Inverse Problems Based Java Informatics Framework to Probe CryoEM Images – A Simple Suggestion Using JikesRVM – Research Virtual Machine & its Promising Image Processing Applications.

D.N.T.Kumar(Nirmal)
Current Member : ante Inst,UTD,Dallas,TX,USA.
email id : tejdnk@gmail.com

[I] Introduction & Inspiration :

"Cryo-Electron Microscopy(Cryo-EM) is an electron microscopy(EM) technique applied on samples cooled to cryogenic temperatures and embedded in an environment of vitreous water. An aqueous sample solution is applied to a grid-mesh and plunge-frozen in liquid ethane. While development of the technique began in the 1970s, recent advances in detector technology and software algorithms have allowed for the determination of bio-molecular structures at near-atomic resolution."

" An inverse problem in science is the process of calculating from a set of observations the causal factors that produced them: for example, calculating an image in X-ray computed tomography, source reconstruction in acoustics, or calculating the density of the Earth from measurements of its gravity field.It is called an inverse problem because it starts with the results and then calculates the causes. This is the inverse of a forward problem, which starts with the causes and then calculates the results.

Inverse problems are some of the most important mathematical problems : in science and mathematics because they tell us about parameters that we cannot directly observe".

[Source : https://en.wikipedia.org/wiki/Inverse_problem]

[Source : http://www.maths.manchester.ac.uk/our-research/events/seminars/inverse-problems-and-imaging/new-inverse-problems-in-electron-microscopy-and-image-analysisopportunities-for-new-solutions.htm]

[Source : https://math.nist.gov/mcsd/Seminars/2009/2009-09-15-Chung-presentation.pdf]

[Source : https://web.math.princeton.edu/~amits/publications/1803.06714.pdf]

[Source : https://en.wikipedia.org/wiki/Cryogenic_electron_microscopy]
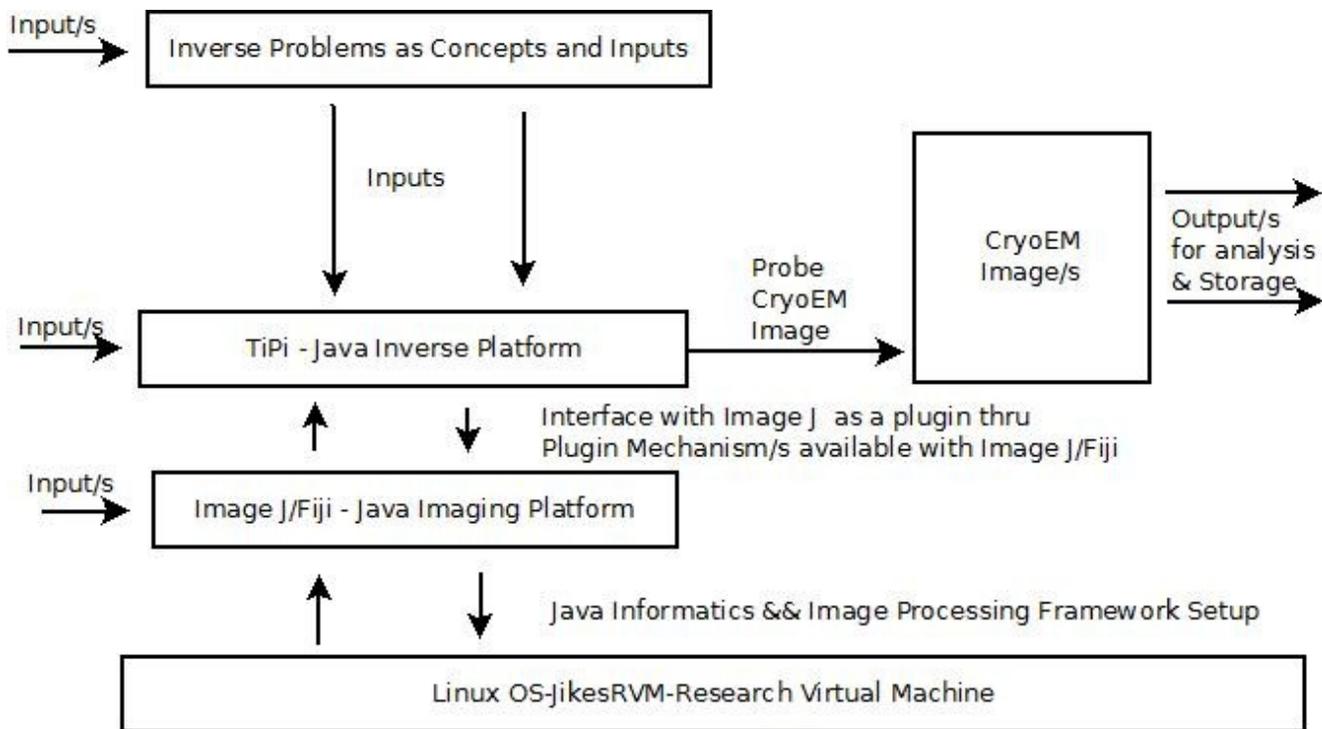
[II] Java Informatics Framework :

[a] Input -→ cryoem Image ----→ probe using inverse-problems-and-imaging concepts --→ output the result.

[b] Download TiPi Package based on JikesRVM ---→ Run the Software Platform and see the results –>>>>> Check the image and process the data ------→>>>> Store the Data.

[c] Download Image J/JikesRVM/TiPi ---->>> Java based computing and informatics Framework.

[d] Simple Block Diagram Just to Give You an Idea :

Figure I – Approximate Informatics Framework

[III] Conclusion With Future Perspectives :

An important application involving **"CryoEM Image Processing and Inverse Problems"** is presented.

[IV] Additional Information on Mathematics & Software Used :

[a] https://www.jikesrvm.org/

[b] http://dmakarov.github.io/work/guide/

[c] http://iopscience.iop.org/journal/0266-5611

[d] https://www.oulu.fi/inverse/

[e] https://aip.scitation.org/doi/abs/10.1063/1.533336

[f] https://www.fips.fi/

[g] https://stuff.mit.edu/afs/athena/course/2/2.717/www/inverse.html

[h] http://vixra.org/author/nirmal_tej_kumar

[i] http://vixra.org/author/d_n_t_kumar

[j] http://vixra.org/abs/1709.0412

[k] http://vixra.org/author/n_t_kumar

[l] http://vixra.org/abs/1709.0376

[m] https://www.maths.ox.ac.uk/about-us/life-oxford-mathematics/oxford-mathematics-alphabet/i-inverse-problems

[n] http://www.aimsciences.org/journal/1930-8337

[o] https://github.com/emmt/TiPi

[p] https://mitiv.univ-lyon1.fr/ - **inverse approach** for **image reconstruction** [TiPi]

[q] http://www-syscom.univ-mlv.fr/ANRDIAMOND/documents/talk_workshop/MiTiV-2011-Mulhouse.pdf

[r] https://www.newton.ac.uk/event/unqw04

[s] https://imagej.nih.gov/ij/ && https://fiji.sc/

[t] https://github.com/imagej/imagej

Acknowledgment/s :

[V] References :

[1] https://doi.org/10.1016/j.jsb.2018.09.008 - Fast multiscale reconstructionfor Cryo-EM

[2] Understanding JikesRVM in the Context of Cryo-EM/TEM/SEM Imaging Algorithms and Applications – A General Informatics Introduction from a Software Architecture View Point
Article DOI : 10.5958/0975-8089.2016.00001.4

[3] https://www.fei.com/life-sciences/history-of-cryo-em/

[4] https://www.chemistryworld.com/news/explainer-what-is-cryo-electron-microscopy/ 3008091.article

[5] https://www.nature.com/articles/nrd.2018.77

" Keep Probing – Never Give Up "

"Inverse Problems are very important "

THE END