**Homework #3: Detonations**

***All students should do problem 1, problems 2-5 are assigned below****.*

Goal: To understand the relationship between detonation velocity, temperature, and pressure and various initial parameters.

**For all cases, compare to experimental data. See for example Lewis and von Elbe. Compare final concentrations to equilibrium.**

There is a new webpage for the Detonation package for Cantera <http://shepherd.caltech.edu/EDL/PublicResources/sdt/> and you can download the zip file and instructions for installation, plus a number of cti or yaml files with the most recent mechanisms and thermodynamics.

1. For a stoichiometric mixture of methane and oxygen, calculate (by hand) the detonation velocity ignoring all dissociation. Compare to answer predicted by the Detonation package using (a) only the species you included (b) all species.

For the following fuels with air and/or oxygen and appropriate diluent,

1. Compare detonation velocity and other parameters to experimental data
2. Determine the variation of detonation velocity, final pressure, and final temperature as a function of equivalence ratio.
3. Examine the effect of initial temperature and pressure on the results.
4. Compare to equilibrium results of Cantera.
5. Hydrogen

(a)-(d) above

1. Methane (a)-(d) above
2. Propane (a)-(d) above
3. Consider a fuel-oxygen mixture in stoichiometric proportions. Examine the effect of adding nitrogen, helium, and argon and other diluents on the detonation pressure, temperature, and velocity. Choose your fuel such that you can compare to experimental data. Explain why each diluent affects the results in a certain way.

**Assignments** **Grade**

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| --- | --- | --- |
| Quinten, Ameya, Ganesh | 2 | 2, 1\* |
| Joshua, Gabriel, Caelix | 3, 1\* | 3 |
| Ethan, Robert, Tullie | 4 | 4 |
| Isha, Ty | 5 | 5 |

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| --- | --- |
| Presentation | 90% |
| #1 | 10% |

\*indicates team responsible for presentation