**Test cases**

Consider the sprint task **#2 Test initializing environment**

Some of the test cases for this task are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Test case  # | Scenario | Input(s) | Expected output |
| 1 | User views GUI for initializing environment | None | All details for initializing environment should display |
| 2 | User gives meaningful width and height (no more than limit) for initializing environment | Width, Height | The width and height of environment should be same with input data |
| 3 | User gives insignificant width and height (more than limit or strange symbol) for initializing environment | Width, Height | There should appear warning for wrong input |
| 4 | User clicks “Create” button without providing width and height | None | There should appear warning for wrong input |
| 5 | User clicks “Create” button without providing width or height | Single value | There should appear warning for wrong input |

Consider the sprint task **#5 Test GUI for adding open spaces**

Some of the test cases for this task are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Test case  # | Scenario | Input(s) | Expected output |
| 1 | User selects an obstacle by clicking an open space once | Selection using button click | The block is marked as obstacle space |
| 2 | User double click an open space | Selection using double button click on open space | The open space will not change |
| 3 | User double click an obstacle space | Selection using double button click on obstacle space | The obstacle space turns into open space |
| 4 | User triple click an open space | Selection using triple button click on open space | The open space turns into obstacle space |
| 5 | User triple click an obstacle space | Selection using triple button click on obstacle space | The obstacle space turns into open space |
| 6 | User click an open space four times | Selection using button click four times on open space | The open space is still open space |
| 7 | User click an obstacle space four times | Selection using button click four times on obstacle space | The obstacle is still obstacle space |

Consider the sprint task **#7 Test GUI for adding agents**

Some of the test cases for this task are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Test case  # | Scenario | Input(s) | Expected output |
| 1 | Choose one agent in each region | A click to choose agent position | An agent is marked in each region |
| 2 | The number of agent is greater than 1 and less than half the number of spaces. | Multiple clicks to choose agent’s position | Each region has many agents |
| 3 | One region has no agent | None | Error. Each region must have at least one agent. |
| 4 | The number of agent is more than the half of spaces in a region | Multiple clicks to choose agent’s position | Error. The number of agents should less than half of open spaces in each region |
| 5 | Choose two agents at the same position | Click twice on the same open space | Two agents are marked in the open space |

Consider the sprint task **#13 Testing algorithm for moving one step, #15 Testing algorithm for moving multiple steps.**

Some of the test cases for this task are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Test case  # | Scenario | Input(s) | Expected output |
| 1 | The environment has only one region. The region has only one agent. | Agent array, Region matrix, Number of steps | The agent travels all the open spaces then it stops. |
| 2 | The environment has only one region. The region has more than one agent. | Agent array, Region matrix, Number of steps | Agents travel the region at the same time. They have different paths. Once all open spaces are visited, algorithm stops. |
| 3 | The environment has more than one region. Each region has only one agent. | Agent array, Region matrix,  Number of steps | All agents in different regions travel at the same time. Once all open spaces are all visited, the algorithm stops. |
| 4 | The environment has more than one region. Each region has more than one agent. | Agent array, Region matrix, Number of steps | All agents in different a regions travel at the same time. Once all open spaces are all visited, the algorithm stops. |
| 5 | The environment has only one region. The region has only one agent. Enter a number indicates the steps an agent moves. | Agent array, Region matrix, Number of steps | The agent moves a fixed number of steps and stops. The algorithm stops. |
| 6 | The environment has only one region. The region has more than one agent. Enter a number indicates the steps an agent moves. | Agent array, Region matrix, Number of steps | All agents move a fix number of steps and stop. |
| 7 | The environment has more than one region. Each region has only one agent. Enter a number indicates the steps an agent moves. | Agent array, Region matrix, Number of steps | All agents move a fix number of steps and stop. |
| 8 | The environment has more than one region. Each region has more than one agent. Enter a number indicates the steps an agent moves. | Agent array, Region matrix, Number of steps | All agents move a fix number of steps and stop. |

Consider the sprint task **#17 Testing after integrating block view and algorithm of moving one step, #19 Testing after integrating block view and algorithm of moving multiple steps.** Some of the test cases for this task are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Test case  # | Scenario | Input(s) | Expected output |
| 1 | The environment has only one region. The region has only one agent. User executes the program by one step. | Click on “Run step by step” | The agent moves by one step and then stops. Color of visited spaces will change. |
| 2 | The environment has only one region. The region has only one agent. User executes the program by fixed number of steps. | Number of steps, click on “Run” | The agent moves by number of steps and then stops. Color of visited spaces will change. |
| 3 | The environment has only one region. The region has more than one agent. User executes the program by one step. | Click on “Run step by step” | All agents move at the same and move by one step and then stops. They will have different paths. Color of visited spaces will change. |
| 4 | The environment has only one region. The region has more than one agent. User executes the program by fixed number of steps. | Number of steps, click on “Run” | All agents move at the same time and moves by number of steps and then stops. They will have different paths. Color of visited spaces will change. |
| 5 | The environment has more than one region. Each region has only one agent. User executes the program by one step. | Click on “Run step by step” | All agents move at the same and move by one step and then stops. They will have different paths. Color of visited spaces will change. |
| 6 | The environment has more than one region. Each region has only one agent. User executes the program by fixed number of steps. | Number of steps, click on “Run” | All agents move at the same time and moves by number of steps and then stops. They will have different paths. Color of visited spaces will change. |
| 7 | The environment has more than one region. Each region has more than one agent. User executes the program by one step. | Click on “Run step by step” | All agents move at the same and move by one step and then stops. They will have different paths. Color of visited spaces will change. |
| 8 | The environment has more than one region. Each region has more than one agent. User executes the program by fixed number of steps. | Number of steps, click on “Run” | All agents move at the same time and moves by number of steps and then stops. They will have different paths. Color of visited spaces will change. |
| 9 | Choose one agent in each region | A click to choose agent position | An agent is marked in each region |
| 10 | The number of agent is greater than 1 and less than the number of spaces. | Multiple clicks to choose agent’s position | Each region has many agents |
| 11 | One region has no agent | None | Error. Each region must have at least one agent. |
| 12 | The number of agent is more than the half of spaces in a region | Multiple clicks to choose agent’s position | Error. The number of agents should less than half of open spaces in each region |

Consider the sprint task **#22 Testing GUI for graph view**

Some of the test cases for this task are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Test case  # | Scenario | Input(s) | Expected output |
| 1 | User views position of the node in the environment | None | The position of the node in the environment should be displayed by the side of the node. |
| 2 | User views two buttons- one to execute the algorithm step by step and the other to execute the algorithm for a fixed number of times. | None | Two buttons should display in suitable positon |
| 3 | User double clicks a node | Double click on a node | The agents’ details in that node should  display |
| 4 | User click a node | Click on a node | Nothing should display |

Consider the sprint task **#26 Test loading file process**. Some of the test cases for this task are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Test case  # | Scenario | Input(s) | Expected output |
| 1 | User click “Load File” button and choose text file. File contents are meaningful. | File | System will show the block view based on those file contents |
| 2 | User click “Load File” button and choose text file. File contents are insignificant. | File | System will give appropriate error message. |
| 3 | User click “Load File” button and choose any type file except text file. | File | System will give appropriate error message. |
| 4 | User click “Load File” button and choose multiple text files. | Files | System will give appropriate error message. |
| 5 | File content is invalid. One region has no agent | File | Invalid file |
| 6 | File content is invalid. One region has more than half the number of open spaces | File | Invalid file |
| 7 | File content is invalid. Environment size is invalid | File | Invalid file |
| 8 | File content is invalid. Region id is missing | File | Invalid file |
| 9 | File content is invalid. Agent id is missing | File | Invalid file |
| 10 | File content is invalid. Agent position is invalid, agent is not in open space | File | Invalid file |
| 11 | File content is invalid. Open spaces are not connected | File | Invalid file |
| 12 | File format is not correct | File | Invalid file |

Consider the sprint task **#30** **Test algorithm of both moving one step and multiple steps**. Some of the test cases for this task are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Test case  # | Scenario | Input(s) | Expected output |
| 1 | The environment has only one region. The region has only one agent. | File, 1 | The algorithm will return array of agent’s trace. Once target list is empty, and agents all go their target, the algorithm will stop. |
| 2 | The environment has only one region. The region has only one agent. | File, N steps(N>1) | The algorithm will return array of each agent’s trace. Once target list is empty, and agents all go their target, the algorithm will stop |
| 3 | The environment has only one region. The region has more than one agent. | File, 1 | The algorithm will return array of each agent’s trace. Once target list is empty, and agents all go their target, the algorithm will stop |
| 4 | The environment has only one region. The region has more than one agent. | File, N(N>1) | The algorithm will return array of each agent’s trace. Once target list is empty, and agents all go their target, the algorithm will stop |
| 5 | The environment has more than one region. Each region has only one agent. | File, 1 | The algorithm will return array of each agent’s trace. Once target list is empty, and agents all go their target, the algorithm will stop |
| 6 | The environment has more than one region. Each region has only one agent. | File, N(N>1) | The algorithm will return array of each agent’s trace. Once target list is empty, and agents all go their target, the algorithm will stop |
| 7 | The environment has more than one region. Each region has more than one agent. | File, 1 | The algorithm will return array of each agent’s trace. Once target list is empty, and agents all go their target, the algorithm will stop |
| 8 | The environment has more than one region. Each region has more than one agent. | File, N(N>1) | The algorithm will return array of each agent’s trace. Once target list is empty, and agents all go their target, the algorithm will stop |
| 9 | The environment has more than one region. Each region has more than one agent. | File, 0 | Nothing will display. Return error message |
| 10 | The environment has more than one region. Each region has more than one agent. | File, 10000 | The algorithm will visit all open spaces in target list and then stop. It will return array of each agent’s trace. |

Consider the sprint task **#32** **Test after integrating algorithm and block view**. Some of the test cases for this task are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Test case  # | Scenario | Input(s) | Expected output |
| 1 | The environment has only one region. The region has only one agent. | File, 1 | The screen should show agent’s moving trace and the color of trace should change. Once target list is empty, and agents all go their target, the algorithm will stop. |
| 2 | The environment has only one region. The region has only one agent. | File, N steps(N>1) | The screen should show agent’s moving trace and the color of trace should change. Once target list is empty, and agents all go their target, the algorithm will stop |
| 3 | The environment has only one region. The region has more than one agent. | File, 1 | The screen should show agent’s moving trace and the color of trace should change. Once target list is empty, and agents all go their target, the algorithm will stop |
| 4 | The environment has only one region. The region has more than one agent. | File, N(N>1) | The screen should show agent’s moving trace and the color of trace should change. Once target list is empty, and agents all go their target, the algorithm will stop |
| 5 | The environment has more than one region. Each region has only one agent. | File, 1 | The screen should show agent’s moving trace and the color of trace should change. Once target list is empty, and agents all go their target, the algorithm will stop |
| 6 | The environment has more than one region. Each region has only one agent. | File, N(N>1) | The screen should show agent’s moving trace and the color of trace should change. Once target list is empty, and agents all go their target, the algorithm will stop. |
| 7 | The environment has more than one region. Each region has more than one agent. | File, 1 | The screen should show agent’s moving trace and the color of trace should change. Once target list is empty, and agents all go their target, the algorithm will stop |
| 8 | The environment has more than one region. Each region has more than one agent. | File, N(N>1) | The screen should show agent’s moving trace and the color of trace should change. Once target list is empty, and agents all go their target, the algorithm will stop |
| 9 | The environment has more than one region. Each region has more than one agent. | File, 0 | The screen should show error message. |
| 10 | The environment has more than one region. Each region has more than one agent. | File, 10000 | The algorithm will stop. The screen should show agent’s moving trace and the color of trace should change. |

Consider the sprint task **#37** **Test after integrating algorithm and graphical view**. Some of the test cases for this task are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Test case  # | Scenario | Input(s) | Expected output |
| 1 | User views graphical view of one region in the environment. The region has only one agent. | File, 1 | The screen should show agent’s moving trace and the color of trace should change. Once target list is empty, and agents all go their target, the algorithm will stop |
| 2 | User views graphical view of one region in the environment. The region has only one agent. | File, N steps(N>1) | The screen should show agent’s moving trace and the color of trace should change. Once target list is empty, and agents all go their target, the algorithm will stop |
| 3 | User views graphical view of one region in the environment. The region has more than one agents. | File, 1 | The screen should show agent’s moving trace and the color of trace should change. Once target list is empty, and agents all go their target, the algorithm will stop |
| 4 | User views graphical view of one region in the environment. The region has more than one agents. | File, N steps(N>1) | The screen should show agent’s moving trace and the color of trace should change. Once target list is empty, and agents all go their target, the algorithm will stop |
| 5 | The environment has more than one region. Each region has more than one agent. | File, 0 | The screen should show error message. |
| 6 | The environment has more than one region. Each region has more than one agent. | File, 10000 | The algorithm will stop. The screen should show agent’s moving trace and the color of trace should change. |

Consider the sprint task **#46** **Testing searching information based on supported data**. Some of the test cases for this task are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Test case  # | Scenario | Input(s) | Expected output |
| 1 | Users want to search run by date | date | Show run information for specific date |
| 2 | Users want to search run by time (hour & minute) | time (hour & minute) | Show run information for specific time (hour & minute) |
| 3 | Users want to search run by size of the environment | size of the environment | Show run information for specific size of the environment |
| 4 | Users want to search run by number of regions | number of regions | Show run information for specific number of regions |
| 5 | Users want to search run by number of steps for completion | number of steps for completion | Show run information for specific number of steps for completion |
| 6 | Users want to search run by date and time (hour & minute) and size of the environment and number of regions  and number of steps for completion | date, time (hour & minute), size of the environment, number of regions  , number of steps for completion | Show run information based on those data |

Consider the sprint task **#50** **Test Constrained-3 algorithm**. Some of the test cases for this task are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Test case  # | Scenario | Input(s) | Expected output |
| 1 | The environment has one region and the region has (1-[openSpaces/3]) agents | Environment object | Return correct target list and agent path. |
| 2 | The environment has one region and the region has one open space and one agent | Environment object | Return value is null |
| 3 | The environment has more than one region and each region has (1-[openSpaces/3]) agents | Environment object | Return correct target list and agent path. |
| 4 | The environment has more than one region and each region has one open space and one agent | Environment object | Return value is null |

Consider the sprint task **#53** **Test Constrained-4 algorithm**. Some of the test cases for this task are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Test case  # | Scenario | Input(s) | Expected output |
| 1 | The environment has one region and the region has (1-[openSpaces/4]) agents | Environment object | Return correct target list and agent path. |
| 2 | The environment has one region and the region has one open space and one agent | Environment object | Return value is null |
| 3 | The environment has more than one region and each region has (1-[openSpaces/4]) agents | Environment object | Return correct target list and agent path. |
| 4 | The environment has more than one region and each region has one open space and one agent | Environment object | Return value is null |

Consider the sprint task **#56** **Test file validation of Constrained-3 algorithm.** Some of the test cases for this task are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Test case  # | Scenario | Input(s) | Expected output |
| 7 | Environment has one region and the region has no agent | File | Error message that show each region has at least one agent |
| 8 | Environment has one region, the number of agents in that region is [1-n/3] | File | Environment information |
| 9 | Environment has one region, the number of agents in that region is more than [n/3] | File | Error message that show the number of each region is [1-n/3] |
| 10 | Environment has multiple regions; each region has one agent | File | Environment information |
| 11 | Environment has multiple regions, the number of agents in each region is [1-n/3] | File | Environment information |
| 12 | Environment has multiple regions, the number of agents in each region more than [n/3] | File | Error message that show the number of each region is [1-n/3] |

Consider the sprint task **#58 Test file validation of Constrained-4 algorithm.** Some of the test cases for this task are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Test case  # | Scenario | Input(s) | Expected output |
| 13 | Environment has one region and the region has no agent | File | Error message that show each region has at least one agent |
| 14 | Environment has one region, the number of agents in that region is [1-n/4] | File | Environment information |
| 15 | Environment has one region, the number of agents in that region is more than [n/4] | File | Error message that show the number of each region is [1-n/4] |
| 16 | Environment has multiple regions; each region has one agent | File | Environment information |
| 17 | Environment has multiple regions, the number of agents in each region is [1-n/4] | File | Environment information |
| 18 | Environment has multiple regions, the number of agents in each region more than [n/4] | File | Error message that show the number of each region is [1-n/4] |
| 19 | Input file contains agents that don’t placed at the end nodes of the region. | File | Error message: agents initial position error |

Consider the sprint task **#60 Test Constrained-3 algorithm and Constrained-4 in block view**. Some of the test cases for this task are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Test case  # | Scenario | Input(s) | Expected output |
| 1 | For Constrained-3 algorithm, load file successfully and start to run one step | 1 | If the algorithm doesn’t stop, agents in each region move one step. Else, agents in each region will stop. |
| 2 | For Constrained-3 algorithm, load file successfully and start to run N (>1) step | N | If the algorithm doesn’t stop, agents in each region move N steps.  If the algorithm stops at M (M<N) step, agents in each region move M steps |
| 3 | For Constrained-4 algorithm, load file successfully and start to run one step | 1 | If the algorithm doesn’t stop, agents in each region move one step. Else, agents in each region will stop. |
| 4 | For Constrained-4 algorithm, load file successfully and start to run N (>1) step | N | If the algorithm doesn’t stop, agents in each region move N steps.  If the algorithm stops at M (M<N) step, agents in each region move M steps |

Consider the sprint task **#66** **Test Constrained-3 algorithm and Constrained-4 algorithm in graph view**. Some of the test cases for this task are as follows:

|  |  |  |  |
| --- | --- | --- | --- |
| Test case  # | Scenario | Input(s) | Expected output |
| 1 | For Constrained-3 algorithm, load file successfully, choose one region to show graph and run one step | 1 | If the algorithm doesn’t stop, agents in each region move one step. Else, agents in each region will stop. Target list and each agent’s current target will show in graph. |
| 2 | For Constrained-3 algorithm, load file successfully, choose one region to show graph and start to run N (>1) step | N | If the algorithm doesn’t stop, agents in each region move N steps.  If the algorithm stops at M (M<N) step, agents in each region move M steps. Target list and each agent’s current target will show in graph. |
| 3 | For Constrained-4 algorithm, load file successfully, choose one region to show graph and start to run one step | 1 | If the algorithm doesn’t stop, agents in each region move one step. Else, agents in each region will stop. Target list and each agent’s current target will show in graph. |
| 4 | For Constrained-4 algorithm, load file successfully, choose one region to show graph and start to run N (>1) step | N | If the algorithm doesn’t stop, agents in each region move N steps.  If the algorithm stops at M (M<N) step, agents in each region move M steps. Target list and each agent’s current target will show in graph. |