Design of a Standard Weather Data Acquisition Device for the Federal University of Technology, Akure Nigeria

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Abstract : Data acquisition (DAQ) is the process by which physical phenomena from the real world are transformed into an electrical signal(s) that are measured and converted into a digital format for processing, analysis, and storage by a computer. The DAQ is designed using PIC18F4550 microcontroller, communicating with Personal Computer (PC) through USB (Universal Serial Bus). The research deployed initial knowledge of data acquisition system and embedded system to develop a weather data acquisition device using LM35 sensor to measure weather parameters and the use of Artificial Intelligence(Artificial Neural Network - ANN)and statistical approach(Autoregressive Integrated Moving Average – ARIMA) to predict precipitation (rainfall). The device is placed by a standard device in the Department of Meteorology, Federal University of Technology, Akure (FUTA) to know the performance evaluation of the device. Both devices (standard and designed) were subjected to 180 days with the same atmospheric condition for data mining (temperature, relative humidity, and pressure). The acquired data is trained in MATLAB R2012b environment using ANN, and ARIMAto predict precipitation (rainfall). Root Mean Square Error (RMSE), Mean Absolute Error (MAE), Correction Square (R2), and Mean Percentage Error (MPE) was deplored as standardize evaluation to know the performance of the models in the prediction of precipitation. The results from the working of the developed device show that the device has an efficiency of 96% and is also compatible with Personal Computer (PC) and laptops. The simulation result for acquired data shows that ANN models precipitation (rainfall) prediction for two months (May and June 2017) revealed a disparity error of 1.59%; while ARIMA is 2.63%, respectively. The device will be useful in research, practical laboratories, and industrial environments.
Keywords : data acquisition system, design device, weather development, predict precipitation and (FUTA) standard device
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