

A SENSING DEVICE FOR MONITORING BREATHING RATE

IITM Technology Available for Licensing

Problem Statement

- ❑ Medical parameters such as breathing rate may be one of best early predictors of decline of health
- ❑ Breathing rate trends enables neonatal care, home monitoring of chronically ill, sleep studies on sleep apnea, deception via polygraph and long-term tracking of health conditions of invalids.
- ❑ Conventional methods involves the limitations such as restricting patient's mobility, causing physiological discomfort and psychological stress

Key Features / Value Proposition

Technical Perspective

- ❑ The present invention provides a sensing device and method for monitoring breathing rate **by the production of electric field created due to a change in the breathing activity of a user.**
- ❑ Includes a sensing platform with at least one inner electrode connected to a voltage source and at least two outer electrodes maintained at a ground potential and insulating layer and outer layer.
- ❑ The said **measuring unit measures the variable capacitance created due to a capacitive coupling between the user's body and the at least two outer electrodes**

User Perspective

- ❑ **Simple, efficient and cost-effective device which does not restrict the patient mobility**
- ❑ Also suitable for **neonatal patients and burn victims**

Technology

- **At least one inner electrode**
- **At least two outer electrodes**
- **An insulation layer**
- **An outer covering prepared from a preselected fabric**

A sensing platform

- **Measure the breathing rate through the change in the electric field and an output from the measurement unit**

A measurement unit

- ❑ The said outer covering prepared from a preselected fabric is configured to accommodate a user's body over the sensing platform at a predefined distance
- ❑ The capacitive coupling between the user's body and the sensing platform creates an electric field, wherein a breathing activity of the user creates a change in the electric field
- ❑ The said measuring unit is configured to measure a change in a variable capacitance due to a change in the electric field

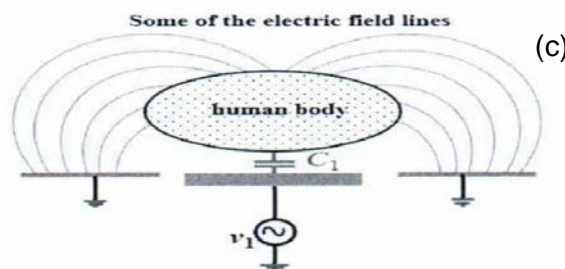
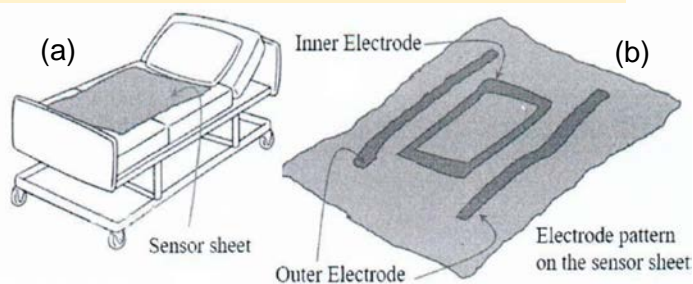


FIG. 1(a) shows conceptual diagram of the monitoring system in form of sensor sheet over bed, **FIG. 1(b)** shows electrode pattern in the sensor sheet designed using a conductive fabric, **FIG. 1(c)** shows capacitance C_1 between inner electrode and body along with a pictorial representation of electric field from body to outer electrodes

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Industrial Consultancy & Sponsored Research (IC&SR)

- ❑ The sensing platform comprises a sensing sheet made of a bed linen material with a conductive fabric constituting electrodes
- ❑ The said conductive fabric comprises a copper and nickel coated polyester fabric.
- ❑ The inner electrode comprises a rectangular shape electrode selected in predefined dimensions
- ❑ The two outer electrodes are maintained at a ground potential
- ❑ The breathing activity changes each of chest dimensions of the user and abdominal portions of the user.
- ❑ Measurement unit comprises an analog to digital converter to generate the output as a digital output for deriving the breathing rate.

Images

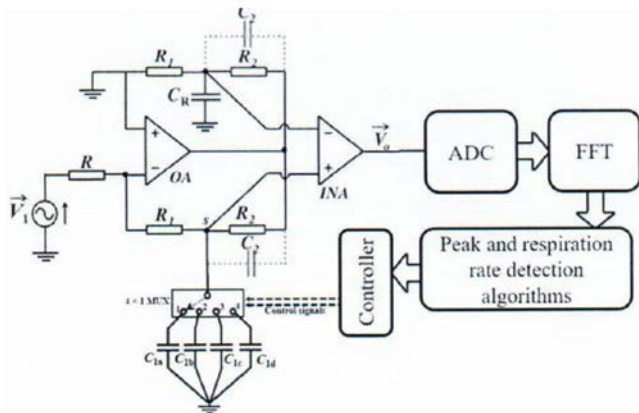


FIG. 2 illustrates the measurement unit of the sensing device with the modular structure of one or more electrodes of the sensing device

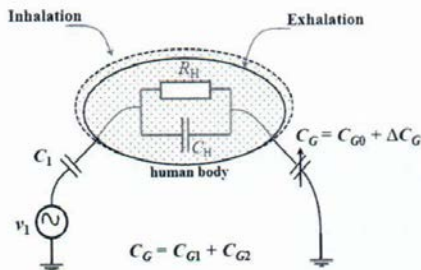


FIG. 3(a) illustrates a simplified equivalent circuit of the sensing device including an impedance if human body in vicinity of one or more electrodes of the sensing device

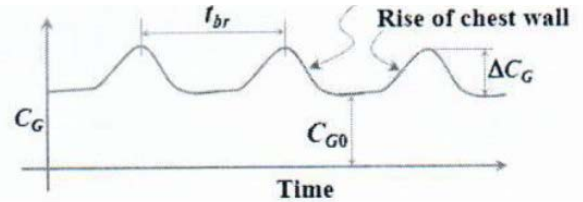


FIG. 3(b) illustrates pictorial representation of change in a capacitance between human body and ground potential (outer electrode), C_G , due to breathing activity of the user

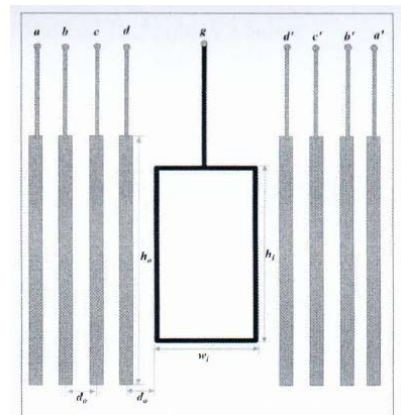


FIG. 4 illustrates a modular structure of one or more electrodes of the sensing device

Technology Category/ Market

Category – Medical devices

Applications –Breath monitor, sensors, dielectric, Biomedical devices and training modules, tracking systems

Industry – Healthcare, Electrical

Market -Medical Devices Market size is expected to grow from USD 63.4 billion in 2022 to USD 134.56 billion by 2030, at a **CAGR of 11.35% in the forecast period**

Intellectual Property

- IITM IDF Ref. 1703
- IN479575-Granted

TRL (Technology Readiness Level)

TRL-3, Experimental proof of concept

Research Lab

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