



INFORMATICS
INSTITUTE OF
TECHNOLOGY

UNIVERSITY OF
WESTMINSTER 

Informatics Institute of Technology

In collaboration with

University of Westminster

BEng. (Hons) in Software Engineering

MODULE: (2023) 6SENG005C.1 Formal Methods

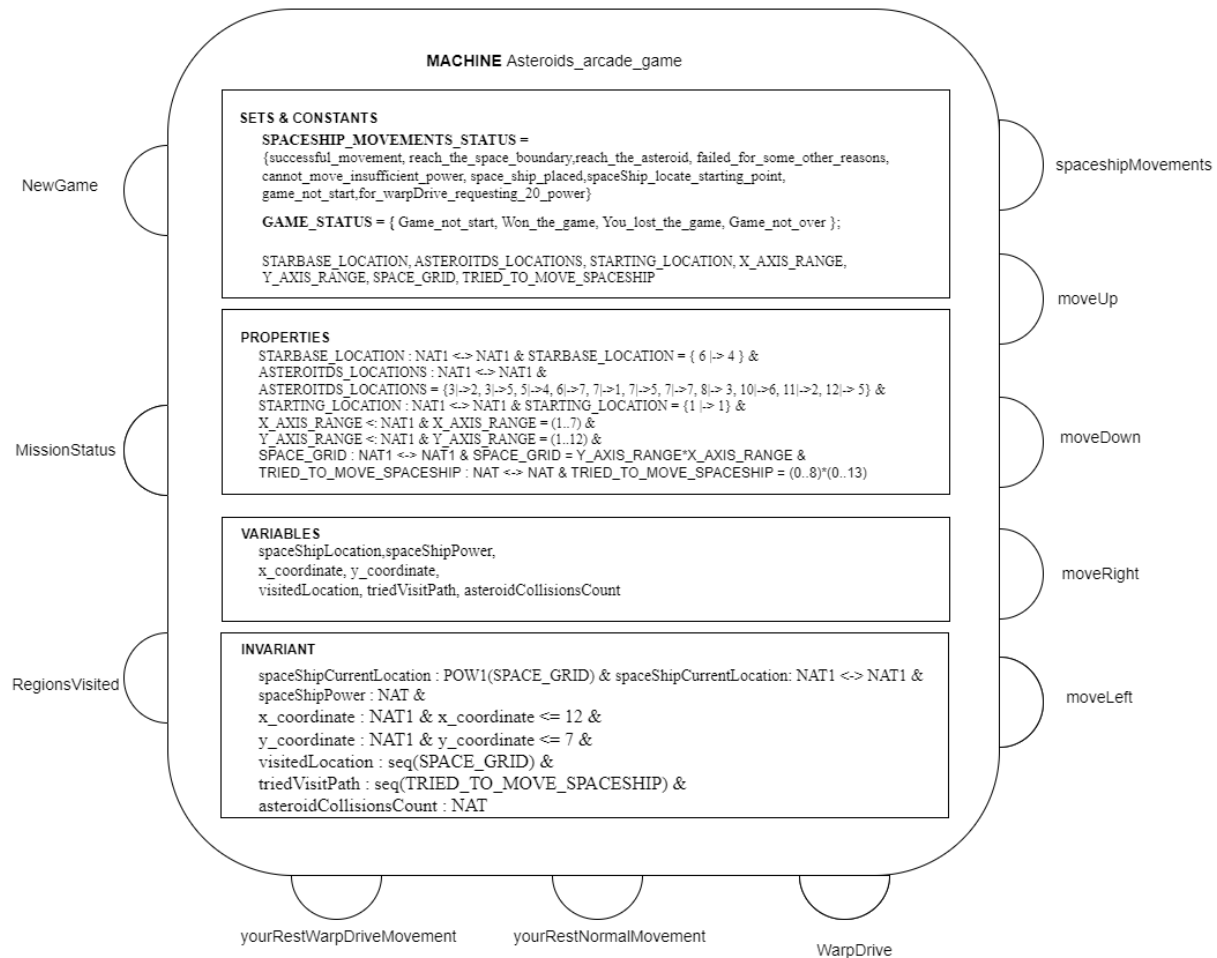
Coursework Report

Name: Undupitiya Appulage Pragathi Sithmini

IIT ID: 20200351

UOW ID: w1810216

Structure Diagram



Link:

https://drive.google.com/file/d/1qW_zlKexj43zAnFVIA6iXjD78x6n7oyP/view?usp=sharing

State Invariant Explanation

Invariant	Definition
spaceShipCurrentLocation : POW1(SPACE_GRID) & spaceShipCurrentLocation: NAT1 <-> NAT1	Map the spaceship location within the space grid using natural numbers, starting from one. The grid should be organized with a sequential arrangement of natural numbers, allowing for a clear representation of the spaceship's position.
spaceShipPower : NAT	Power of the spaceship should be an element of the Natural number set start from 0.
x_coordinate : NAT1 & x_coordinate <= 12	The spaceship's X coordinate should be an element of set of natural numbers start with 1 and it should less than or equal 12.
y_coordinate : NAT1 & y_coordinate <= 7 &	The spaceship's Y coordinate should be an element of set of natural numbers start with 1 and it should less than or equal 7.
visitedLocation : seq(SPACE_GRID)	The visited location of the spaceship should be a sequence of Space Grid. (Regions of Space)
triedVisitPath : seq(TRIED_TO_MOVE_SPACESHIP) &	The path traveled by the spaceship should be represented as a sequence of TRIED_TO_MOVE_SPACESHIP events.
asteroidCollisionsCount : NAT	The count of the asteroid's collisions should be an element of natural number set start from 0.

Discussion

In the context of this coursework, the task involves developing a B machine named "Asteroids_arcade_game." The first step is to define two sets: SPACE_MOVEMENTS_STATUS, and GAME_STATUS, which will play a crucial role in efficiently handling inquiry operation responses. Additionally, seven constants need to be established, representing starbase_location, asteroids_locations, space_grid, starting_location, x_axis_range, y_axis_range and tried_to_move_spaceship. Each of these constants should be given specified types using declared properties.

To integrate these variables into the B machine, they will be utilized in various operations. The coursework requires the implementation of 11 operations, with a focus on managing the spaceship effectively. Specifically, operations such as MoveUp, MoveDown, MoveLeft, MoveRight, and Warp-drive are to be created. These operations will be instrumental in controlling the spaceship's movements within the game.

In the invariant section of the B machine, the task involves articulating the invariant properties of the aforementioned variables. This ensures that the defined sets and constants maintain their integrity and adhere to the specified constraints throughout the execution of the machine.

By systematically incorporating these elements into the B machine, the goal is to create a robust and functional system for an Asteroids arcade game, meeting the coursework requirements effectively.