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Application  
Group

## 胎兒監控裝置 Fetal Monitor

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### 作品摘要

臨床上一般使用床邊孕婦監測器監控子宮收縮，作為孕婦懷孕後期的主要評估依據。由於子宮監測器主機過大，對孕婦平日的突發狀況無法第一時間掌握。有鑑於此，本作品以智慧手機為基礎，建立一套新型的可攜式孕婦子宮收縮即時監控系統，讓孕婦可以隨身穿戴，不管在任何情況下皆可使用。本系統除了使用新的收縮感測結構來提高量測的準確度外，更搭配正向力判斷機制，可以避免因為晃動而產生不必要的干擾訊號，並且加入胎心音監測裝置，作為懷孕後期的主要評估依據。感測器為了符合人體工學，以一定的傾斜（ $\leq 13.5$ 度）方便孕婦配戴，藉由藍牙 4.0 低功耗傳輸的優點，提升本裝置的續航力。此外，本裝置也結合 APP 自動上傳雲端功能，醫師可藉由雲端資料庫得知孕婦近期的身體狀況。實驗結果顯示，本研究所提出的設計，可以讓孕婦在居家或工作時，準確偵測宮縮訊號並可持續使用 8 小時，可連續使用 8 小時以低數據傳輸損耗率（ $< 2\%$ ）在 2 公尺內且資料遺失率在 0.01% 以下。

關鍵字：正向力判斷、薄膜式壓電感測器、APP



### Abstract

Clinically, a bedside monitor is generally used to check uterine contractions of pregnant women. It is mainly used as basis of assessment for the later period of pregnancy. Due to the large dimensions of the monitoring apparatus, it cannot quickly monitor daily unexpected situations for pregnant women. In view of this scenario, this research established a novel wearable device for the monitoring of uterine contractions. A new sensing structure for positive force measurement (PFM) was proposed to improve accuracy and avoid unnecessary signal interference from shaking, and added fetal heart tone monitoring device, as late pregnancy the main basis for this assessment. For ergonomic sensor to a certain inclination ( $\leq 13.5$  degrees) easy to wear for pregnant women. This device also makes use of the advantage of the low-power transmission of Bluetooth 4.0 coupled with a smart-phone equipped with an APP that automatically uploads data to the cloud. Experimental results showed that the design proposed in this study could enable pregnant women to accurately detect contraction signals without interference from shaking and noise. Moreover, it could be used continuously for eight hours of continuous use at a low data rate transmission loss ( $< 2\%$ ) within 2 meters and data loss rate of 0.01%.

Keywords: Positive force measurement (PFM), piezoelectric film sensor, APP