

# A Portable Android Based Detection System of Prevalent Chronic Respiratory Illnesses

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Chronic Obstructive Pulmonary Disease (COPD) is the third leading cause of death in the world. The need exists to develop an innovative device to proactively detect the disease without the administration of a qualified health professional. This sparked the interest to develop a Pulmonary Function Analyzer, LungAware, an innovative android application integrated with an Arduino microcontroller, pressure sensor, a Bluetooth Low Energy link, and a mechanical spirometer that was 3D printed. By measuring a pressure differential using the sensor and the flow of air through the spirometer, an accurate flow was derived using a calibration procedure. The pressure differential is calculated by the sensor, then the analog to digital Converter converts this and is monitored by the microcontroller. The collected data is then transmitted to the Android application wirelessly. The received data is graphed as flow rate vs. time in realtime. Using integration principles and various computational capabilities of the device, FEV1, FVC and other lung metrics are calculated. Based on information from the user, expected lung metrics are determined through regression equations and algorithms are implemented. The observed lung metrics, expected metrics, and disease standards are compared and through a series of various analyses, the severity, percentages, and other statistics of any of the five diseases is presented to the user. The five diseases that were detected by the application were asthma, emphysema, chronic bronchitis, restrictive lung disease, and levels of COPD. The three part system that was developed met the goals of affordability, portability, and efficiency.

## Awards Won:

Fourth Award of \$500

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