Developing a Respiration Sensor for Babies

Ingrid J. Cruz; Michelle Soriano; Sarah Christie; Jazlynne Pichinte; Peter Chura-Borda; Adassa Alvarez; Ava Larkin; Jose Reyes, ingrid.cruz@PGCPS.ORG

Abstract

We designed and built a wearable technology that quickly and accurately measures the respiration rate of an infant. Specifically, a low-cost sensing device that can accurately measure the respiratory rate of a baby. An accurate respiration measurement is critical because an elevated Respiratory Rate is a marker of serious respiratory illness and is the main indicator for childhood pneumonia which is the leading cause of death in children aged 0 to 5 years worldwide. We started the project by researching existing sensors in the market. We first narrowed down the 2 main ways of measuring an infant's respiration rate. The first way is contact-based while the second way was non-contact based. We decided contact-based was the best option since non-contact ways were more difficult to try. From contact-based, we figured out that there were 4 ways of measuring the respiration rate. These 4 were the acoustic method, the Co2 method, the airflow method, and the chest and abdominal method. The acoustic method needed a microphone and we imagined it would be hard to get a microphone for a baby. The Co2 method was also expensive to afford. We couldn't find a device to go along the airflow method. The last option was chest and abdominal movement and we looked into it and it seemed like the best choice if we use a flex sensor with it. Coding took the most time on the project because we had to learn how to do it from scratch. Our code was based on previously published codes we found online that we combined together in order to make our respiration sensor work. The final prototype has the following design features: -We used an expandable waistband with velcro lock to make it adjustable and allow appropriate fit on different infants while at the same time ensuring comfort for the baby. We also made it double layered in order to hold the sensor in place and catch every movement of the chest. -We also added a little cut in the waistband to allow the flex sensor to be removable, making the waistband washable - We made a pink waistband and a blue waistband for if the parents wanted a certain color for their child. -We also made the code have a special feature in which if the baby stops breathing then the code will assume the baby is 'not breathing' and a buzzer on the device will sound. -To top all of that, we added an LCD screen to show the readings and the whole system connects to a battery making our design very portable.