Cryo-EM Image Processing Using Pixels,Processing & Python – A General Introduction.

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Abstract :

In this short communication,the author intends to demonstrate a simple informatics framework to process cryo-EM images using "Processing" and Python.To the best of our knowledge,this is one of the pioneering efforts.Many cryo-EM image processing software both open source or commercial have good presence of python in their source code.So,it is an inspiration to probe and process cryo-EM images using python based interaction and pixel based image processing concepts.

index words: Processing/Python/cryo-EM Images/Pixels/Informatics/Image Processing.

Introduction & Inspiration :

As we observe,there is already excellent published materials available online in the cryo-EM imaging domains. However,I will mention about our publication,please do read. You write Processing code,in Python. For more information on Processing language,please refer to the links mentioned below.

cryo-EM Image Processing :

Please read our publication Ref[4] it is available on Research Gate in PDF format.

Processing :

Processing was started by Ben Fry and Casey Reas in the spring of 2001, while both were graduate students at the MIT Media Lab,MA,USA."Processing is a flexible software sketchbook and a language for learning how to code within the context of the visual arts. Since 2001, Processing has promoted software literacy within the visual arts and visual literacy within technology. There are tens of thousands of students, artists, designers, researchers, and hobbyists who use Processing for learning and prototyping".

[Source : https://processing.org/] / [https://mitpress.mit.edu/books/processing]

I have derived my inspiration based on the techniques presented in the following research article.

Research Paper - Thresholding: A Pixel-Level Image Processing Methodology Preprocessing Technique for an OCR System for the Brahmi Script - Author: H. K. Anasuya Devi.

[Source of Inspiration : https://www.ancient-asia-journal.com/articles/10.5334/aa.06113/]

Need & Necessity For More R&D in cryo-EM Image Processing :

[i] http://www.nature.com/news/2009/091001/full/news.2009.969.html

[ii] http://www.pnas.org/content/110/45/E4178

[iii] http://www.pnas.org/content/110/30/12438

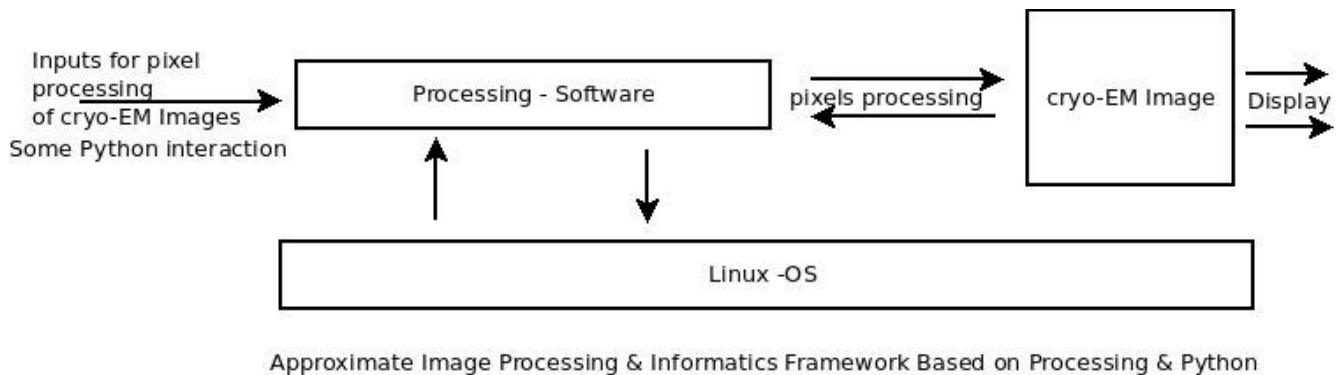**Informatics Framework Design & Implementation :**

Figure I – Approximate cryo-EM Image Processing Framework Based on Processing & Python.

Figure I is based on Refs[1-7].For additional information please refer to the links provided in this short note.

Conclusion with Future Perspectives :

A simple informatics framework to process cryo-EM images,was presented using "Processing",Python & Pixels. Processing holds a lot of promise in this challenging domain of nano-bio systems w.r.t cryo-EM Image Processing. Hence,it is sincerely hoped that,new researchers will come up with even more interesting and advanced image processing concepts by using Processing & Python.

Additional Information on Software/Mathematics Used :

[a] https://processing.org/ ; https://processing.org/tutorials/pixels/

[b] https://www.ma.utexas.edu/users/hadani/publications.htm

[c] https://www.python.org/ ; http://py.processing.org/(interesting note)

[d] https://www.biophys.mpg.de/fileadmin/user_upload/lectures/EM/basicImProc-210514-modified.pdf

[e] https://pragprog.com/book/dsproc/rapid-android-development

Acknowledgements :

References :

[1] https://www.ancient-asia-journal.com/articles/10.5334/aa.06113/

[2] http://gigl.scs.carleton.ca/node/48   - Processing

[3] http://cryoem.berkeley.edu/

[4] Kumar, D.N.T. & Shmavonyan, G.s. (2016). Understanding JikesRVM in the Context of Cryo-EM/TEM/SEM Imaging Algorithms and Applications – A General Informatics Introduction from a Software Architecture View Point. International Journal of Applied Research on Information Technology and Computing. 7. 1. 10.5958/0975-8089.2016.00001.4

[5] http://vixra.org/pdf/1709.0376v1.pdf – cryo-EM Image Processing Short Note.

[6] https://www.sciencedirect.com/science/article/pii/S0076687916300271 – cryo-EM Data Processing etc..

[7] https://processing.org/handbook/