**Maximum Likelihood Reconstruction for Emission Tomography**

*Team Members:*

1. Sanket Barhate (120070010)
2. Kalpesh Patil (130040019)

*Results:*Number of detectors = 40

* Reconstruction of Single Pixel Impulse   
  1. Resolution = 4 (9\*9 image)

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| Input Images | | | |
|  |  |  |  |
| EM Output | | | |
| Input Image with Resolution4 and Position 2.jpg |  |  |  |
| Inversion Output | | | |
|  |  |  |  |

2. Resolution = 8 (17\*17 image)

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| --- | --- | --- | --- |
| Input Images | | | |
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| EM Output | | | |
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| Inversion Output | | | |
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3. Resolution = 16 (33\*33 image)

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| Input Image | EM Output | Inversion |
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* Reconstruction of Binary Image

Number of detectors = 80

Resolution = 32 (65\*65 image)

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| --- | --- |
| Images | Description |
|  | Input Binary Image (logo) |
|  | EM Output |
|  | Inversion Output |

*Theory Concerning Project*

Here denote sites. There are sites in total. denotes detector tube and there are tubes in total. is the probability that emission in is detected in tube . The emission at site is assumed to be Poisson with mean .

is the total number of emissions detected in tube during acquisition (real data).

denotes the number of emissions in detected in . are mutually independent Poisson random variable, across , across (split of Poisson process independent).

Best estimate of is

Above sets of linear equations form the basis for inversion reconstruction.

Now let’s move onto expectation maximization. If we have as hidden random variable then estimation of becomes very easy.

So,

Each poisson process is independent

of no use since it doesn’t contain parameter

Differentiating above expression respect to to get maxima

Final formula for update is given below