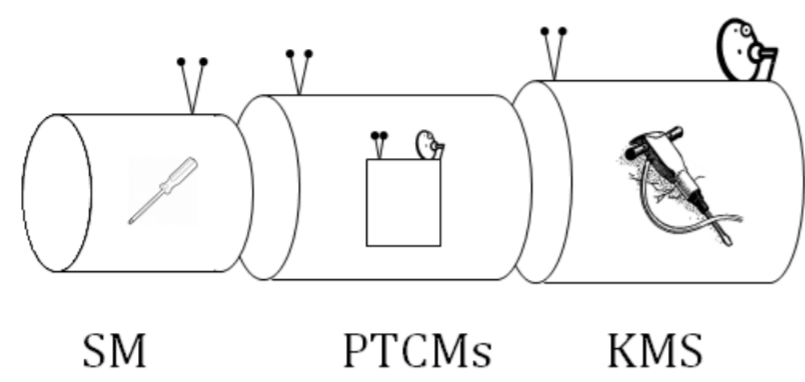


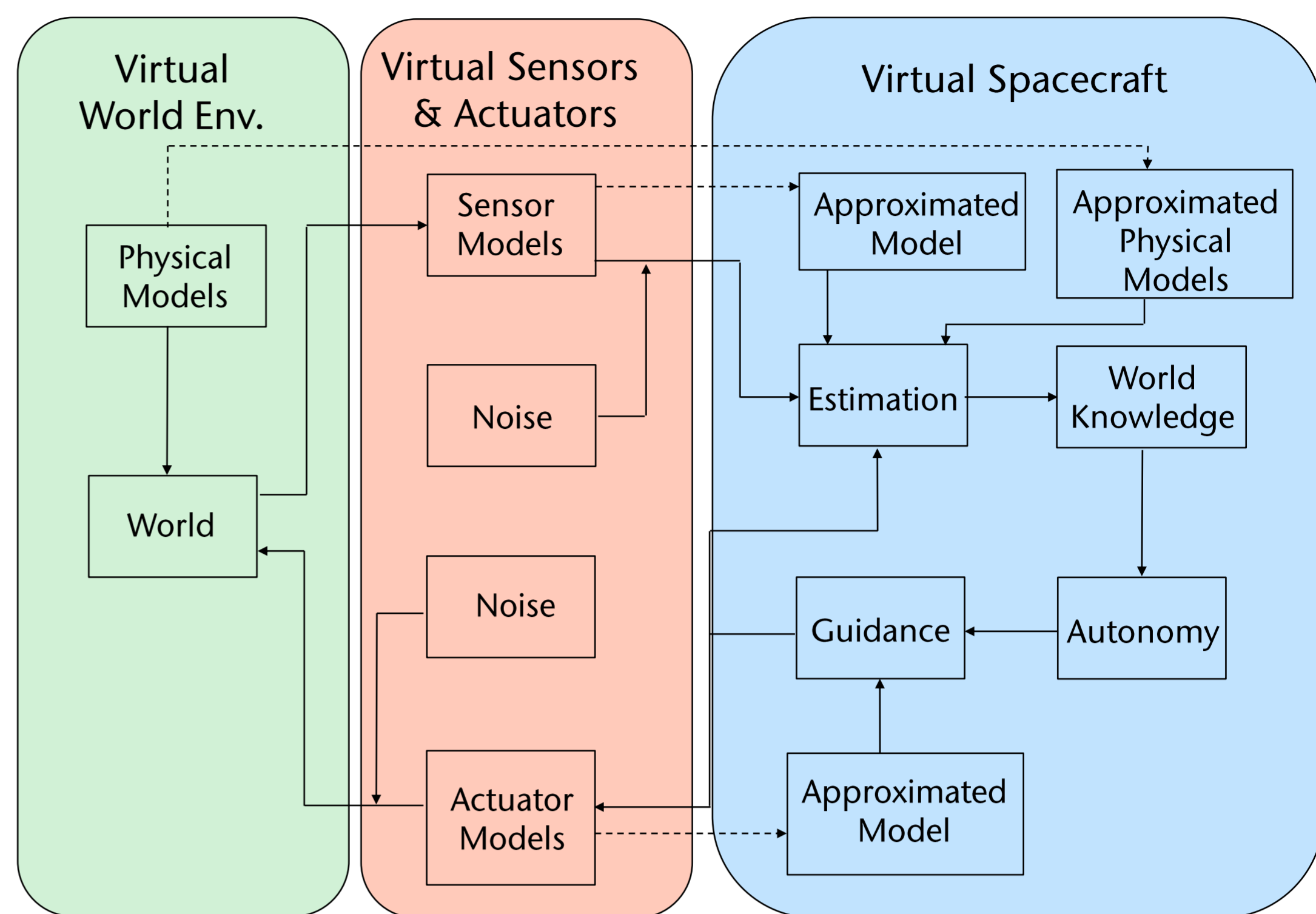
Mission Concept

- Asteroid mining mission targets the asteroids in the Main Belt. It consists of
 - the Mining Spacecraft (KMS)
 - Several Potential Target Characterization Modules (PTCMs)
 - Service & maintenance modules (SM)



PTCMs swarm out to identify suitable objects, the KMS and service & maintenance modules are stationed in a Parking Orbit. The KMS chooses a suitable asteroid and sets itself in motion for mining based on the information collected by all PTCMs.

System Overview



Autonomy

- Highly autonomous system capable of:
 - Plan generation and execution
 - Fault detection, fault isolation and recovery
 - Handling of emergency situations
- Biology-inspired and cognitive motivated strategies for decision-making processes such as:
 - Information gain strategies
 - Active perception

Visualization and Interaction

- Intuitive 3D interaction metaphors
- Massively threaded VR system
- Procedural 3D modelling of asteroids

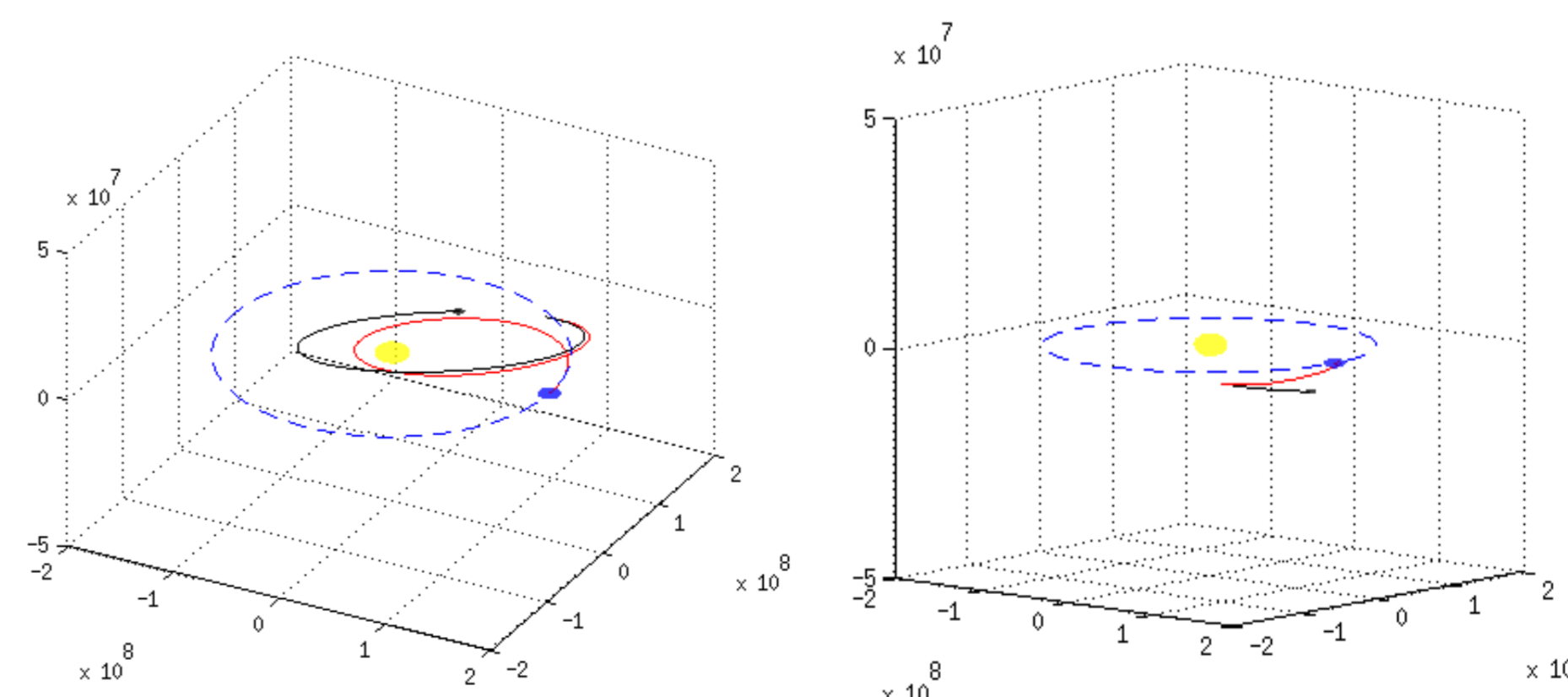


Autonomous Navigation

- The virtual environments helps to develop and verify
 - autonomous proximity navigation techniques (approach, descent and landing) with procedurally generated asteroids
 - autonomous interplanetary navigation strategies (e.g. celestial navigation, pulsar based navigation, etc.)
 - techniques to reconstruct the state of asteroids (e.g., rotation dynamics)
 - algorithms for autonomous surface relative navigation, descent and landing

Optimal Trajectory Planning

- Real-time optimal control of the spacecraft
- Non-linear high-dimensional optimization of the flight trajectories
- Disturbance and parametric sensitivity analysis



Energy- and time-optimal trajectory (red) for rendezvous with asteroid 2003-MH4 (black)