### Installation

* Follow CoolProp guide[A] instructions to install CoolProp before installing Cantera
* Download Cantera 2.6.0 x64 from the .msi file at the [GitHub download link](https://github.com/Cantera/cantera/releases)[1]
* Run the installer, just hit “enter” without changing the settings from the defaults
  + Override safety warnings
* Open MATLAB
* Navigate to the “Home” tab in the far top left
* Go to the environment tab in the center-right of the banner
* Click “Set Path”
* Click “Add with Subfolders”
* Navigate through the file path *OS:>Program Files>Cantera>matlab>toolbox*
* Select the *toolbox* folder and then click “select folder” in the bottom right
* Click “Save” and then “Close”
* Test software in command prompt with line “gas1 = GRI30”

### GRI30 Gas Object Initialization

For our purposes, we will primarily be using the mixture object GRI30. GRI30 is commonly used for natural gas combustion, but since our fuel is a hydrocarbon and our oxidizer contains only nitrogen and oxygen (commonly found in air), this software supports any species which can be reasonably expected within the working fluid. These can be initialized in the following fashion:

*gasName = GRI30;*

This will initialize hydrogen gas. The properties of the gas can be changed in a similar fashion to CoolProp using the *set()* function, following the syntax below:

*set(gasName, “inputProperty”, inputValue… …”inputProperty”, inputValue)*

Supported input values can be found in the [Cantera documentation](https://cantera.org/documentation/docs-2.6/sphinx/html/matlab/thermodynamics.html)[2]. Cantera’s CEA can be implemented using the *equilibrate()* function as follows:

*outputGas = equilibrate(inputGas, ‘HP’)*

…where *outputGas* stores the gas object after the reaction, and *input* gas is the gas at the initial temperature, pressure, composition, etc., and *‘HP’* specifies fixed reaction at fixed enthalpy and pressure. The exhaust properties can then be obtained using functions such as *temperature(outputGas)*, *meanMolecularWeight(outputGas)*, *viscosity(outputGas)*, *thermalConductivity(outputGas)*, *cp\_mass(outputGas)*, *cv\_mass(outputGas)*, etc…

## References and Sources

[1] [Cantera GitHub Download](https://github.com/Cantera/cantera/releases)

[2] [Cantera Gas Properties Documentation](https://cantera.org/documentation/docs-2.6/sphinx/html/matlab/thermodynamics.html)