Dissertation Notes

# Decoupled Scheme

3/6/15

* Complex Jacobian checker is known to work for generic gas path (without decoupling)
  + Required significant overhaul of scheme to allow the perturbation to affect all stored values
  + Rewrote new interface to thermo (thermodynamics.f90), in thermo\_gen.f90, allowing a single node to be recomputed and all aux variables and conserved variables updated in qnode
* Using Roe FDS, the Decoupled scheme complex jacobian is exact for single species.
  + For second order accuracy, without limiters (flux or eigenvalue)
  + TO DO: modify the complex jacobian checker to test the decoupled jacobians, like they currently do for the turbulence jacobians
* Decoupled scheme is shown to work for 5 km/s inviscid sphere case, with chemical reactions and 2nd order reconstruction (one-temperature model)
* Implemented minmod\_gg with heuristic pressure limiter (called hminmod\_gg). Provided significantly better convergence and stability for high-speed, 2nd order cases
* Updated pressure closure BC used by tangency boundary condition to include exact linearization of the RHS
  + Note: this is actually an element-based BC hiding amongst the node-based BC’s in bc\_inviscid.f90.
  + TO DO: move 3000 BC to bc\_element\_based.f90
* Error in viscous jacobian due to lack of viscous jacobian viscosity derivatives
  + TO DO: implement viscosity/diffusivity derivatives into viscous jacobian for decoupled scheme
    - Should minimized dependence on species densities for viscosity:



* + - The same should be true for diffusivity ()