Numerical Reconstruction of Flow Fields in IC Engine

Relevance to the Automotive Industry:	With the increased demand for "greener" / low emission engines as well as the need for higher efficiency in order to reduce our nations dependence on foreign oil it is imperative to develop technologies that enable us to investigate and analyze the physical processes in combustion engines. Therefore, the characterization of the full three dimensional flow field and possibly the dynamics of spray atomization and of the fuel injection process in the internal combustion engine is paramount importance for the improvement of existing designs as well the development of novel ones.	
Research Location:	TUD	VT Advanced Experimental Thermofluids Engineering Reserach (AEThER) Laboratory
Homepage (Engl.):		http://www.me.vt.edu/AEThER/
Faculty Mentor:		Prof. Pavlos Vlachos, Ph.D.
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Graduate Mentor:		Sam Raben, MS
Graduate Mentor Email:		sraben@vt.edu
Project Description: Jun 1 - Jul 29, 2009; (8 weeks, 40h/week)	With the growth of computational power over recent years, highly advanced and highly resolved experimental measurement techniques have become increasingly more popular. One specific technique uses a coherent light source to create interference wave off of a reflected object. If these waves are captured using a digital camera the resulting image is a hologram. Through a process called numerical reconstruction, these images can be used to determine an objects' three-dimensional shape and location. The objective of this project is to combine this technique with high magnification optics and an endoscopic imaging system in order to enable three-dimensional three-component measurements of a flow velocity field within contained inaccessible domains like inside of an IC engine. Specifically the Research program will be as follows: At VT the student will perform Holographic Particle Image Velocimetry using a high magnification borescope. The aim of this research is to demonstrate the capability of making highly resolved measurements inside of an IC engine.	
Necessary Skills/ Knowledge:	• Working/basic knowledge of Matlab, CAD, introductory fluids courses	
Desirable Skills/ Knowledge:	• LabView, Tecplot, introductory optics	
Additional Online Resource:		

NSF REU Students must have completed at least two semesters of engineering studies prior to the proposed summer research, and they must have at least one semester remaining before they can earn their BS in Engineering.