University of Central Punjab
Faculty of Information Technology

Project:

A special camera is launched into Mars' orbit to identify and label "points of interest" (POI for short), which are essentially pattern files (smaller matrix), within the source image file for scientific research. The camera produces black and white images in varying resolutions in the form of large matrices with integer values between 0 and 255. You must create a program that is capable of reading a file containing such an image and search it for any POI provided by the user through a file as well. Once a POI has been identified, you must mark it by inverting its values (make them negative e.g. 155 becomes -155). Finally after all such POI's have been found and marked, output the entire matrix to a new file specified by user.

Your program must adhere to the following guidelines:-

a) Must be dynamic to allow for files of any size to be processed

b) Store matrices using appropriate structs (with appropriate initialization functions)

c) No memory leakage

d) Allow user to choose multiple POI files to mark for a single source image file

e) You can assume number of columns of the matrix is provided at the start of the file (but no row count data)

Bonus functionality:

a) POIs may be rotated either 90, 180, or 270 degrees

b) POIs may overlap

c) Neither row nor column data is provided in the file

Sample run:

Input file:

101	175	123	52	78	184	202	8	219	15	49	254	86	62
156	213	41	200	123	131	252	186	108	116	39	205	243	120
218	239	201	109	52	173	244	58	185	18	64	209	165	222
81	136	247	149	183	206	164	214	179	121	176	200	89	128
61	224	221	103	114	170	88	133	117	30	104	46	19	151
99	111	41	180	188	1	32	27	100	241	97	56	22	10
26	238	248	155	154	106	123	52	78	66	125	225	193	190
54	127	159	3	34	152	41	200	123	146	94	90	195	199
105	191	212	23	194	207	201	109	52	231	95	250	150	55
51	227	204	36	80	253	160	215	153	236	124	71	98	75
249	47	168	13	211	59	87	240	228	68	63	218	156	101
148	141	91	115	40	38	197	137	83	123	158	239	213	175
157	129	12	5	147	109	33	134	77	144	101	175	123	123
135	177	9	45	123	52	78	118	73	232	156	213	123	182
167	162	96	174	41	200	123	11	16	122	218	239	175	161
139	132	44	25	201	109	52	201	216	78	142	138	84	234
72	4	29	52	119	79	42	233	235	140	112	187	21	198

- Green boxes highlight non bonus example where submatrices are always oriented straight up and never overlap
- Blue boxes highlight bonus example where top blue matrix has been rotated by 90 degrees clockwise and bottom blue matrix is oriented straight up
- Yellow portion highlights overlap occurring between the two blue boxes

POI file (non-bonus):

```
123  52  78
 41 200 123
201 109  52
```

POI file (with-bonus):

```
101 175 123
156 213 123
218 239 175
```

Output file:

101	175	-123	-52	-78	184	202	8	219	15	49	254	86	62
156	213	-41	-200	-123	131	252	186	108	116	39	205	243	120
218	239	-201	-109	-52	173	244	58	185	18	64	209	165	222
81	136	247	149	183	206	164	214	179	121	176	200	89	128
61	224	221	103	114	170	88	133	117	30	104	46	19	151
99	111	41	180	188	1	32	27	100	241	97	56	22	10
26	238	248	155	154	106	-123	-52	-78	66	125	225	193	190
54	127	159	3	34	152	-41	-200	-123	146	94	90	195	199
105	191	212	23	194	207	-201	-109	-52	231	95	250	150	55
51	227	204	36	80	253	160	215	153	236	124	71	98	75
249	47	168	13	211	59	87	240	228	68	63	-218	-156	-101
148	141	91	115	40	38	197	137	83	123	158	-239	-213	-175
157	129	12	5	147	109	33	134	77	144	-101	-175	-123	-123
135	177	9	45	-123	-52	-78	118	73	232	-156	-213	-123	182
167	162	96	174	-41	-200	-123	11	16	122	-218	-239	-175	161
139	132	44	25	-201	-109	-52	201	216	78	142	138	84	234
72	4	29	52	119	79	42	233	235	140	112	187	21	198