

Abstract

Author

David Felipe Figueroa Angulo

Title of Thesis

Design, Development, Set up and Verification of a System to Produce Artificial Pulse Waves

Keywords

Arterial pulse wave, Cardiovascular system, PulseWave Velocity (PWV), Noninvasive Blood Pressure (NIBP) measurement, Boyle-Mariotte Law, Development, LabVIEW, MATLAB.

Abstract

Cardiovascular diseases are affecting a large number of the population. A high mortality rate is associated with them, being this a worldwide concern. The development and improvement of technology in this area, is a major focal point of researchers.

This work presents a system for generating and measuring pulse waves. The system is able to produce a negative pressure step, which makes a pressure change of approximately 15 mmHg. The system uses a linear actuator, a latex membrane and a container to generate the pressure step. The membrane is attached to the container, then it is pushed and released to generate the step. The step is applied and measured on the upper arm using a cuff filled with air. The effect of the step traveling through the brachial artery is measured with a second cuff filled with air on the wrist. The measurements are taken by differential pressure sensors of the series 144S-BARO. The pressure sensors along with the arm cuffs are used to detect and measure the arterial pressure waveform. The Data acquisition (DAQ) is carried out using a NI USB-6009 DAQ card from National Instruments (NI). The data is acquired simultaneously and stored for further analysis using MATLAB. The signals are denoised using a Butterworth low-pass filter of third order with a cut-off frequency of 10 Hz. The signal acquired from the wrist cuff, where the traveling pulse is measured, is analyzed using signal averaging.