CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

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Project Title

3D-Printed Bluetooth Android-Based Spirometer with HIPAA-Compliant Secured Cloud Data Storage

Abstract

Objectives/Goals

Asthmatic and COPD patients need portable digital spirometers because they are optimal tools in determining their lung capacity and detecting changes in lung function in a more accessible manner. This results in a better evaluation and treatment of earlier exacerbations and reduces ER visits and healthcare costs. It also involves and encourages patients to take an active role in monitoring their symptoms.

Methods/Materials

Creo ProEngineer; ProJet 3510 HD; VisiJet M3 Crystal ; EAGLE; SmartDraw; Eclipse (Java); Android SDK; 2 circuitboards ;Circuitboard components: ; 1 red LED light; 1 green LED light; MPXV7002DP air pressure sensor; CC2541 Bluetooth module; 2 NPN transistors; 17 fixed resistors; 1 toggle switch; 10 nonpolar capacitors; 1 button; 3 AAA batteries; WQS-8888 Spirometer/Calibrator; Google Cloud Service.

Conclusions/Discussion

The spirometer prototype had an approximate 4% error rate and variation of .14 L, complying with the American Thoracic Society#s standards. It demonstrates a cost-effective, portable, durable, user-friendly solution by resolving the issue of having costly desktop spirometers.

Summary Statement

This project identifies an inexpensive approach in the development and structure of a portable, compact spirometer; merging new technology such as 3D printing, Bluetooth, Android & Cloud for the gathering and determination of lung function.

Help Received

Schematic diagram reviewed and corrected by Mr. Cai, suggestions on Cloud provided by Professor Breaux of Carnegie Mellon