

## A Low-Cost IoT Based Neonatal Incubator for Resource Poor Settings

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(Received 24 July 2019; Revised 04 May 2020; Accepted 21 May 2020)

**Abstract:** Preterm births in resource poor countries are characterised by high infant mortality. The high cost and non-availability of conventional neonatal incubators are considered to significantly affect efforts aimed at mitigating this problem. In this paper, a low-cost Internet of Things (IoT) based neonatal incubator with phototherapy blanket is presented. The device was constructed using a wooden box with a dimension of 33 × 20 × 18 inches, a heating element, a relay, a liquid crystal display (LCD) module, an I2C module, control buttons, a light emitting diode (LED), 220 Ω resistors, 5 volts' power supply, transparent 2 mm thick acrylic sheet, a mattress, Wi-Fi module and LED based phototherapy blanket. An IoT platform was developed for real-time monitoring of temperature and humidity of the incubator which can be accessed by a password protected graphical user interface (GUI) application developed using C programming language. Modelling and simulation of the incubator environment based on standard thermodynamic principles were performed using Python programming language. A relatively stable temperature and humidity suitable for an infant was observed in the developed device. The IoT platform was effective in monitoring the temperature and humidity of the device. Incubator temperature attained steady state in 200 seconds. The environmental conditions were found to be suitable for a neonate. The device was effective for real-time monitoring of environmental conditions in the incubator.

**Keywords:** Internet of Things, Humidity, Neonatal Incubator, Phototherapy Blanket, Smart Medical Devices