

Design of a Traversing Arduino Pitot Tube for the Low-speed Wind Tunnel of KDU

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The educational wind tunnel presently available at Kotelawala Defence University renders readings of pressure via a 24-tube multi-tube manometer. However, readings thus obtained are subject to observer and instrumental error. The present work addresses these issues with the aim of obtaining finer readings to yield far accurate flow measurements. Since the design of the test section permits mounting of a pitot static tube at midpoint with very little flexibility of movement in the direction of the flow, a special apparatus was designed to incorporate a traversing pitot tube with an Arduino-based pressure indicating system, thereby replacing the conventional manometer. The aerodynamic performance of the designed apparatus was examined through Computational Fluid Dynamics simulations. It was found that the presence of the additional apparatus imposed minimum increase turbulence in the streamwise direction. The Arduino-based pressure sensing system was developed to obtain numerical readings of pressure and velocity without additional manual calculations. The designed system was used to measure the dynamic pressure variation inside the test section, which shows acceptable variations in the order of 0.4%. Further the readings obtained with the device vary from that of the clean test section with rigid pitot tube in the order of 5-7%, which is acceptable. The data generated will enable future users to make necessary corrections to results obtained during experiments.

Keywords: Arduino-based pressure sensor; Computational Fluid Dynamics; manometer; Pitot-tube; turbulence; wind tunnel