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Graphical User Interface for Supersonic Flow and Shock Waves in a Converging-Diverging Nozzle¹ JENNIFER SCHOMMER, KEITH STEIN, BENJAMIN HEPPNER, Bethel University — A graphical user interface (GUI) is developed to study the compressible flow in a converging-diverging (CD) nozzle. Related experiments are carried out with a small supersonic blowdown tunnel in the Bethel University physics department. The tunnel is constructed with two 5-gallon pressure tanks which are connected by a CD nozzle. Flow in the nozzle goes through three stages during the operation of the blowdown tunnel. The first stage is highly transient and culminates with the development of the quasi-static flow condition throughout the nozzle. In the second stage, flow is fully developed with sufficient driving pressure to sustain supersonic flow in the entire divergent section of the nozzle. In the final stage, the driving pressure is no longer sufficient and a normal shock recedes from the exit of the nozzle to the throat. The GUI is created with MATLAB and focuses on modeling the second and third stage of the flow in the nozzle. Modeling in stage two is based on a 1D isentropic flow assumption, whereas stage three is based on 1D isentropic flow along with normal shock relations. Additional functions of the GUI are being implemented to allow for side-by-side comparisons between simulation and ongoing experiments.

¹Minnesota Space Grant Consortium

Keith Stein
Bethel University

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