Master Thesis

Numerical investigation of the effect of plasma on spark ignition

Ignition process is rather important in practical combustion devices in terms of improvement of performance, increase of flame stability and reduction of emissions. In engines and gas turbines, spark ignition initiates the flame kernel and influences its development. For example, experiments already show that the early flame phase is very important for the spark ignition engine, especially for combustion stability, which is one of the biggest challenges in the optimization of engine performance. Therefore, there is a great need to understand the ignition and the early flame development process.

In the spark ignition process, the electric discharge energy is spent on ionization, excitation and dissociation of molecules. The generated plasma can modify combustion process in several different ways. For instance, plasma can rapidly raise mixture temperature via energy transfer from electrons to neutral molecules. It can also produce active radicals and reactive species, which are the controlling parameters for the combustion process. In this study we will investigate the effect of plasma on the ignition process, especially the influence of plasma generated radicals.

Tasks
- Implementation of plasma kinetics
- 0D/2D simulations of spark ignition
- Analysis of the influence of plasma kinetics on ignition process

Requirements
- Interest in programming
- Experience with Linux desirable
- Self-motivation & commitment

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