Supplementary Materials: Automated Micro-Object Detection for Mobile Diagnostics Using Lens-Free Imaging Technology

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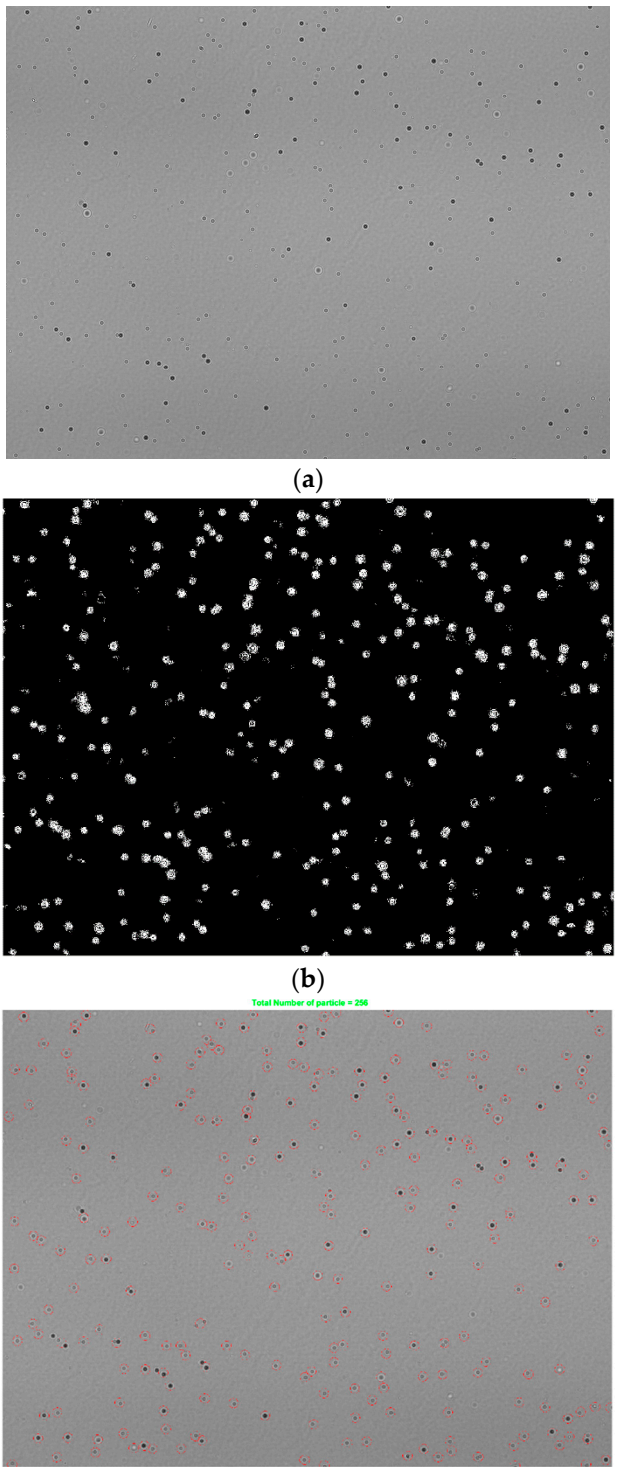
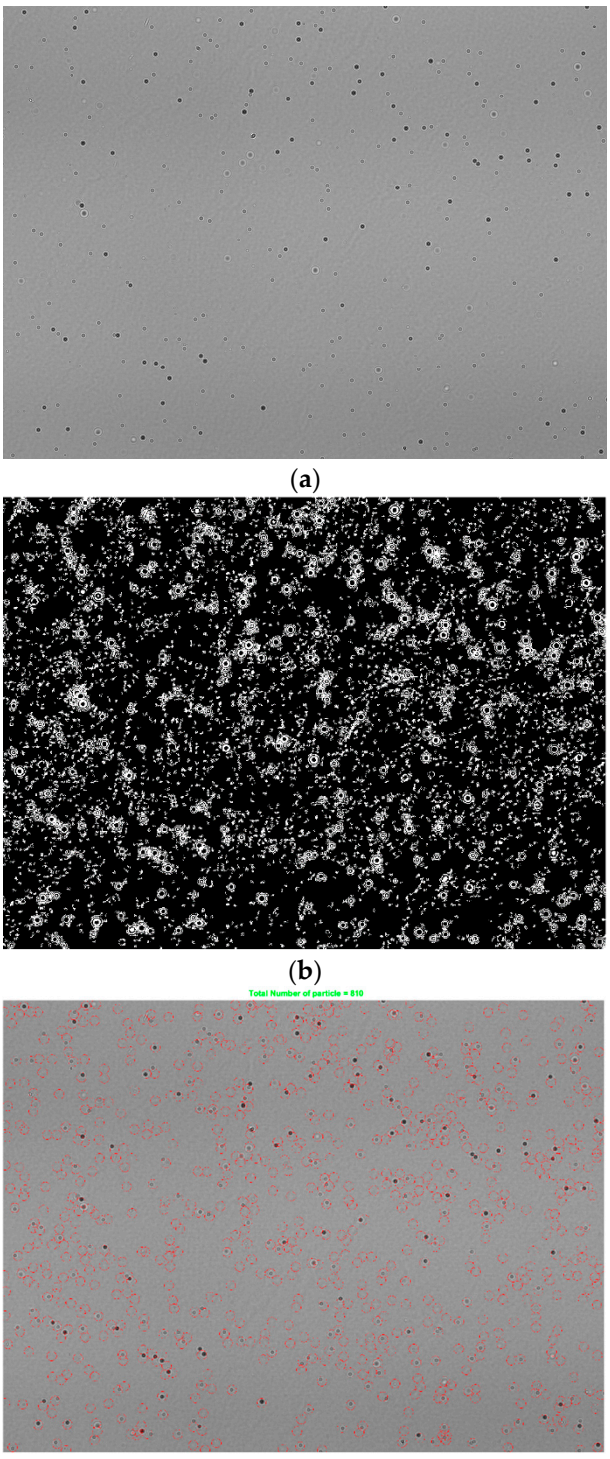


Figure S1. Processed by custom developed algorithm, (**a**) Original Image; (**b**) Binary image after threshold; (**c**) Counted and marked.

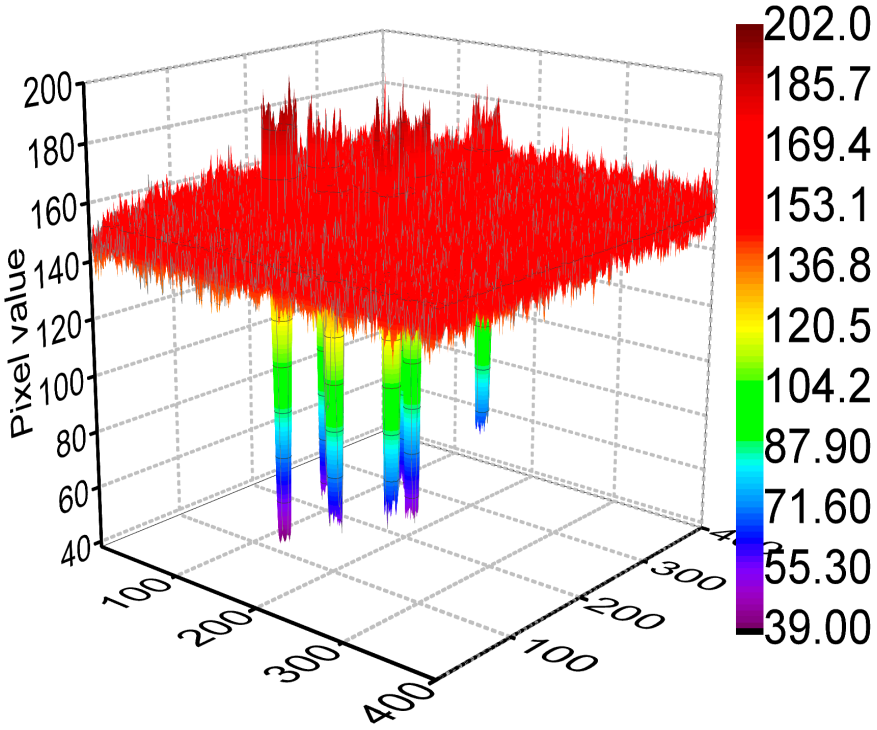


(**a**)

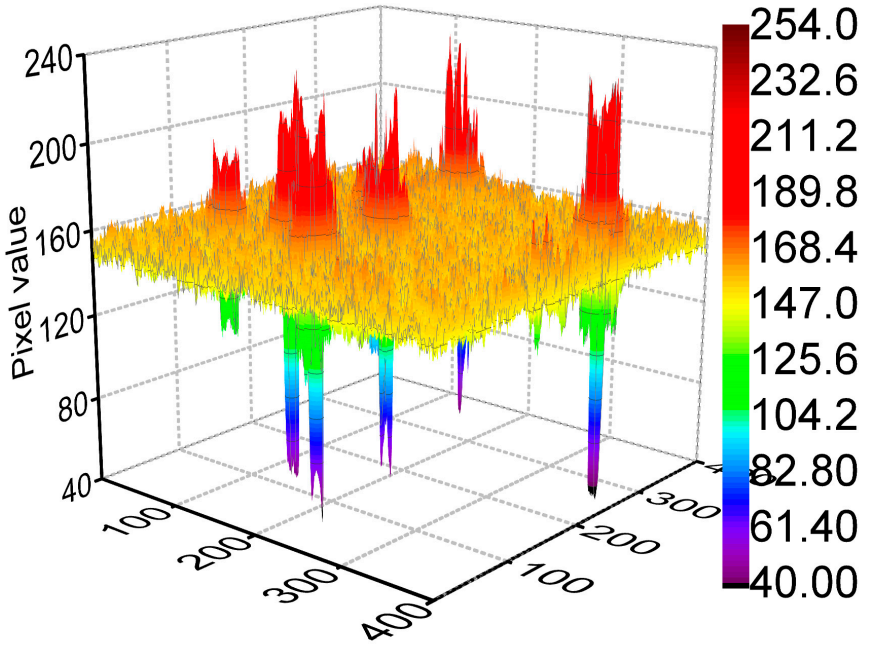
(**b**)

(**c**)

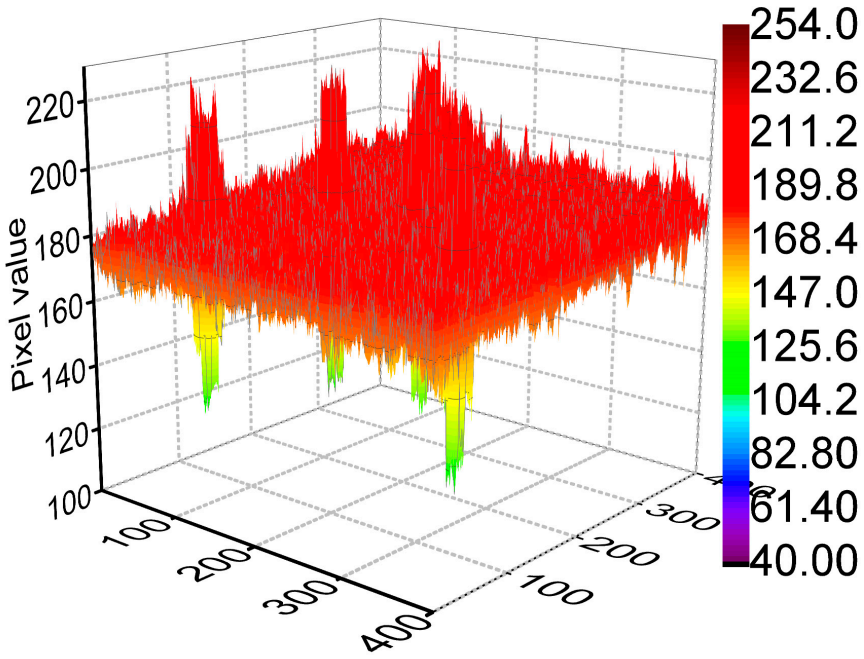
Figure S2. Processed by existing algorithm (graythresh), (**a**) Original Image; (**b**) Binary image after threshold; (**c**) Counted and marked. (http://www.mathworks.com/help/images/image-enhancement-and-analysis.html?s_tid=gn_loc_drop&refresh=true).


Pixel value
200
180
160
140
120
100
80
60
40
100
200
300
400
100
200
300
202.0
185.7
169.4
153.1
136.8
120.5
104.2
87.90
71.60
55.30
39.00

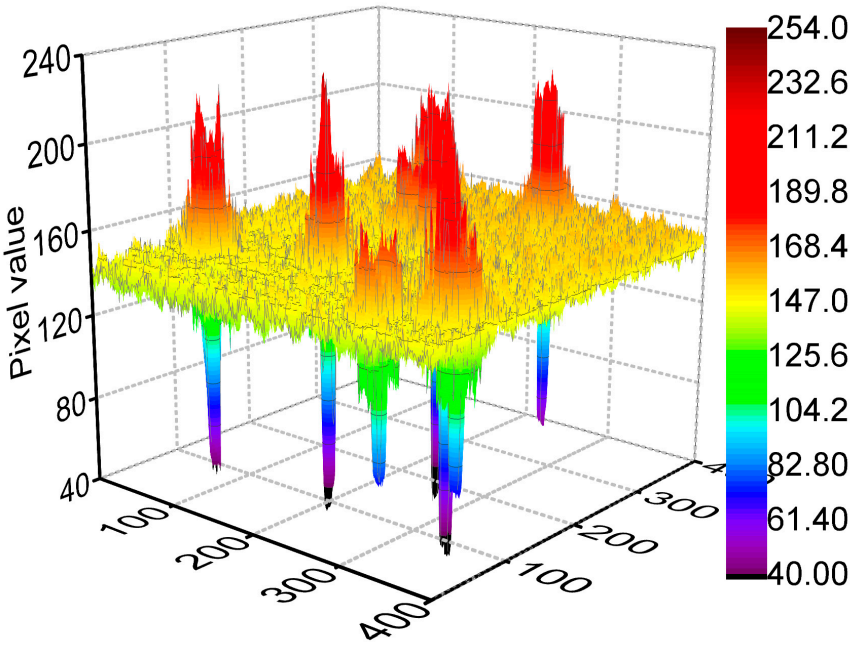
(**a**)


Pixel value
240
200
160
120
80
40
100
200
300
400
100
200
300
254.0
232.6
211.2
189.8
168.4
147.0
125.6
104.2
82.80
61.40
40.00

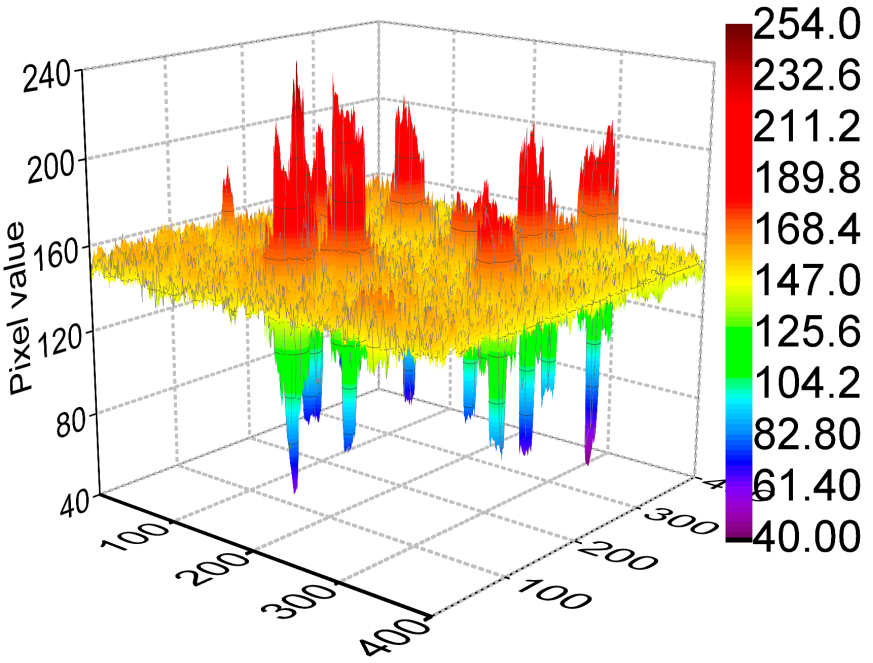
(**b**)


Pixel value
220
200
180
160
140
120
100
100
200
300
400
100
200
300
254.0
232.6
211.2
189.8
168.4
147.0
125.6
104.2
82.80
61.40
40.00

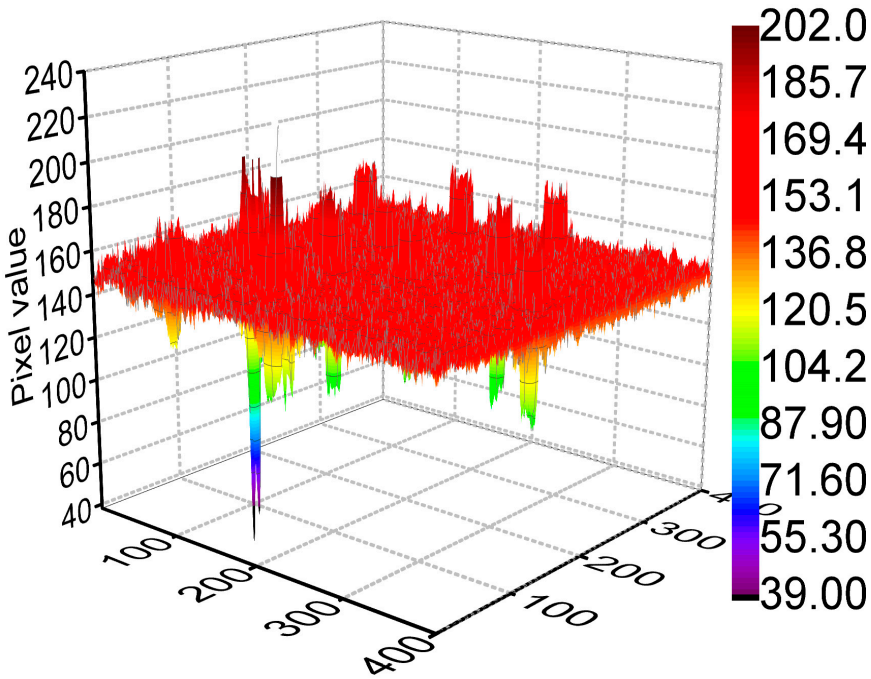
(**c**)


Pixel value
240
200
160
120
80
40
100
200
300
400
100
200
300
254.0
232.6
211.2
189.8
168.4
147.0
125.6
104.2
82.80
61.40
40.00

(**d**)



(**e**)



(**f**)

Figure S3. 3D intensity plot of (**a**) 20 μm bead; (**b**) HepG2; (**c**) RBC; (**d**) MCF7; (**e**) HeLa; (**f**) 10 μm bead.

Table S1. Comparison of automated methods for the counting of lens-free images of microbeads.

Methods	Manual Counting	Existing Algorithm (Graythresh)	Custom Algorithm
Count	249	810	256

Table S2. Comparison of actual size of microparticle by microscope vs. size by automated algorithm.

Sample No	Actual Size by Microscope (Micrometer)	Size Determine by Algorithm (Micrometer)	Difference (Micrometer)
1	20.2	20	0.2
2	21.35	21.71428571	0.364285714
3	12.55	12	0.55
4	24.69	22.85714286	1.832857143
5	24.69	23.42857143	1.261428571
6	11.78	10.57142857	1.208571429
7	11.78	9.142857143	2.637142857
8	11.2	10.57142857	0.628571429
9	10.1	12	1.9
10	11.22	10.85714286	0.362857143
11	10.1	8.857142857	1.242857143
12	10.66	10	0.66
13	23.57	21.71428571	1.855714286
14	11.78	11.42857143	0.351428571
15	10.1	8	2.1
16	13.47	11.42857143	2.041428571
17	12.35	10	2.35
18	12.91	9.428571429	3.481428571
19	24.64	23.71428571	0.925714286
20	19.64	20.57142857	0.931428571
21	12.35	9.714285714	2.635714286
22	11.78	10.28571429	1.494285714
23	10.1	7.428571429	2.671428571
24	11.22	7.428571429	3.791428571
25	23.1	22.28571429	0.814285714
26	10.66	8.571428571	2.088571429
27	26.37	22.28571429	4.084285714
28	10.66	9.428571429	1.231428571
29	10.1	10.85714286	0.757142857
30	11.78	11.42857143	0.351428571
31	10.66	12.57142857	1.911428571
32	20.76	24	3.24
33	10.1	8.857142857	1.242857143
34	18.52	21.71428571	3.194285714
35	20.2	22	1.8
36	10.1	10.28571429	0.185714286
37	21.32	24.57142857	3.251428571
38	11.22	13.71428571	2.494285714
39	22.45	23.71428571	1.264285714
40	25.25	25.71428571	0.464285714
41	24.13	23.71428571	0.415714286
42	22.45	23.42857143	0.978571429
43	21.32	21.14285714	0.177142857
44	10.66	10	0.66
45	10.66	12	1.34
46	10.66	11.42857143	0.768571429
47	22.45	22	0.45
48	14.4	12.57142857	1.828571429
49	10.66	8.571428571	2.088571429
50	10.1	8.857142857	1.242857143
51	12.35	10.57142857	1.778571429
52	10.66	11.14285714	0.482857143
53	23.01	22.28571429	0.724285714
54	25.25	24	1.25

55	12.35	11.14285714	1.207142857
56	11.78	10.28571429	1.494285714
57	12.35	13.42857143	1.078571429
58	11.22	12	0.78
59	10.1	11.42857143	1.328571429
60	11.78	11.42857143	0.351428571
61	12.35	12.28571429	0.064285714
62	19.08	22.28571429	3.205714286
63	10.66	8.857142857	1.802857143
64	10.66	11.42857143	0.768571429
65	10.1	9.142857143	0.957142857
66	10.66	8.285714286	2.374285714
67	10.1	11.42857143	1.328571429
68	11.78	10.85714286	0.922857143
69	10.1	7.142857143	2.957142857
70	19.08	21.14285714	2.062857143
71	10.1	10	0.1
72	10.1	9.142857143	0.957142857
73	12.91	10.57142857	2.338571429
74	11.22	10.28571429	0.934285714
75	10.66	9.142857143	1.517142857
76	10.1	11.71428571	1.614285714
77	11.78	11.14285714	0.637142857
78	12.35	8.857142857	3.492857143
79	24.13	23.71428571	0.415714286
80	10.66	8.571428571	2.088571429
81	20.76	24	3.24
82	24.13	25.14285714	1.012857143
83	10.66	13.14285714	2.482857143
84	24.13	24.85714286	0.727142857
85	10.1	10.28571429	0.185714286
86	10.66	11.42857143	0.768571429
87	10.66	9.428571429	1.231428571
88	20.76	22	1.24
89	23.01	24.57142857	1.561428571
90	12.35	10.85714286	1.492857143
91	10.66	8.857142857	1.802857143
92	22.45	24.85714286	2.407142857
93	11.78	9.714285714	2.065714286
94	12.35	12.85714286	0.507142857
95	21.89	23.14285714	1.252857143
96	10.66	9.428571429	1.231428571
97	11.22	10	1.22
98	10.1	9.428571429	0.671428571
99	20.76	23.14285714	2.382857143
		average Difference	**1.647908623**