Spaceships & Asteroids Game (AsteroidGame.mch)

Invariant Definitions & Structure Diagram

Invariant Definitions

SpaceshipPosition: GRID // SpaceshipPosition is a set of points that exist in 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 AsteroidCollissions: NAT // AsteroidCollissions is a natural number starting at 0 PowerAmount: NAT // PowerAmount is a natural number starting at 0 HorizontalPosition: NAT1 & HorizontalPosition <= 12 // HorizontalPosition is a natural number starting at 1 and must be less than or equal to 12 VerticalPosition: NAT1 & HorizontalPosition <= 7 // VerticalPosition is a natural number starting at 1 and must be less than or equal to 7 RouteTaken: seq(GRID) // RouteTaken is a sequence of sets of points that exist in the grid GameActive: NAT & GameActive <= 1 // GameActive is a natural number starting at 0 and must be less than or equal to 1

Structure Diagram

MACHINE AsteroidGame

SETS & CONSTANTS

Direction, Status, MissionError

GRID, HOME_BASE, STAR_BASE, ASTEROID_POSITIONS,
NORMAL_POWERCOST, WARP_POWERCOST, CRASH_POWERCOST, POWER_VALUES

MissionStatus

NewGame

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PROPERTIES

GRID = (1..12) * (1..7) &

HOME_BASE = (1, 1) &

STAR_BASE = (6, 4) &

ASTEROID_POSITIONS = {(3,2),(3,5),(5,4),(6,7),(7,1),(7,7),(8,3),(10,6),(11,2),(12,5)} &

NORMAL_POWERCOST = 5 &

WARP_POWERCOST = 20 &

CRASH_POWERCOST = 10 &

POWER_VALUES = {(100), (125), (150), (175), (200)}
```

WarpDrive

NormalMove

VARIABLES

SpaceshipPosition, NextPosition, Asteroids, AsteroidCollissions, PowerAmount, HorizontalPosition, VerticalPosition, RouteTaken, GameActive

INVARIANT

```
SpaceshipPosition : GRID &
NextPosition : GRID &
Asteroids <: ASTEROID_POSITIONS &
AsteroidCollissions : NAT &
PowerAmount : NAT &
HorizontalPosition : NAT1 & HorizontalPosition <= 12
VerticalPosition : NAT1 & VerticalPosition <= 7 &
RouteTaken : seq(GRID) &
GameActive : NAT & GameActive <= 1
```

RegionsVisited