Tracking People and Trouble in an Airport Environment

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Products Used:

LabVIEW® and DAQ

Abstract

Two LabVIEW-based products were created to meet the needs of (a) tracking the volume of people and (b) detecting manually triggered 'alert buttons' within an airport environment

The Challenge

Using LabVIEW, Timing I/O cards, a Digital I/O card, custom hardware and two PCs to acquire signals.

The Solution

Two LabVIEW-based products exist to meet the needs of (a) tracking the volume of people and (b) detecting manually triggered 'panic buttons' within an airport environment.

The products address the needs for collecting, storing, and processing data in central locations. Design goals included (a) the concept of a 'base' system with easy expandability for future growth, (b) reliable, off-the-shelf hardware, and (c) a software 'engine' which performs the necessary functions and is configurable by an end user via a single, intuitive configuration screen. LabVIEW was selected as the programming language primarily for its ease of use and its built-in interfaces for the data acquisition hardware.

The People Counter System

Everyone is familiar with the rush of crowds at airports on any given day, as tens of thousands of people rush from point to point attempting to make connections, keep track of their family members and luggage, grab a bite to eat, and shop. While in the thick of this scene, it is difficult to see the patterns that exist; the general flow of people at given times in given places. The information is there, however, and the People Counter System provides a way to collect that information and, more importantly, prepare useful reports which allow airport authorities, vendors, and others to plan effectively based on this flow of people.

The People Counter System includes an off-the-shelf PC running LabVIEW for Windows, and Lotus 1-2-3 (which is used to generate the reports), 5 National Instruments PC-TIO-10 counter/timer boards, and an expansion chassis for the PC-TIO-10 boards. The software continually displays and logs total counts (Year to Date, Current Month, and Current Day) of people passing by strategically located sensors throughout the airport. Data collection is performed via a background task launched from within the main LabVIEW code. This task continually polls the counters, converts the raw counts to meaningful data based on a user entered wiring map (which links sensors to specific concourses within the airport) and logs the data to a file. Further, the software was designed to reduce the need for the operator to deal with the operating system by including functionality for backing up/restoring data, formatting a disk, setting the date and time and checking disk usage. Then there are the reports.

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As many developers have learned, generating printed reports is not a strength of LabVIEW. The work around for this was to utilize the spreadsheet program Lotus 1-2-3 for formatting data and printing. Utilizing the Dynamic Data Exchange (DDE) VIs within LabVIEW and developer defined reports, data is placed on spreadsheets, saved to file, and printed - all without operator action. The operator simply selects the type of report (daily, monthly, year to date) and the range to be displayed (i.e. a block of

hours, specific concourses, specific days or months), the number of copies, and the software does the rest. Imagine the usefulness to the food vendor in knowing how many people traveled down his concourse between 5p.m. and 8p.m. on a specific day, week or month!

The Flex Response System

As we are all familiar with the crowds at airports, so too are we familiar with the metal detectors and x-ray machines. There is no doubting the importance of this equipment, or the information it provides. The Flex Response System comes into play when airport security notices a potential threat and triggers an 'alert button'. It is a central processor for the many 'alert buttons' located near the metal detectors. When pressed, these buttons cause a contact closure which results in visual and audio alarms at the command station.

The current configuration consists of an off-the-shelf rack mount computer system, a rack mount Uninterruptible Power Supply, a custom interface panel with audible and visible alarm indicators, a Laser printer, a National Instruments DIO-96, and custom LabVIEW software. Again, a LabVIEW - NI DAQ hardware solution was used due to the ease of software development and the pre-existing VIs available within LabVIEW for interfacing with NI hardware.

The software provides the following functionality: (a) configuration, (b) data logging, (c) test, (d) alarm acknowledgment, (e) alarm silencing, and (f) report generation. The configuration function allows an operator to create/edit a configuration file mapping the different inputs to various location throughout the airport. With a configuration in place, a background task is used to log all alarm occurrences. The test option allows an operator to select a particular sensor for operational verification; a twice daily requirement. As with all other alarm data, test data is logged for future use, should the system functionality ever come into question and airport authorities need to demonstrate that fact to the FAA.

Additional logged information includes an action and resolution for each alarm detected. As with any product logging important information, a report option exists allowing generation of all alarm activity, actions, and resolution during a selected period of time. Unlike the People Counter System, this report is actually created using a LabVIEW VI which is setup to print when finished executing; a text box is populated with the necessary information, the VI ends, and a report is printed. Finally, the system contains a network card which allows data collected during tests to be immediately transferred to other systems for analysis and archiving.

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