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| --- | --- |
| Nouns | Verbs |
| * Grid * Board * Robot * Flags * ~~Board~~ * Positions * Player * ~~Player marker~~ * North * Actions * Locations * Token * ~~Starting position~~ * East * South * West * Flags * Pits * Gears | * ~~Implement (board game)~~ * (board) activates * ~~Race (with robots)~~ * Touch (flags) * ~~(player) gets (first marker)~~ * ~~(players) program (robots)~~ * Move (to starting position) * Move forward (one space) * Back up (one space) * Rotate (90 degrees) left * Rotate (90 degrees) right * U-turn * Wait * ~~(robots) operate (in player order)~~ * ~~(robots) execute (actions)~~ * (location) activates * (token) passes * (space ) is occupied (by robot) * (robot) pushes (another robot) * ~~(~~robot) Moves outside (board) * (robot) destroyed * (flags) notify (game) * ~~(locations) react (to robots)~~ * (robots) enter (location) * (game) tracks (next flag) * ~~(pits) destroy (robot)~~ * ~~(~~gears) rotate (robots) |

**Noun-Verb Analysis**

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| Noun | Verbs |
| * Grid * GridIdentityType * BoardStimulation * Robot * Flags * Location * Player * Actions * LocationType * Token * Pits * Gears * Direction (North/East/South/West) | * Activates (board) * (Robot)Touch (flags) * Move (an action) * (robots) execute (actions) * (locationType) activated * (token) passes * (Location) is occupied (by gridIdentityType) * (robot) destroyed * (locationType) react (to robots) * (boardStimulation) tracks (next flag) * (GridIdentityType) acts * ~~(~~gears) rotate (robots) |

**CRC cards**

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| Grid |  |
| RESPONSIBILITIES   * Arranges Locations in 2D grid | COLLABORATORS   * BoardStimulation * Location |

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| GridIdentityType |  |
| RESPONSIBILITIES   * Has a Location in Grid * Can act | COLLABORATORS   * Grid * GridIdentity hierarchy |

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| Location |  |
| RESPONIBILITIES   * Calculates starting position * Can add GridIdentityTypes * Can remove GridIdentityTypes * Can check who is in it | COLLABORATORS   * GridIdentityType |

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| BoardStimulation |  |
| RESPONSIBILITIES   * Initializes the grid * Keeps track of all GridIndentityType | COLLABORATORS   * Grid * GridIdentityType hierarchy |

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| LocationType (Subtype of GridIdentityType) |  |
| RESPONSIBILITIES   * Activated when robot enters | COLLABORATORS   * Grid * GridIdentityType hierarchy * Robot |

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| Robots(Subtype of GridIdentityType) |  |
| RESPONSIBILITIES   * Executes actions * Pushes robot that are in the same space * Touches flags * Destroyed if outside board/in pit * Push robot in same position | COLLABORATORS   * GridIdentityTypes * Actions * Player |

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| Pits (Subtype of LocationType) |  |
| RESPONSIBILITIES   * Destroys robot (that enters) | COLLABORATORS   * Same as LocationType |

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| Gears (Subtype of LocationType) |  |
| RESPONSIBILITIES   * Rotates robots after action slot is resolved | COLLABORATORS   * Action * Grid * GridIdentityType hierarchy * Robot |

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| Flags (Subtype of LocationType) |  |
| RESPONSIBILITIES   * Notifies BoardStimulation robot has entered | COLLABORATORS   * Grid * GridIdentityType hierarchy * Robot * boardStimulation |

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| Actions |  |
| RESPONSIBILITIES   * Moves robot * Updates location of robot * Passes token to next player when action slot of current player is completed | COLLABORATORS   * GridIdentityType * Player * Location * Token * Grid |

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| Forward (Subtype of Actions) |  |
| RESPONSIBILITIES   * Moves robot forward one space | COLLABORATORS   * Same as Actions |

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| Backward (Subtype of Actions) |  |
| RESPONSIBILITIES   * Moves robot backwards one space | COLLABORATORS   * Same as Actions |

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| RotateRight (Subtype of Actions) |  |
| RESPONSIBILITIES   * Rotates robot 90 degrees to the right | COLLABORATORS   * Same as Actions |

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| RotateLeft (Subtype of Actions) |  |
| RESPONSIBILITIES   * Rotates robot 90 degrees to the left | COLLABORATORS   * Same as Actions |

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| U-turn (Subtype of Actions) |  |
| RESPONSIBILTIES   * Rotates robot 180 degree to the left/right | COLLABORATORS   * Same as Actions |

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| Wait (Subtype of Actions) |  |
| RESPONSIBILITIES   * Doesn’t change position of robot | COLLABORATORS   * Same as Actions |

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| Token |  |
| RESPONSIBILITIES   * Passes token to next player when action slot has been resolved for current player * Allows next player to call an action | COLLABORATORS   * Player |

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| Direction |  |
| RESPONSIBILITIES   * Returns new direction of robot when action rotates robot * Returns new direction when gears rotate robot | COLLABORATORS   * Action * Gears |

Direction (enum type)

+NORTH +SOUTH

+WEST +EAST

Gears

-SlotResolved (boolean)

+ResolvedActionSlot()bool

+rotateRobot()

Pits

+hasRobot()boolean

+setRobotPosition()

+destroyRobot()

LocationType (abstract)

-activated () (boolean)

<<GridIdentityType>>

+act()

Forward

-char F

–completed(bool)

+Forward()

+getRobotID()

+actionCompleted()bool

+passToken()

TOKEN

-nextPlayer

-token (bool)

+passToken()

+nextPlayer()

U-turn

-Char U

-Completed(bool)

-token

+U-turn()

+getRobot()

+passToken()

+actionCompleted()bool

Actions (abstract)

-move()

Backward

-Char B

–completed(bool)

+Backwards()

+getRobotID()

+passToken()

RotateLeft

-Char L

–completed(bool)

+RotateLeft()

+getRobotID()

+passToken()

+actionCompleted()bool

Wait

-Char W

–completed(bool)

+Wait()

+getRobotID()

+passToken()

+actionCompleted()bool

RotateRight

-Char R

–completed(bool)

+RotateRight() (constructor)

+getRobotID()

+passToken()

+actionCompleted()bool

Flags

+hasRobot()bool

+notifyBoard()

Player

-player id -robotID

+remove

+getRobotID()

+setRobotID()

+setPLayerID()

+getPlayerID()

+hastoken()bool

+nextPlayer()

Robot

-flagCount (int)

-StartingPosition (string)

-robot(robotID)

+getrobot(playerID)

+getPosition()

+setPosition()

+touchFlag()

+setWin()

+pushRobot()

+CompletedAction(bool)

Location

-gen(random)

- actors: List<GridIdentityType>

+add(GridIdentityType)

+getRow +getColumn

+getLocation

+remove(GridIdentityType)

+ get(): List<GridIdentityType>

BoardStimulation()

-nextFlag: (flag)

+Startingposition (Location)

+isnextFlag(bool)

Grid

- cells: Location[][] +

+getCell(row, col): Location +getEmptyPositions()

+getRowCount(): int + +getColumnCount(): int