UNIVERSITY OF WESTMINSTER

INFORMATICS INSTITUTE OF TECHNOLOGY

Institute of Information Technology (IIT)

In Collaboration with

University of Westminster (UoW)

Bachelor of Science (Hons) in Software Engineering

6SENG005W -Formal Methods

Title: Formal Methods – Coursework (2023/24)

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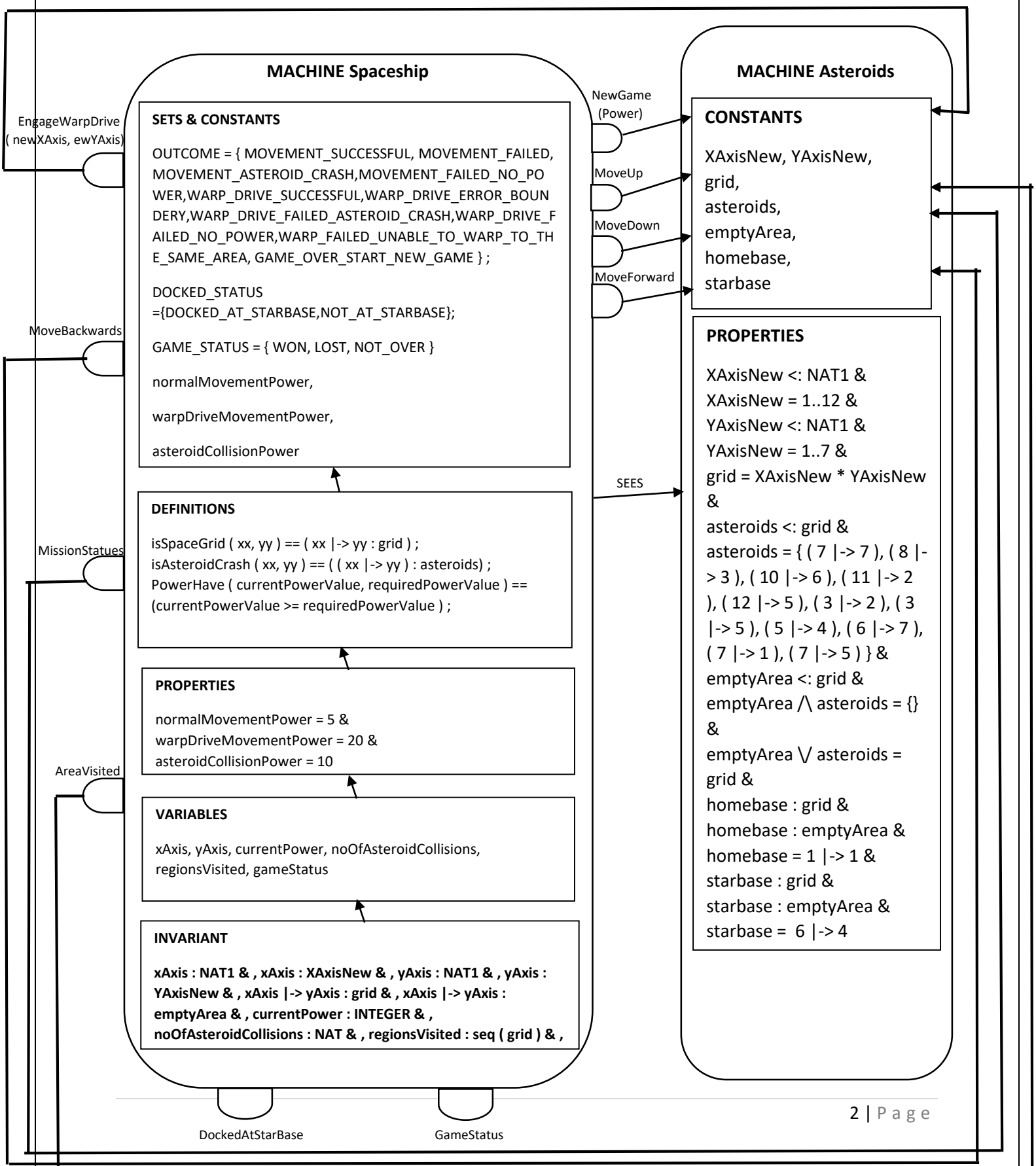
1. The Structure Diagram of Spaceship & Asteroids System B machine



2. Explanation of State of Invariants in Plain English

According to the diagram above showed,

Invariant	Description
xAxis : NAT1 & xAxis : XAxisNew & yAxis : NAT1 & yAxis : YAxisNew & xAxis |-> yAxis : grid & xAxis |-> yAxis : emptyArea &	The current coordinates of the Spaceships (x, y) must always be contained within the Space Region's boundaries. Coordinates must be in a natural form. Values in the x-axis should range from 1 to 12, while values in the y-axis should range from 1 to 7. There should be no asteroids at the current coordinates, leaving empty spaces.
currentPower : INTEGER &	The spaceship's current power should be defined as an integer. Required for the spaceship to move in different directions remains in the currentpower variable. Also it belongs to the natural number set.
regionsVisited : seq (grid) & regionsVisited : seq (emptyArea) &	Sequence of the visited locations (x positions and y positions), in order to maintain track of the All of the spaceship's movements will be recorded initially, along with the locations the spaceship has visited and their coordinates. Consequently, this invariant serves as a list of the locations along the whole game mission route.
noOfAsteroidCollisions : NAT &	The spaceship's total number of collisions encountered with asteroids should be an integer. Stored in the noOfAsteroidCollisions variable. Additionally, it belongs to the natural number set.

These invariants guarantee that during system execution, the system stays in a valid and consistent state. If these requirements are broken, there may have been a mistake made during implementation or an unforeseen circumstance within the system.