based on the technique of charging and discharging a capacitor through a resistive element to create a train of pulses governed by the capacitor-resistor time constant.

Both types of sensors, which operated successfully over the wide temperature range, have potential use in extreme temperature environments including jet engines and space exploration missions.

◉ Terminal Descent Sensor Simulation

NASA's Jet Propulsion Laboratory, Pasadena, California

Sulcata software simulates the operation of the Mars Science Laboratory (MSL) radar terminal descent sensor (TDS). The program models TDS radar antennas, RF hardware, and digital processing, as well as the physics of scattering from a coherent ground surface. This application is specific to this sensor and is flexible enough to handle end-to-end design validation. Sulcata is a high-fidelity simulation and is used for performance evaluation, anomaly resolution, and design validation.

Within the trajectory frame, almost all internal vectors are represented in whatever coordinate system is used to represent platform position. The trajectory frame must be planet-fixed. The platform body frame is specified relative to arbitrary reference points relative to the platform (spacecraft or test vehicle). Its rotation is a function of time from the trajectory coordinate system specified via dynamics input (file for open loop, callback for closed loop). Orientation of the frame relative to the body is arbitrary, but constant over time.

The TDS frame must have a constant rotation and translation from the platform body frame specified at run time. The DEM frame has an arbitrary, but time-constant, rotation and translation with respect to the simulation frame specified at run time. It has the same orientation as sigma0 frame, but is possibly translated. Surface sigma0 has the same arbitrary rotation and translation as DEM frame.

◉ A Robust Mechanical Sensing System for Unmanned Sea Surface Vehicles

NASA's Jet Propulsion Laboratory, Pasadena, California

The need for autonomous navigation and intelligent control of unmanned sea surface vehicles requires a mechanically robust sensing architecture that is watertight, durable, and insensitive to vibration and shock loading. The sensing system developed here comprises four black and white cameras and a single color camera. The cameras are rigidly mounted to a camera bar that can be reconfigured to mount multiple vehicles, and act as both navigational cameras and application cameras. The cameras are housed in watertight casings to protect them and their electronics from moisture and wave splashes.

Two of the black and white cameras are positioned to provide lateral vision. They are angled away from the front of the vehicle at horizontal angles to provide ideal fields of view for mapping and autonomous navigation. The other two black and white cameras are positioned at an angle into the color camera's field of view to support vehicle applications. These two cameras provide an overlap, as well as a backup to the front camera. The color camera is positioned directly in the middle of the bar, aimed straight ahead. This system is applicable to any sea-going vehicle, both on Earth and in space.