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| **Compute Surface Correction Factors:** | | |
| Require: |  | Horizon Parameter |
| Require: |  | PD Material Properties |
| Require: |  | Shear Modulus |
| Require: | Pandas DataFrame Object | Instance that implements required data structure for PD attributes for all points |
| 1. | **for each** material point i in the body **do** |  |
| 2. | Get neighbor indices of material point |  |
| 3. | Compute initial distance, |  |
| 4. | Compute length of the deformed bond, |  |
| 5. | Compute stretch of the deformed bond, |  |
| 6. | Compute Volume Correction Factor, |  |
| 7. | Compute parameter |  |
| 8. | Compute Dilatation Term, |  |
| 9. | Compute Strain Energy Density, |  |
| 10. | Set Surface Correction Factor, |  |

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| **Preprocess with Surface Correction Vectors:** | | |
| Require: |  | Horizon Parameter |
| Require: |  | PD Material Properties |
| Require: | Pandas DataFrame Object | Instance that implements required data structure for PD attributes for all points |
| 1. | **for each** material point i in the body **do** |  |
| 2. | Get neighbor indices of material point |  |
| 3. | Compute Principal Axes for Surface Correction Ellipsoid, |  |
| 4. | Compute initial distance, |  |
| 5. | Compute length of the deformed bond, |  |
| 6. | Compute stretch of the deformed bond, |  |
| 7. | Compute Volume Correction Factor, |  |
| 8. | Compute parameter |  |
| 9. | Compute Dilatation Term, |  |
| 10. | Compute Strain Energy Density, |  |

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| **Compute PD Forces and Iteration with Adaptive Dynamic Relaxation:** | | |
| Require: |  | Horizon Parameter |
| Require: |  | PD Material Properties |
| Require: | Pandas DataFrame Object | Instance that implements required data structure for PD attributes for all points |
| 1. | **for each** iteration between 1 to max. iter. **do** |  |
| 2. | **for each** material point i in the body **do** |  |
| 3. | Get neighbor indices of material point |  |
| 4. | Compute Principal Axes for Surface Correction Ellipsoid, |  |
| 5. | Compute initial distance, |  |
| 6. | Compute length of the deformed bond, |  |
| 7. | Compute stretch of the deformed bond, |  |
| 8. | Compute Volume Correction Factor, |  |
| 9. | Compute parameter |  |
| 10. | Compute PD Force |  |
| 11. | Compute PD Force |  |
| 12. | Summation of PD Forces |  |
| 13 | Compute Elements of Stiffness Matrix, |  |
| 14. | Compute Diagonal Element of Density Matrix, |  |
| 15. | Initialize |  |
| 16. | **for each** material point i in the body **do** |  |
| 17. | Compute Diagonal Element of Local Stiffness Matrix, |  |
| 18. | Update Numerator and Denominator parts of |  |
| 19. | Update Damping Coefficient |  |
| 20. | **for each** material point i in the body **do** |  |
| 21. | **if** 1st iteration then, **do** |  |
| 22. | Compute |  |
| 23. | **else, do** |  |
| 24. | Compute |  |
| 25. | Compute |  |
| 26. | Store |  |