

# Portable Cardiopulmonary Resuscitation and Ventilator Device: Design & Implementation

Abdullah W. Al-Mutairi and Kasim M. Al-Aubidy

*Faculty of Engineering & Technology, Philadelphia University, Jordan*

[kma@philadelphia.edu.jo](mailto:kma@philadelphia.edu.jo)

## **Abstract:**

The demand for large numbers of ventilators and cardiopulmonary resuscitation (CPR) has increased recently after the global spread of the Corona epidemic (known as COVID-19), and the equipment available in hospitals and health centers has become insufficient. Providing a large number of these expensive devices in a short period of time is difficult, and providing suitable places for them is not easy. Hence the need to apply the concepts of reverse engineering in the design and manufacture of low-cost portable devices for use by patients, wherever they are.

This chapter provides the main components of the mechanical ventilator and how it works as a first stage to apply the concepts of reverse engineering to the design and construction of a low-cost portable device as well as a cardiopulmonary resuscitation system. Wireless sensor network technologies were applied in order to access the device and adjust its main parameters by the specialist according to the patient's condition. This device can be used at home, ambulances, health centers and remote hard-to-reach places. The main parameters of the device can be adjusted directly by the operator or remotely by a specialist according to the patient's condition.

Experimental results on the first prototype, when compared to available portable devices, indicate its ability to assist a patient with difficulty breathing. The prototype efficiently responds to the input settings provided by the paramedic or specialist, depending on the patient's condition. The respirator prototype is small and weighs 4.7 kilograms, equipped with a wireless guidance system for CPR, and its cost does not exceed 800 USD.

**Keywords:** Mechanical ventilation, Bag volume mask, Low-cost ventilator, Portable ventilator, CPR, Real-time monitoring.

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*Chapter in Book entitled “Advanced Sensors and Systems for Biomedical Applications”, Springer, January 2021.*