

CTP PROJECT

TITLE :- Control the Virus

Team Members: -

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Problem Statement: -

Designing an efficient method to limit the spread of the virus utilizing limited available resources.

Explanation: -

A virus has gripped a village and is spreading at an alarming rate. With each passing night, the virus multiplies in all four directions. To prevent the spread of this virus, we need to quarantine as many houses affected as possible. Because of limited resources, we can quarantine only a single block of houses in a day.

Motivation: -

Current global crisis has taken a toll on all our lives. Following the pandemic, reducing the effect of the virus was a matter of utmost importance. So, we tried to come up with an idea of quarantining the affected houses thus minimizing the spread of the virus if we had a chance.

Tentative Solution: -

The aim of our project is to quarantine those clusters of infected houses which will have a massive impact on the outspread of the virus. Owing to the limited resources, we will first quarantine that part of the village where the maximum number of houses will be affected overnight. By the next day, the virus must have spread in the other parts of the village. Then, we analyze the condition and repeat the process till all the affected houses have been quarantined.

Coding Approach: - Here we assume a village is an $m \times n$ grid.

In this, we utilize 3 functions:-

- 1.) The first function identifies which cluster of houses should be quarantined first. If there is a tie in the number of houses, the virus will spread to, then we call the second function.
- 2.) The second function is the tie-breaker function. When there is a tie, as mentioned earlier, based on the location, it will identify which cluster of houses to quarantine.
- 3.) Since in one day we can quarantine only one cluster, the third function provides us with where the virus has spread in one night.

So, we take the input in a 2-D array regarding the coordinates of the virus. As mentioned above, we call the three different functions which consist of various loops and conditional statements.

For example: -

	X			X		
	X			X	X	
				X	X	

Based on the above diagram, we quarantine the 5 affected houses on the right.

	X					
X	X	X		X		
X	X	X		X	X	
	X			X	X	

Since the left side couldn't be quarantined the virus has spread overnight. So, now on the next day we quarantine this side. Thus, we have stopped the virus outbreak.

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