Spaceships & Asteroids Game (AsteroidGame.mch)

Invariant Definitions & Structure Diagram

Invariant Definitions

SpaceshipPosition : GRID

// SpaceshipPosition is a set of points that exist in the grid. It represents the current position of the spaceship on the grid.

NextPosition : GRID

// NextPosition is a set of points that exist in the grid. Used to define where the next position will take the spaceship, to check for asteroids or out of bounds movements.

Asteroids <: ASTEROID_POSITIONS

// Asteroids is the set of grid positions that asteroids are present on. It is used to define the positions on the grid that will cause the spaceship to collide with an asteroid.

AsteroidCollissions : NAT

// AsteroidCollissions is a natural number starting at 0. It represents the number of times that the player has collided with an asteroid during the game.

PowerAmount : -5 .. 200

// PowerAmount is a range of integers from -5 to 200. It represents the remaining power level for the Spaceship. Starts at -5 to maintain the invariant in the event that the user's last remaining move whilst at 5 power hits an asteroid, resulting in a 10 power loss.

HorizontalPosition : NAT1 & HorizontalPosition <= 12

// HorizontalPosition is a natural number starting at 1 and must be less than or equal to 12. Defines the spaceship's current position on a horizontal plane and ensures it cannot travel beyond the grid length.

VerticalPosition : NAT1 & HorizontalPosition <= 7

// VerticalPosition is a natural number starting at 1 and must be less than or equal to 7. Defines the spaceship's current position on a vertical plane and ensures it cannot travel beyond the grid height.

RouteTaken : seq(GRID)

// RouteTaken is a sequence of sets of points that exist in the grid. It is used to list the grid positions that the spaceship has travelled to in order.

GameActive : NAT & GameActive <= 1

// GameActive is a natural number starting at 0 and must be less than or equal to 1. Used to define if the game has been started or not.

Structure Diagram