THERMAL SIMULATION PROCESS FOR A MOBILE OBJECT IN A RADIATIVE ENVIRONMENT

Technological advantages
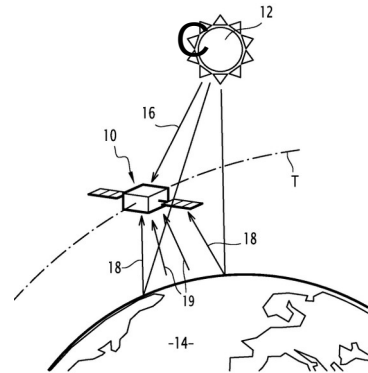
- **Good computational accuracy**
- **Computational times are largely reduced**
- **Thermal simulation can be carried out in real time**

Invention synthesis

The invention presents a process for thermal simulations on a mobile object (such as a satellite) in radiative environment : direct solar fluxes, direct Earth (planetary) fluxes, reflected solar fluxes.

Traditional probabilist methods, generally based on Monte-Carlo, require a large set of computations for all points along the trajectory. This is very costly.

The invention proposes to compute initially for the object nodes for all radiative sources and for all different angular positions a characteristic ratio (using Monte-Carlo method) between the received radiative flux and the direct radiative flux. Then, along the trajectory and for each new angular position (object relative orientation), the direct radiative flux is computed but the effective radiative flux is obtained from the predetermined characteristic ratio. Using a spherical coordinate system, the characteristic ratio may be expressed in an angular based matrix.

Schematic view of a satellite in a radiative environment

(10) Satellite
(12) Solar source
(16) Direct solar radiative fluxes
(18) Reflected radiative fluxes reflected by the Earth
(19) Terrestrial radiative fluxes (IR)
(T) Trajectory

Commercial benefits

- Reduction in the satellite thermal environment.
- Better accuracy in real time reducing margins and thus costs.

Potential applications

- Space domains

Patented invention - under license.