TECHNOLOGY ARENA

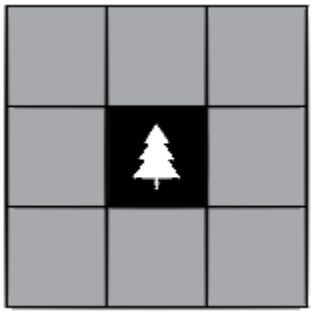
Original document: https://hackmd.io/wPhHcJR0T8mEh_GBpcHVSw?view

Introduction

Forest rangers are planting a forest. The meadow where planting will take place can be displayed as a two-dimensional grid containing **n x n fields**. Each field can be planted or not planted. Planting is possible in all fields, but **in each field exactly one tree can be planted**.

Every field interacts with its eight neighbouring fields, which are the cells that are horizontally, vertically, or diagonally adjacent.

Neighbourhood of field:



Set of field properites:

Planted (alive)

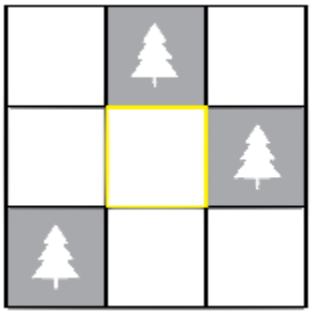
Not planted (dead/empty)

Each field's properties are dependent on its neighboring fields so for each next generation in time, the following transitions occur:

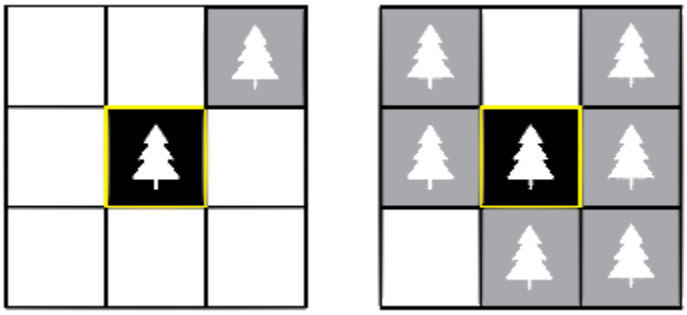
Rules:

1. Every planted tree will survive to the next generation if its field has two or three neighboring fields with planted trees.

2. Each empty field with exactly three trees around it will grow a new tree.



3. All other trees will die, and their fields will become empty.



Task 1

Find the initial tree planting arrangement to achieve the maximum possible afforestation (maximum number of trees) after 420 generations on a 200x200 meadow.

Part 2

Introduction

Before the beginning of the afforestation, soil analysis revealed that the soil is infertile in the fields whose numerical designation is a prime number, so in these fields, planting is not possible and trees can't grow on that field.

Example:
A grid where n=10. The grid have the numerical labels shown below. Red fields are indicating fields with prime numbers.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Task 2

Find the initial tree planting arrangement in order to achieve the maximum possible afforestation after 420 generations on a 200x200 meadow having in mind that in every generation field with prime number labels are always 0 and trees will never grow there.

Solution submission

When submitting the solution, take into account that only those solutions that are “active” will be evaluated, i.e. that there have been changes in the distribution of values of 1 and 0 over the generations.

Solutions are submitted as **.txt** files that are named as *team name* and *task number* for which you submit it.

File name example: *team_name_task1.txt*

The contents of the file are values of 1 or 0 that indicate a planted tree or an empty field.

Example of solution input:

0,1,1,1,0,0,1,0,0,1
1,1,1,1,0,1,1,0,1,0
1,0,1,0,1,0,1,0,1,0
1,1,1,1,1,0,0,1,1,1
1,1,0,1,1,1,0,0,1,0
1,0,1,0,1,1,1,1,1,1
1,0,1,1,0,1,1,1,0,0
1,1,1,1,1,1,0,1,1,1
0,1,0,1,0,1,1,1,0,1
0,0,1,1,1,1,1,0,1,1

Evaluation

Each team has the right to submit the solution of each task once for evaluation. They are awarded with the number of points depending on the number of trees that are alive in the meadow after a given number of generations.