# *BabyTex - TEXTRONICS SYSTEM FOR MONITORING VITAL FUNCTIONS OF SMALL CHILDREN*

**Adam Jakubas, Ewa Łada-Tondyra, Marcjan Nowak**

***Częstochowa University of Technology, Faculty of Electrical Engineering***

## Introduction

Minimization of electronic devices and development of novel textronic materials have made it possible to integrate specialized sensors monitoring parameters life of humans into every-day garments. The application of sensors in children's clothes that measures e.g. blood pressure, pulse, breath frequency, temperature, ECG, etc. makes it possible to detect anomalies that might be a threat to health or life ahead of time. In the proposed BabyTex system two parameters are controled within a single monitoring system, namely: body temperature and frequency of breath rhythm.

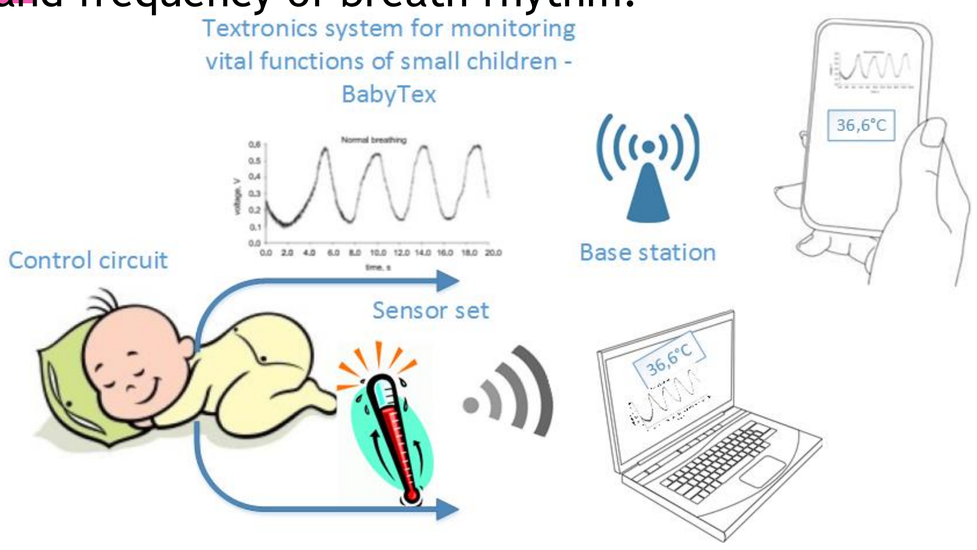


*Fig. 1.* A simplified working scheme for the BabyTex system.

## Design

The BabyTex in its composition includes: the comfortable intelligent underwear for everyday use with textile sensors; the detachable control unit with microcontroler; the base station for data archiving and the application for mobile devices and PCs.

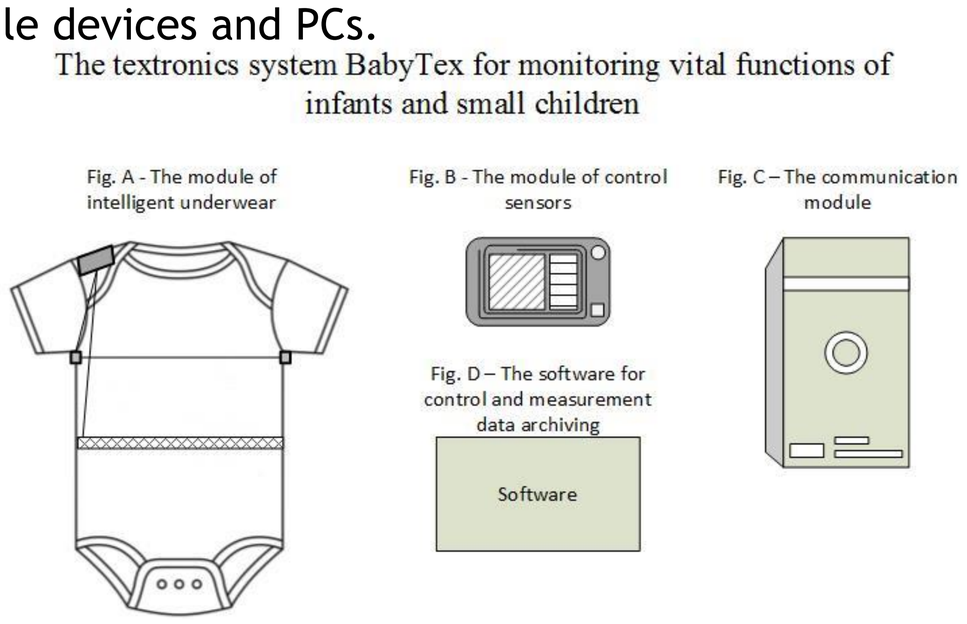


*Fig. 2.* The textronic system BabyTex - exemplary implementation

## Intellectual property

**The Patent Office of the Republic of Poland Ru.070280 - Textronic nightwear underwear for babies**

## Measurements

In order to carry out verification of the presented solutions, the research team has carried out measurements and examination on prototypes of chosen components of textronic system for measurement of vital functions of babies and infants. The results have been presented in [1-4].

The respiratory rhythm sensor is made from electroconductive fibers. This is integrated in the form of a belt in the structure of the baby underwear. The measurements shown on fig. 3. presents the cyclical nature of the respiratory rhythm in 1 minute (Fig.3a.) and the number of breaths during 5 min (Fig. 3b). The results correspond to the medical data, ie 30 +/- 8 respirations per minute.

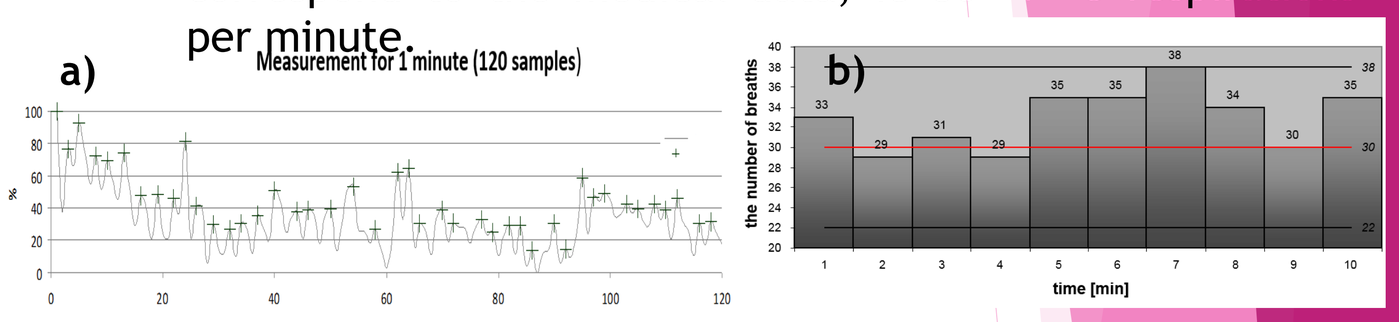


*Fig. 3. a)* Measurement of breath rhythm during one minute. *b)* The number of recorded respirations.

The temperature measurement is carried out using 2 digital sensors with medical accuracy. The sensors are integrated in the structure of the clothes under the armpits. The location of the sensors were chosen based on studies of thermography. Exemplary results of the measurements are presented in Fig. 4.

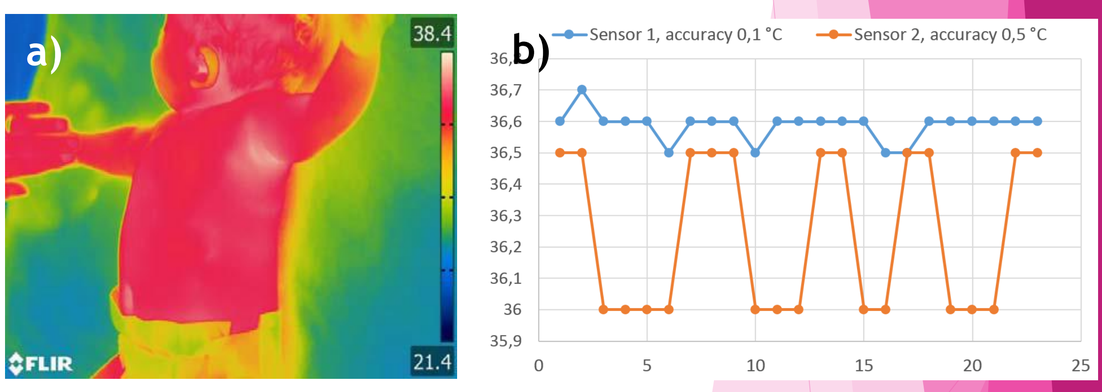


*Fig. 4. a)* Temperature distribution for a baby 3-month old. *b)* Body temperature measurements with the sensors of different accuracy

The high-performing microchip ATmega328 is responsible for the functioning of the entire system. The microchip reads the data from the sensors, analysis it and allows communication with a user. The children clothes prototype with the sensors of vital functions is shown in Fig. 5.


Fig. 5. The prototype of the children's intelligent clothes BabyTex