GENESIS:Bioimaging-Cyro Genetic Electron Imaging

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A specific criteria is used for en-closer of tools in Cyro-Genetic Electon Microscope tool package. Software which are included are based on this specific criteria.

- Publication Date (Later than 2010)
- Freeware License without any restrictions
- Linux Based
- Offline

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1 Abstract

Technological advances have always been made in the fields of Physics, Chemistry and Computer but never in Biology. This is due to the fact that the emerging field of IT has not linked itself with Biologists and vice versa. Owing to this an initiative is taken leading to the development of a software package intended to help Biologists with their research. Genesis is an installation package software designed to help download the tools required for running Cryo-Electro Magnetic Microscope. The software reduces the hassle of of browsing tools online and checking their compatibility, Genesis offers filtered tools and automatically downloads the selected ones. It also offers a selection window to select the tools according to their category.

Sr. no	Software /Tool Name	Linux Based	Pub. Date	Free	Offline	Plug-ins	Installed
	Image Preprocessing						
	Image Acquision						
1	Cyro-EM Cloud Tools[1]	✓	✓	✓	✓		✓
2	Leginon[2]	✓		✓	✓		
3	Mr. T[3]	✓		✓	✓		
4	SerialEM[4]			✓	✓		
5	UCSFImage[5]	✓	✓	✓	✓		✓
	Image Enhancement						
6	Amira 3D [6]	✓			✓		
7	bfactor[7]	✓	✓	✓	✓		✓
8	BioImageXD[8]	✓		✓	✓		
9	diffmap [9]	✓	✓	✓	✓		✓
10	Distortion Correction[10]	✓		✓	✓		
11	EM-Bfactor [11]	✓	✓		✓		
12	EMHP [12]	✓	✓	✓	✓		
13	FASTDEF [13]	✓		✓	✓		
14	FindDQE [14]	✓	✓	✓	✓		✓
15	goCTF[15]	✓	✓	✓	✓		
16	Huygens[16]	✓		✓	✓		
17	IMAGIC [17]	✓	✓		✓		
18	mag-distortion-correct [18]	✓	✓	✓	✓		
19	mag-distortion-estimate [19]	✓	✓	✓	✓		
20	MotionCorr[20]	✓	✓	✓	✓		✓
21	normscan	✓		✓	✓		
22	RELION [21]	✓	✓	✓	✓		✓
23	SPHIRE [22]		✓	✓	✓		
24	TIFFStripper [23]			✓	✓		
25	TranSPHIRE [24]	✓	✓	✓	✓		✓
26	Unblur [20]	✓	✓	✓	✓		✓
27	VolumeRover [25]	✓		✓	✓		
28	Z-Spacing [26]	✓	✓	✓	✓		
	Image Visualization						
29	Amira 3D Software[27]	✓		✓			
30	BioImageXD [28]	✓	✓	✓	✓		✓
31	Bsoft [29]	✓		✓	✓		
32	Drishti [30]	✓	✓	✓	✓		✓
33	EM-SURFER [31]	✓	✓	✓			
34	Extended Depth of Field[32]	✓	✓	✓	✓		✓
35	Gorgon [33]	✓	✓	✓	✓		
36	Image SXM[34]			✓	✓		
37	Volume Rover [35]	✓	✓	✓	✓		✓
	Drift Correction						
38	MotionCor2 [20]	✓	✓	✓	✓		✓
39	SPHIRE [22]		✓	✓	✓		
40	TranSPHIRE [24]	✓	✓	✓	✓		✓
41	Unblur[36]	✓	✓	✓			
42	Zorro-Drift correction [37]	✓	✓	✓	✓		✓
	CTF estimation/correction						
43	2dX [38]	✓		✓	✓		
44	cisTEM [39]	✓	✓	✓	✓		✓
45	CTFFIND [40]	✓		✓	✓		
46	e2boxer.py [41]	✓	✓	✓	✓		✓
47	Eos [42]	✓		✓	✓		
48	FASTDEF[13]	✓		✓	✓		
49	FitCTF [43]	✓		✓	✓	✓	
50	Frealign [44]	✓		✓	✓		✓
51	Gctf [45]	✓	✓	✓	✓		✓
52	IMAGIC [17]	✓	✓		✓		✓
53	SPHIRE [22]		✓	✓	✓		
54	System for Processing Image data from Electron Microscope [46]	✓		✓	✓		
55	TranSPHIRE [24]	✓	✓	✓	✓		✓
56	UCSFlamge [5]	✓	✓	✓	✓		✓
	Image Processing						
	Image Segmentation						
57	mincRmnms[47]	✓	✓	✓	✓	✓	

Sr. no	Software /Tool Name	Linux Based	Pub. Date	Free	Offline	Plug-ins	Installed
58	Graph cuts[48]	✓		✓	✓		
59	CDeep3M[49]	✓	✓	✓		✓	
60	SegEM[50]	✓	✓	✓	✓	✓	
61	A-Fast-Forward-Connection-Algorithm[51]	✓	✓	✓	✓	✓	
62	Stomata Counter[51]	✓	✓	✓			
63	AxonDeepSeg[52]	✓	✓		✓		
64	AutoThreshold[53]	✓	✓	✓	✓		✓
65	E-Snake[54]	✓			✓		
66	Interactive H Watershed[55]		✓	✓	✓		
67	dive[56]	✓	✓	✓			
68	IPLT[57]	✓		✓	✓		
69	sbfsem-cardiac-cell-segmenter[58]	✓	✓	✓	✓	✓	
70	DeepEM3D[59]	✓	✓	✓	✓	✓	
71	Amira 3D Software for Life Sciences[60]	✓			✓		
72	Volume Annotation and Segmentation[61]			✓	✓		
73	GALA[62]	✓	✓	✓	✓		
74	NeuroProof[63]	✓	✓	✓	✓		✓
75	BioImageXD[28]	✓	✓	✓	✓		✓
76	ilastik[64]	✓	✓	✓	✓		✓
77	Free-D[65]	✓			✓		
78	SPIDER[66]	✓		✓	✓		
	Image registration						
79	BioImageXD[28]	✓	✓	✓	✓		✓
80	Elastic Alignment and Montage[67]	✓		✓	✓		
81	EM aligner[68]	✓	✓	✓	✓	✓	
82	FOCUS[69]	✓		✓	✓		
83	Free-D[65]	✓			✓		
84	Register Virtual Stack Slices[70]	✓	✓	✓	✓		✓
	Serial block face imaging 3D reconstruction						
85	Amira 3D Software for Life Sciences[71]	✓			✓		
86	Elastic Alignment and Montage[72]	✓		✓	✓		
87	EM aligner[68]	✓	✓	✓	✓	✓	
	3D Macromolecule Reconstruction						
88	2dX[73]	✓		✓	✓		
89	cisTem[74]	✓	✓	✓	✓		✓
90	cryoSparc[75]	✓	✓		✓		
91	EMAN[76]	✓		✓	✓		
92	EMringer[77]	✓	✓	✓	✓		✓
93	FOCUS[78]	✓		✓	✓		
94	Frealix[79]	✓	✓	✓	✓		✓
95	Gorgon[33]	✓	✓	✓	✓		✓
96	IMAGIC[80]	✓	✓		✓		
97	ROME[81]	✓	✓	✓	✓		✓
98	Scipion[82]	✓	✓	✓	✓		✓
99	SerialEM[4]			✓	✓		
100	RELION[21]	✓	✓	✓	✓		✓
101	SPRING[40]	✓	✓		✓		
102	SPARX[83]	✓	✓	✓	✓		✓
103	SPHIRE[22]		✓	✓	✓		
104	SubspaceEM[84]	✓	✓	✓	✓	✓	
105	SPIDER[85]	✓		✓	✓		
106	Volume Rover [25]	✓	✓	✓	✓		✓
	3D refinement						
107	ROME[81]	✓	✓	✓	✓		✓
108	SPHIRE[22]		✓	✓	✓		
	Structural Analysis						
	Neuron Tracing						
109	NeuronJ[86]	✓		✓	✓		
110	UltraTracer[87]	✓	✓	✓	✓		✓
111	FARSIGHT[88]	✓	✓	✓	✓		✓
112	Aivia[89]		✓	✓	✓		
113	NeuroProof[90]	✓	✓	✓	✓		✓
114	RhoANA[91]	✓	✓	✓	✓	✓	
115	webKnossos[92]	✓	✓	✓			
116	Amira 3D[27]	✓			✓		
117	DeepEM3D[59]	✓	✓	✓	✓	✓	
118	Viking[93]	✓	✓		✓		
119	Reconstruct[94]	✓		✓	✓		
120	ELEKTRONN[95]	✓	✓	✓	✓		✓
121	AxonTracker[96]	✓	✓	✓	✓	✓	
122	SegEM[97]	✓	✓	✓	✓	✓	
123	SpineLab[98]	✓	✓	✓	✓		✓
	Biological Network Reconstruction						
124	Mr.T[99]	✓		✓	✓		
125	FARSIGHT[88]	✓	✓	✓	✓		✓
126	EMFit[100]	✓		✓	✓		
127	UROX[101]	✓		✓	✓		

Sr. no	Software /Tool Name	Linux Based	Pub. Date	Free	Offline	Plug-ins	Installed
	Single particle Analysis						
128	EMAN[76]	✓		✓	✓		
129	IMAGIC[80]	✓	✓		✓		
130	SPIDER[85]	✓		✓	✓		
131	Frealigne[102]	✓		✓	✓		
132	SPARX[83]	✓	✓	✓	✓		✓
133	Unblur[103]	✓	✓	✓	✓		✓
134	Scipion[82]	✓	✓	✓	✓		✓
135	EMringer[77]	✓	✓	✓	✓		✓
136	cryoSparc[75]	✓	✓		✓		
137	IMIRS[104]	✓		✓	✓		
138	Ruby-Helix[105]	✓		✓	✓		
139	RosettaES[106]	✓			✓		
140	SPRING[40]	✓	✓		✓		
141	MulticolorSPR[107]	✓	✓		✓		
142	cisTem[74]	✓	✓	✓	✓		
143	3DEMBenchmark[108]	✓	✓	✓			
144	DeepEM[59]	✓	✓	✓	✓	✓	
	Structure Orientation						
145	FibrilTool[109]	✓	✓	✓	✓		✓
146	Directionality[110]	✓			✓		
	Morphometric Analysis						
147	IMAGIC[80]	✓		✓	✓		
148	Free-D[65]	✓			✓		
149	Bsoft[29]	✓		✓	✓		
150	FracLac[111]	✓	✓	✓	✓		✓
151	BioImageXD[28]	✓	✓	✓	✓		✓
152	ImageSXM[112]			✓	✓		
153	DiameterJ[113]		✓	✓	✓	✓	
154	GSA ImageAnalyser[114]	✓	✓		✓		
155	VolumeRover[25]	✓		✓	✓		
156	Amira 3D[27]	✓			✓		
157	TEM Exosome[115]				✓		
158	Flynotyper[116]	✓	✓	✓	✓		✓
159	Reconstruct[94]	✓		✓	✓		
160	NeuroMorph[27]	✓	✓	✓	✓		
161	Fourier Analysis[117]	✓		✓	✓		
162	Gorgon[118]	✓	✓	✓	✓		✓
163	MapBone Structure[119]	✓		✓	✓		
164	ImageSXM[112]			✓	✓		
165	GSA Image Analyser[120]	✓			✓		
166	Stomata Counter[121]	✓		✓			
167	Cell Counter[122]	✓		✓	✓		
168	superAngle[123]	✓		✓	✓	✓	
	Image Classification						
169	RELIO[124]	✓	✓	✓	✓		✓
170	EMAN[125]	✓	✓	✓	✓	✓	✓
171	Frealign[102]	✓		✓	✓	✓	
172	cryoSPARC[75]	✓			✓		
173	SPHIRE[83]			✓	✓		
174	cisTEM[74]	✓	✓	✓	✓	✓	✓
	Particle Picking						
175	EMAN[125]	✓	✓	✓	✓	✓	✓
176	IMAGIC[80]	✓		✓	✓		
177	e2boxer.py[126]	✓		✓	✓		
178	TMaCS[127]	✓		✓	✓		
179	Gautomatch[128]	✓		✓	✓		
180	DoG Picker[127]	✓		✓	✓		
181	FindEM[128]	✓		✓	✓		
182	TiltPicker[127]	✓		✓	✓		
183	Xmipp[129]	✓	✓	✓	✓		✓
184	SPHIRE[22]		✓	✓	✓		
185	cisTEM[74]	✓	✓	✓	✓	✓	✓
186	DeepPicker[130]	✓	✓	✓	✓		✓
187	gEMpicker[131]	✓	✓		✓	✓	
188	crYOLO[132]		✓	✓	✓		
189	Signature[133]	✓		✓	✓		
190	APPLE Picker[134]	✓		✓	✓	✓	
	Image Simulation						
191	Dr. Probe[135]	✓	✓		✓		
	Image Data Management and Annotation						
	Data Management and Annotation						
192	BrainVISA[136]	✓		✓	✓	✓	
193	Computational Project for Electron cyro-Microscopy[137]	✓	✓	✓	✓		✓
194	Cytomine[138]	✓	✓	✓	✓		✓

Sr. no	Software /Tool Name	Linux Based	Pub. Date	Free	Offline	Plug-ins	Installed
195	Summovie[74]	✓	✓	✓	✓		✓
196	phenomelmpute[139]	✓	✓	✓	✓	✓	
197	NeuroMorph_Other Tools[140]	✓	✓	✓	✓		✓
198	Viking[93]	✓	✓		✓	✓	
199	NeuroMorph_3D Drawing[140]	✓	✓	✓	✓		✓
200	Raveler[141]	✓	✓	✓	✓	✓	
201	Scientific Animation Integration Library	✓		✓	✓		
202	PC2MRC	✓		✓	✓		

Table 1: This table displays all of the tools installed, with there Sizes.

Sr. No	Software/Tool Name	Size
Image Pre-Processing		
	Image Acquision	
1	BFactor	493KB
	Image Enhancement	
2	Diffmap	183KB
3	Find DQE	8.5MB
4	Relion	2.8MB
	Image Visualization	
5	BioImage XD	110MB
6	Drishti	2.2MB
	Drift Correction	
7	MotionCor2	1.8MB
8	TranSPHIRE	883KB
9	Gctf	303MB
	CTF estimation	
10	Frealign	143MB
11	cisTEM	382MB
12	Gctf	303MB
Image Processing		
	Image Segmentation	
13	Auto-Threshold	18KB
	Image Registration	
14	BioImageXD	110MB
15	Virtual Stack	27KB
	3D Macro-molecules	
16	cisTEM	382MB
17	EMringer	256KB
18	Frealix	47MB
19	Gorgon	62.9KB
	3D refinement	
20	ROME	169MB
Structural Analysis		
	Particle Picking	
21	EMAN2	12MB
22	DeepPicker	416KB
23	cisTEM	382MB
24	Xmipp	7.3MB
	Neuron Tracing	
25	FARSIGHT	69MB
	Structure Orientation	
26	FibrilTool	5.11MB
	Image Classification	
27	RELION	2.8MB
28	EMAN	12MB
29	cisTEM	382MB
	Biological Reconstruction	
30	FARSIGHT	69MB
	Single Particle Analysis	
31	Unblur	9.3MB
32	Scipion	29MB
33	EMringer	256KB
	Morphometric Analysis	
34	Gorgon	62.9KB
35	Flynotyper	167MB
36	BioImage XD	110MB
37	Fraclac	13.1MB
Image Data Management		
	Data Annotation	
38	Cytomine	161.5MB
39	Summovie	9.6MB
40	NeuroMorph	131MB
41	CCP-EM	716MB

Table 3: Tools with Matlab Plugins

Sr	Tool
1	FitCTF
2	SegEM
3	Connection Algorithim
4	DeepEM3D
5	sbfsem-cardiac-cell-segmeter
6	EM-Aligner
7	SubspaceEM
8	RhoANA
9	DeepEM
10	MIB
11	Diameter J
12	Superangle
13	EMAN
14	Frealign
15	cisTEM
16	gEMpicker
17	ApplePicker
18	BrainVisa
19	phenomelmpute
20	Viking
21	NeuroMorph-othertools
22	Viking
23	NeuroMorph3D Drawing
24	Raveler Scientific Animation

pipeline (1) (1) (1).png

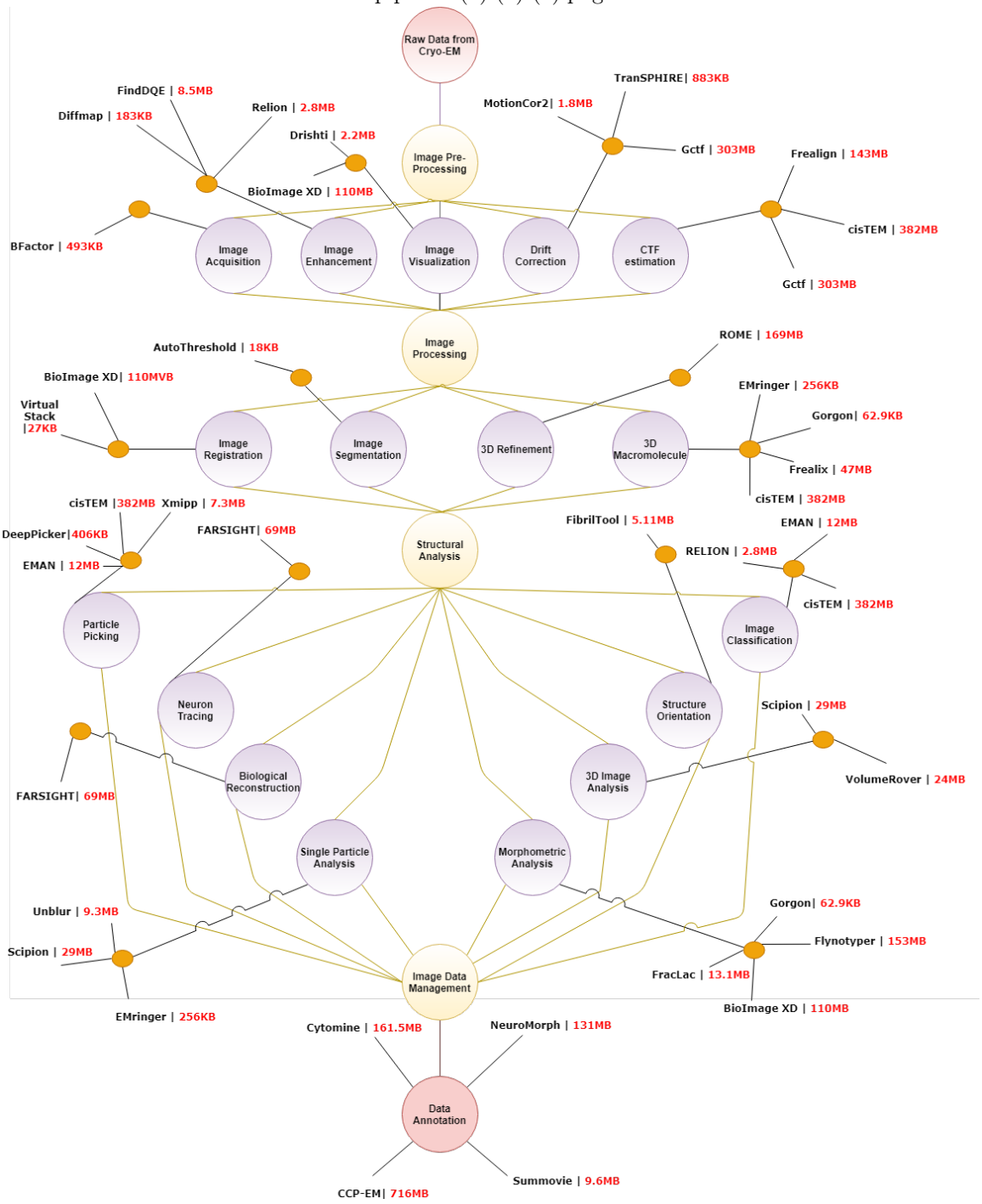

Figure 1: The fig. represents an overview of the Cyro-Electron Microscope data analysis pipeline. The softwares installed in GENESIS along each category are mentioned in it.

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