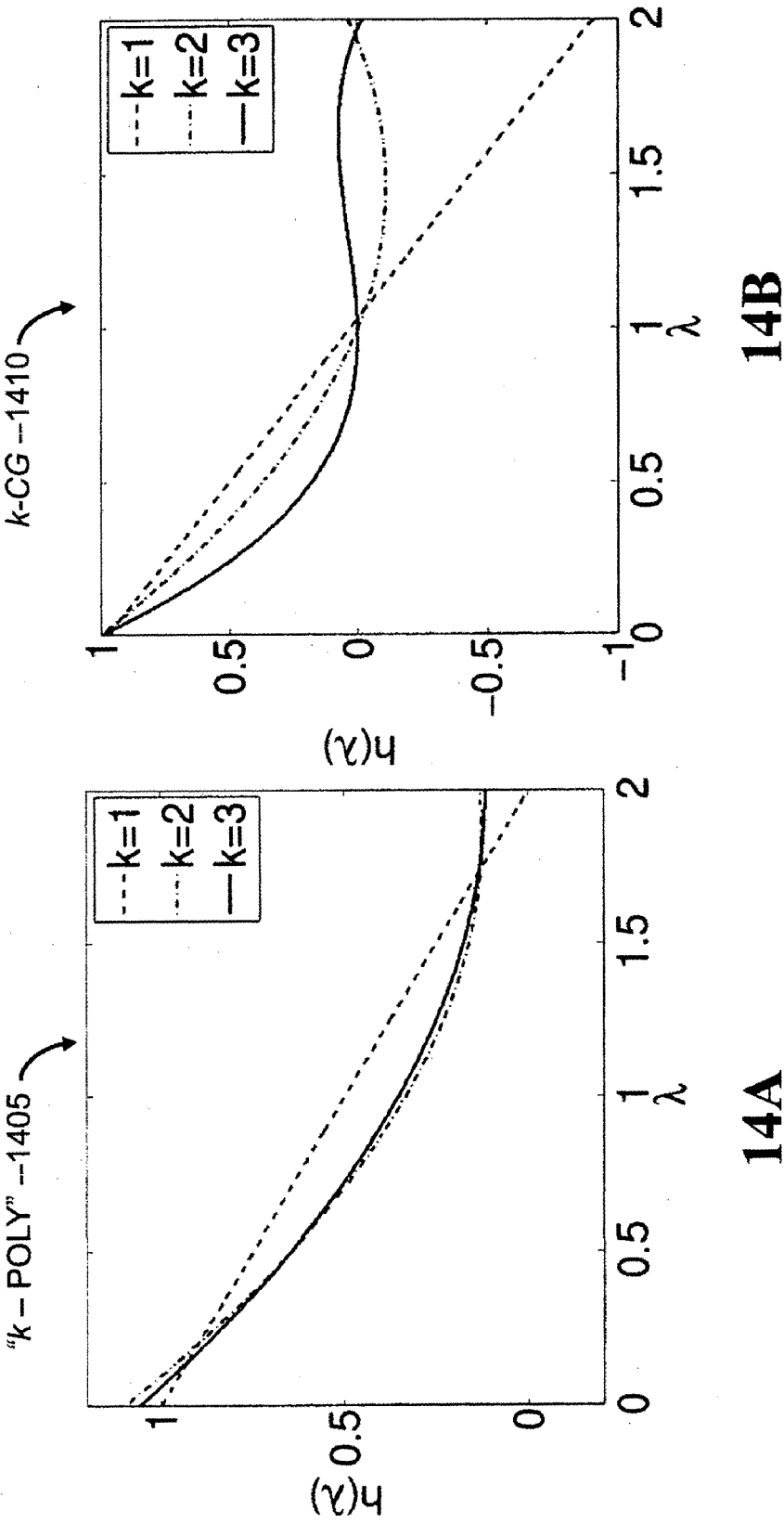


FIG. 14

Algorithm *m*-hop

Input

X point cloud

A graph operator (matrix) or a function of graph operator (matrix)

m the number of hops

n the number of new sampling points

$\mathcal{M}_{\text{in}}$ sampling set on points that have already been sampled

Output

$\mathcal{M}_{\text{out}}$ new sampling set on points to be sampled

Function

1. Let $Q = A$
2. Replace the rows in Q with 1_i for sampled points $\forall i \in \mathcal{M}_{\text{in}}$,
where entries of row vector 1_i are all 0, except that the i -th entry is equal to 1
3. Let $\xi_{\mathcal{M}} = \pi_{\mathcal{M}} = \|X - A X\|_{\text{row}}$, where $\|\cdot\|_{\text{row}}$ is a row-wise norm operator
4. Replace the entries in $\xi_{\mathcal{M}}$ with 0 for non-sampled points $\forall i \notin \mathcal{M}_{\text{in}}$
5. Loop *m* times
 - 5.1 Update, $\xi_{\mathcal{M}} \leftarrow Q \xi_{\mathcal{M}}$
 end
6. Update, $\pi_{\mathcal{M}} \leftarrow \pi_{\mathcal{M}} - \xi_{\mathcal{M}}$
7. Select *n* new sampling points according to $\pi_{\mathcal{M}}$ and generate new sampling set $\mathcal{M}_{\text{out}}$

Return $\mathcal{M}_{\text{out}}$

FIG. 15

Algorithm Weighted K -means++

Input X point cloud
 K number of reference points
Output $\mathcal{M}$ resampling set

Function

1. Initialize sampling set $\mathcal{M} = \emptyset$, sampling distribution $\pi_i = w_i / \sum_j w_j$ for all points i
 2. Take one reference point from sampling distribution π
 3. Loop until we have taken K reference points
 - 3.1. Update sampling distribution $\{\pi_i\}$, where $\pi_i = w_i D^2(\mathbf{x}_i) / \sum_j w_j D^2(\mathbf{x}_j)$
 where $D(\mathbf{x}_i) = \min_{\mathcal{M}_j \in \mathcal{M}} \|\mathbf{x}_i - \mathbf{x}_{\mathcal{M}_j}\|_2$
 - 3.2. Take another reference point from sampling distribution π
- end
return $\mathcal{M}$
-

FIG. 16

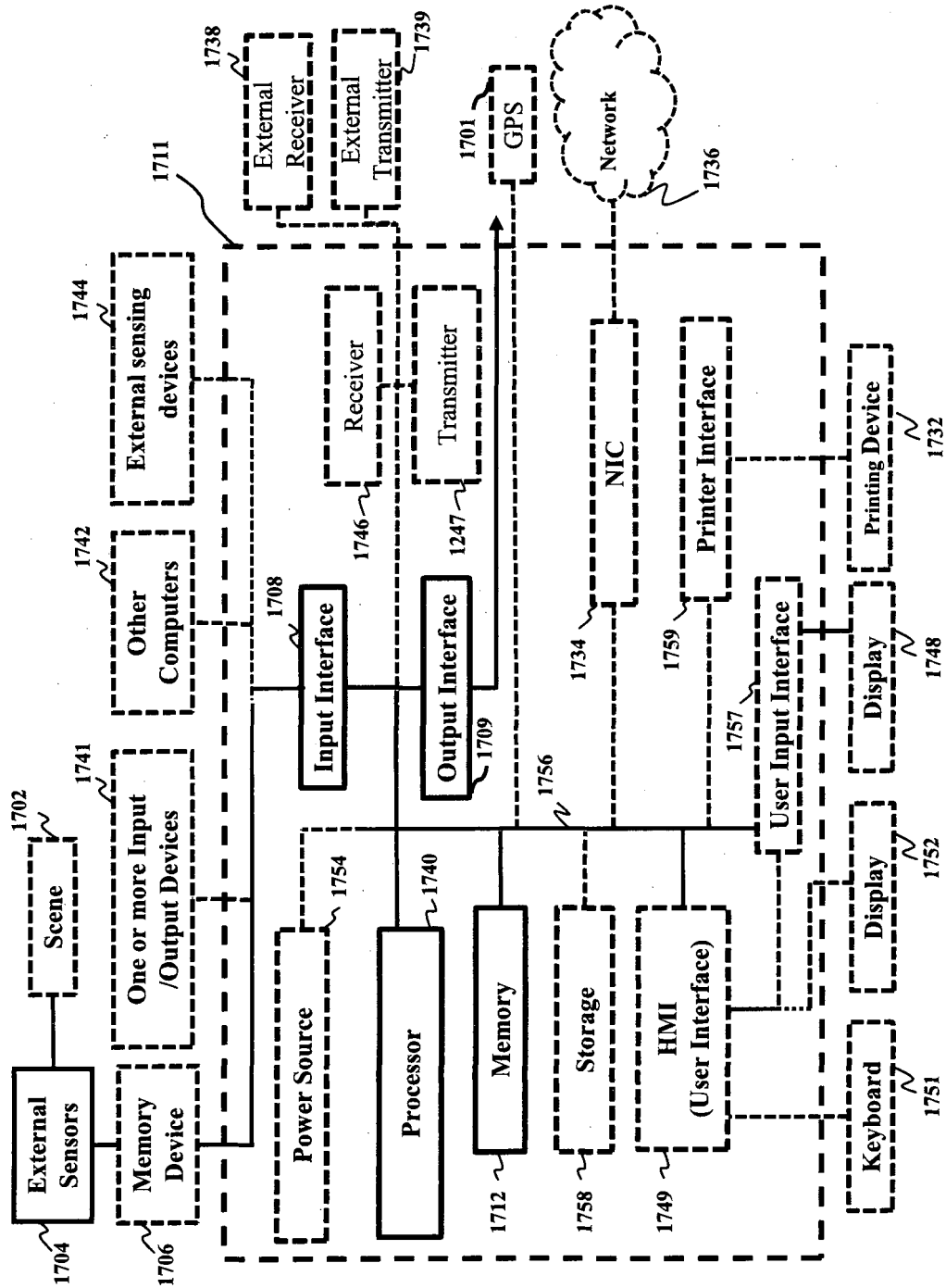


FIG. 17