Flexible Low-Cost Sensory Patch for Chronic Wheezing Detection

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Chronic lung diseases are a serious world threat. According to the World Health Organization, there are approximately 364 million pulmonary disease patients around the world and this number is rapidly growing. The fundamental challenge contributing to this is the lack of affordable versatile diagnosis of respiratory diseases at a stage during which prevention is a valid option. This project aims to develop a low-cost flexible sensor that can detect respiratory disorders by real-time identification of wheezes, one of the main common symptoms of respiratory disease It was hypothesized that the proposed sensor will detect wheezes by identifying the ultra-low intensity sound waves (around 400Hz) using a novel parallel plate capacitor. A 3D model of the sensor was made, and through a sculpting printer, the sensor was built using affordable-cheap materials that include aluminum foil, sticky-notes paper, and double-sided tape. It was tested by being exposed to wheeze-like sound waves of 400Hz sound waves with three intensities using a frequency generator. Finally, discrete-low amounts of weights were applied to test the performance of the sensor and how sensitive it was when it detected ultra-low pressure applied by the generated sound waves. It was concluded that the sensor was efficiently sensitive and could detect acoustic pressures that can get below 1Pa and wheeze-like sound waves regardless of the intensity of the sound. This sensor can potentially be used by more than 3 billion people living in poverty across the globe to efficiently detect chronic respiratory diseases in their initial stages.