**Use case 1: User want to start simulator**

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| USE CASE 1 | Start Simulator | |
| Goal in Context | User wants to start simulator to run simulation | |
| Scope & Level | Simulator, Summary | |
| Preconditions | User has simulator properly installed, user has access to command-line interface. User knows the location of the world/maze file and script file if he/she wants to provide them. | |
| Success End Condition | Both client side and server of simulator are running, simulator has created environment with user-intended world/maze file, and has access to the user-intended script file. | |
| Failed End Condition | Either client side or server of simulator won’t start,  Simulator doesn’t create environment with intended world/maze file, simulator doesn’t get access to the intended script file. | |
| Primary,  Secondary Actors | User of this simulator | |
| Trigger | User types start simulator command in command-line interface of laptop. | |
| DESCRIPTION | Step | Action |
|  | 1 | User types in simulation command in command-line interface with locations of world/maze file and script file. |
|  | 2 | Simulator locates the world/maze file and simulation script from user command. |
|  | 3 | Simulator checks the world/maze file and script. |
|  | 4 | Simulator builds 3D environment from the world/maze file provided by the user. |
| EXTENSIONS | Step | Branching Action |
|  | 1a | User doesn’t provide world/maze file:  1a1. User select one of the demo word/maze files on UI (use case 5) |
|  | 1b | User doesn’t provide script:  1b1. User select one of the demo scripts on UI (use case 6) |
|  | 2a | User provided a wrong location for world/maze file or script file:  2a1. Simulator show error message of wrong location |
|  | 3a | Simulator found error in world/maze file or script:  3a1.Simulator show error message about the error of the file. |

**Use case 2: User wants to select robot**

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| USE CASE 2 | Select Robot | |
| Goal in Context | User wants to select a robot in the robot list to run simulation | |
| Scope & Level | Simulator, Sub function | |
| Preconditions | Simulator is running, environment has been created, script file is ready. | |
| Success End Condition | Simulator gets the robot model selected by the user and places the robot at user-intended position | |
| Failed End Condition | Simulator doesn’t get the robot model selected by the user, simulator doesn’t place the robot as intended by the user. | |
| Primary,  Secondary Actors | User of this simulator | |
| Trigger | Simulator has got environment ready and script ready. | |
| DESCRIPTION | Step | Action |
|  | 2 | Simulator shows a window with a list of robot models. |
|  | 3 | User select one of the robot by clicking one in the list. |
|  | 4 | User put in the x and y value as the initial coordinates of the robot. |
|  | 5 | Simulator checks the provided coordinates and initialize the robot to the nearest possible position (in case the coordinates conflict with the walls) |
|  | 6 | User checks the position of the robot |
|  | 7 | User clicks “done” button on the robot selection window |
|  | 8 | Simulator closes the robot selection window |
| EXTENSIONS | Step | Branching Action |
|  | 4a | User doesn’t input x nor y values or user only inputs one of x and y.  4a1.Simulator assign the missing value to 0 (using origin as coordinates if neither x or y is provided). |
|  | 5a | X or y value is too large (exceeds the dimensions of floor) or x or y is not a number  5a1. Simulator show error messages |
|  | 6a | User reselect a robot from the robot list  6a1. Simulator replace current robot model with the new selected one. |
|  | 6b | User changes the x or y coordinate of the robot.  6b1.Simulator checks the new coordinates and move the robot to the new spot. |

**Use case 3: User wants to start simulation**

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| USE CASE 3 | Start Simulation | |
| Goal in Context | User wants to start simulation with provided or demo world/maze file, and provided or demo script file. | |
| Scope & Level | Simulator, Primary Task | |
| Preconditions | Simulator is running, simulator has got the user-intended world/maze file and script file, robot has been selected by user. | |
| Success End Condition | Simulator runs simulation per script. | |
| Failed End Condition | Simulator doesn’t run simulation according to script. | |
| Primary,  Secondary Actors | User of this simulator | |
| Trigger | User click “start” button on simulator UI | |
| DESCRIPTION | Step | Action |
|  | 1 | User click “start simulation” button on UI to start the simulation |
|  | 2 | Simulator runs simulation per the script |

**Use case 4: User wants to add errors**

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| USE CASE 4 | Add Errors | |
| Goal in Context | User wants to add errors to simulation to make the simulation more realistic | |
| Scope & Level | Simulator, Sub function | |
| Preconditions | User has selected robot. | |
| Success End Condition | Simulator runs the simulation with error as specified by the user. | |
| Failed End Condition | Simulator doesn’t run the simulation with error as specified by the user. | |
| Primary,  Secondary Actors | User of this simulator | |
| Trigger | User clicks the “add error” button on UI | |
| DESCRIPTION | Step | Action |
|  | 1 | User clicks the “add error” button on UI |
|  | 2 | Simulator shows a list of errors for user to select |
|  | 3 | User select one or more of the errors in the list to add |
|  | 4 | User input the percentage of error in the input box on the side of each error. |
|  | 5 | Simulator applies the errors and percentage for each error to the respective simulation algorithms |
|  | 6 | Simulator show “add error successfully” message |

**Use case 5: User wants to load Environment**

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| USE CASE 5 | Load Environment | |
| Goal in Context | User wants to select from one of the default word/maze files without having to provide one. | |
| Scope & Level | Simulator, Sub function | |
| Preconditions | Both the client side and unity server are running; user has initiated simulation. | |
| Success End Condition | Simulator gets the word/maze file selected by user and builds world environment accordingly | |
| Failed End Condition | Simulator doesn’t get the file; no environment is built. | |
| Primary,  Secondary Actors | User of this simulator | |
| Trigger | User’s simulation command didn’t provide a world/maze file. | |
| DESCRIPTION | Step | Action |
|  | 1 | User types in simulation command without indicating a world/maze file in command-line. |
|  | 2 | Simulator shows a window with a list of pre-defined world/maze files on UI. |
|  | 3 | User select one of the files by clicking one file in the list. |
|  | 4 | Simulator build environment with the selected word/maze file. |
|  | 5 | User inspects the created environment |
|  | 6 | User can reselect another world/maze file in the list |
|  | 7 | After user find the satisfactory word/maze file, user clicks “done” on simulator UI. |
|  | 8 | Simulator closes the selection window. |

**Use case 6: User wants to select one demo script**

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| USE CASE 6 | Select Script | |
| Goal in Context | User wants to select one demo script to run simulation without having to provide one. | |
| Scope & Level | Simulator, Sub function | |
| Preconditions | Both the client side and unity server are running; user has initiated simulation. | |
| Success End Condition | Simulator gets the demo script file selected by user. | |
| Failed End Condition | Simulator doesn’t get script file. | |
| Primary,  Secondary Actors | User of this simulator | |
| Trigger | User’s simulation command didn’t provide a script file. | |
| DESCRIPTION | Step | Action |
|  | 1 | User types in simulation command without indicating a script file in command-line. |
|  | 2 | Simulator shows a window with a list of demo script files on UI. |
|  | 3 | User select one of the files by clicking one file in the list. |
|  | 4 | Simulator closes the selection window. |

**Use case 7: User wants to move camera**

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| USE CASE 7 | Move Camera | |
| Goal in Context | User wants to adjust the view camera during simulation | |
| Scope & Level | Simulator, Sub function | |
| Preconditions | Simulator has started simulation, simulation is running. | |
| Success End Condition | Simulator gets the view camera adjusted according to user control. | |
| Failed End Condition | Simulator doesn’t adjust view camera according to user control. | |
| Primary,  Secondary Actors | User of this simulator | |
| Trigger | User uses mouse dragging during simulation to control view camera. | |
| DESCRIPTION | Step | Action |
|  | 1 | User uses mouse dragging inside simulation window |
|  | 2 | Simulator adjusts simulation view camera according to user’s action. |

**Use case 8: User wants to adjust simulation speed**

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| USE CASE 8 | Adjust Simulation Speed | |
| Goal in Context | User wants to adjust the speed during simulation | |
| Scope & Level | Simulator, Sub function | |
| Preconditions | Simulator has started simulation, simulation is running | |
| Success End Condition | Simulator gets the simulation speed adjusted according to user control. | |
| Failed End Condition | Simulator doesn’t adjust simulation speed according to user control. | |
| Primary,  Secondary Actors | User of this simulator | |
| Trigger | User adjusts the speed control bar in UI during simulation to control speed. | |
| DESCRIPTION | Step | Action |
|  | 1 | User mouse drags the speed control bar during simulation. |
|  | 2 | Simulator adjusts simulation speed per user’s action. |

**Use case 9: User wants to stop simulation**

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| USE CASE 9 | Stop simulation | |
| Goal in Context | User wants to stop during simulation | |
| Scope & Level | Simulator, Sub function | |
| Preconditions | Simulator has started simulation, simulation is running | |
| Success End Condition | Simulator stops the simulation. | |
| Failed End Condition | Simulator doesn’t stop the simulation. | |
| Primary,  Secondary Actors | User of this simulator | |
| Trigger | User clicks stop button during simulation to stop. | |
| DESCRIPTION | Step | Action |
|  | 1 | User clicks stop button in the UI. |
|  | 2 | Simulator stops the simulation. |