

Chapter 5

Data Acquisition Using NI LabVIEW for Test Automation

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ABSTRACT

In a fighter aircraft, the pilot's safety is of utmost importance, and the pressure sensing in the pilot's mask is essential for ensuring the pilot's safety. This innovative solution ensures the swift and accurate measurement of pressure, minimizing the risk of potential hazards and enhancing military aviation safety. Additionally, it provides a robust and reliable solution that can withstand the harsh and challenging conditions often encountered in the field. This chapter explores the advanced capabilities and benefits of utilizing the National Instrument USB-6363, programmed with LabVIEW, in military aviation, highlighting its potential for revolutionizing pressure measurement processes in this critical field. It describes a research study on developing a pressure-sensing system for pilot masks using NI USB 6363 and LabVIEW.

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1. INTRODUCTION

The pilot mask is a key component in a fighter aircraft designed to provide the pilot with breathing air while protecting them from dangerous gasses, smoke, and debris, particularly concerning the functioning of its oxygen system (Alajmi and Khan, 2013). Oxygen system malfunctioning can be disastrous and put pilots' lives at risk (Alharbi et al., 2020). The pressure within the pilot's mask is an important parameter that must be maintained to ensure the pilot's safety. Any abnormal pressure conditions can result in Hypoxia, which is a life-threatening condition caused by a lack of oxygen supply in the body; it can significantly impair the cognitive and physical abilities of pilots, leading to a potential loss of control of the aircraft (Banu et al., 2022). As a result, it is essential to develop a pressure-sensing system for pilot masks that can accurately detect pressure and oxygen system malfunctions and warn the pilot promptly in case of any abnormal conditions (Burangadda et al., 2022). The proposed system is based on NI USB-6363, which offers precise measurements and is a reliable solution (Chopra et al., 2022).

1.1. Problem Formulation

This project aims to propose an innovative solution using the National Instrument USB 6363 and LabView programming for more effective live simulations in various industrial applications (Chumbley et al., 2017). The goal is to interface Pressure Sensors with more functionality, ensuring reliable and accurate measurements with a simplified design (Deepa et al., 2022). A simpler control panel using a GUI will also be developed for ease of maintenance (Fan et al., 2018).

The proposed solution will provide better data visualization on the LabView Dashboard, allowing for easier monitoring and analysis of various data parameters (Fazil et al., 2023). The ultimate objective is to develop a reliable solution with more live simulation capabilities for future reference, enhancing safety and operational efficiency (Gowtham et al., 2022). This problem formulation outlines the critical requirements and objectives of the project, setting the stage for subsequent sections that will focus on the implementation, testing, and evaluation of the innovative solution (Jain et al., 2022).

1.2. Problem Identification

The breathing analysis of pilots is critical in ensuring their safety during flight (Khan, 2016). According to our analysis, the use of pressure as a primary attribute with NI USB6363 to indicate the malfunctioning of oxygen systems in fighter aircraft and to determine aircraft altitude (Khan, 2021a). By analyzing breathing patterns, the system can warn pilots of potential hypoxia threats and prevent dangerous situations (Reddy et al., 2022a). The report addresses the problem of ensuring the safety of pilots in fighter aircraft by providing a reliable system for breathing analysis using pressure as a primary attribute (Khan, 2021b).

1.3. Problem Statement and Objectives

The objective is to propose a solution for ensuring the safety of pilots in fighter aircraft by analyzing their breathing patterns using pressure as a primary attribute (Kim et al., 2019). The proposed solution aims to achieve the following goals:

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