**CD++ Model Data Form**

Title: Solid Propellant Combustion

Type:

Acronym/Short name: Solid Propellant Combustion

Purpose for which Developed: This model was developed to simulate solid propellant combustion for complex-shaped propellant grain.

Other Applications for which it is Suitable:  Any systems that can be represented by a binary cellular space where the cells change state when at least one neighbouring cells is a specific state:

1) S = 0 if cell(0,0) is 1 and number of wall neighbors 0 is > 0;

2) S = remains constant for all other cases.

Date Developed/Implemented: 28 Oct 2020

Domain:

Current Version: 1.0

URL: N/A

Description (including characteristics): The solid propellant combustion model represents the combustion behaviour of a propellant grain cross-section. The cross-section is reproduced into a 2D array of cells. Each cell has three possible states:

• 0: empty (white cells)

• 1: filled with solid propellant (black cells)

• 2: outside of the propellant grain cross-section (grey cells)

The cell's state is influenced by the cell itself and all 8 neighbours. A cell becomes empty when at least one of the neighbouring cells is burning (i.e., empty). The simulation ends once all cells filled with solid propellant are emptied (i.e., no more propellant left). The model simply reproduces the mass loss at every step of the simulation. It simulates a geometry change and is not coupled to physical quantity such as pressure or heat loss that would affect the burn rate. Any complex-shaped propellant grain cross-sections can be used with this model.

Links to Related Documents

Short Title: S. Wurster, T. Fisher, "ICT-Cellular-Combustion-Algorithm (ICCA) Application to the Combustion of Complex Shaped Propellants," In Proceedings of the 45th International Annual Conference of ICT, 2014, pp. 32.1-32.12.

URL:

Description:

Keywords: propellant, form function, burn profile, combustion

Developer:

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| Name: Françoise Blanc | Acronym: |
| Address 1: | [e-mail]: |
| Address 2: |  |
| City: Gatineau | Province/State-Country: QC/Canada |
| Zip  - | Phone:  - - |

Comments: For more information about the model, please refer to the model report (solid\_propellant\_combustion\_model.docx).