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Wireless Techniques of Infant Incubator Based on Arduino

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Abstract:

The health problems experienced by premature babies who are born before the age of nine months are among the most important and dangerous things that researchers must address from here. The presence of a premature baby incubator is a beginning to solve these problems, as the device works to provide a suitable environment for the child (temperature 37°C and humidity 50 % and an environment free of pollution) such as the environment of the mother's womb. In this research, the problems and solutions of the premature brood device were discussed, the most important of which is the problem of the complexity of wires, their danger and cost. We proposed a technology for wireless of information using an Arduino in which the sensors are connected and information is sent to another Arduino that displays the results of the sensors. And it controls the temperature and humidity, whenever the temperature passes 37C the heat source turns off and whenever the temperature is less than 37C the heat source operates, as well as the humidity whenever the humidity passes 50% the moisture source turns off and whenever the humidity is less than 50% the moisture source works, in order to provide a temperature Appropriate temperature and humidity inside the incubator, as was the temperature and humidity in the mother's womb. Placed inside the incubator, connected wirelessly to the display devices of the child's family via the Internet, and that premature babies are exposed to jaundice due to the inability of the liver to break down bilirubin, so we provided photodynamic therapy, which is the wavelength of the light used (400nm) capable of breaking down the proportion of bilirubin in the blood

Keywords: *Wireless Techniques, Arduino*

Design and Connect

4-1 Introduction

This chapter focuses on the design of the incubator, the materials used in it, the programming of electronic materials and electrical conductivity. This chapter also talks about the role of the camera in the incubator of preterm infants and the light with a frequency of (400nm)

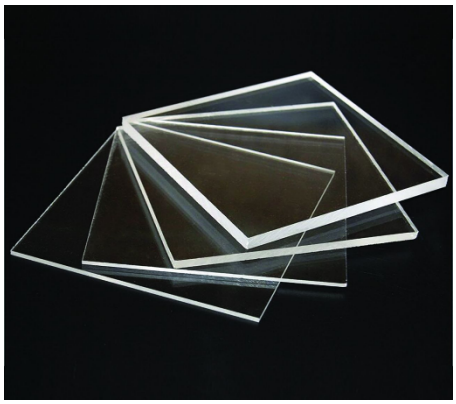
4-2 Proposed System

The principle of work of the preterm incubator that we designed is based on the air that enters through a fan preceded by an air filter that filters the air from pollution, the air enters opposite a heat source that makes the air hot, and then the air goes to the source of moisture, so it is hot and humid air and heads towards the box in which a child is placed Premature infants, and in the box there is a board containing temperature, humidity and pollution sensors that are connected to the Arduino piece, which is programmed to send the reading of the sensors through the wireless transmitter piece to the controller (Arduino 2) that receives the reading through the receiver and programmed to display the readings on a screen and control the electrical source heat and Humidity by means of the relay. Whenever the temperature exceeds 37°C, the heat source turns off, and whenever the temperature drops below 37°C, the heat source turns on, Likewise, the humidity, whenever the humidity is greater than 50%, the source of moisture is turned off, and whenever the humidity is less than 50%, the source of moisture is turned on. The controller or Arduino 2 is connected to a sound source that gives an alarm whenever the degree of contamination increases inside the incubator.

4-3 Design

Non-electronic materials.

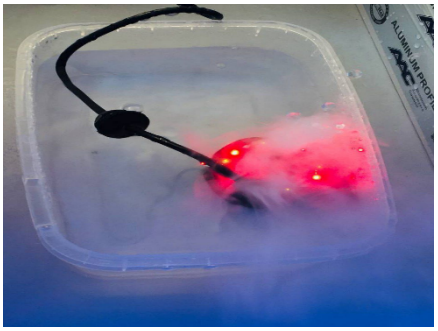
In the design of this incubator, we used other non-electronic materials, including these. materials:



1-acrylic: The properties of this acrylic material; Excellent clarity ,Lightweight, Good impact resistance, Outstanding thermal insulator and UV resistant. Acrylics have distinct properties that were used in the design of the box in which a premature baby is placed.

The appropriate dimensions are the box in which the child is placed, according to studies, where the length is 75 cm, the width is 50 cm, and the height is 50 cm. These dimensions are appropriate in the distribution of heat and humidity inside the incubator.

2-heat source: In our design, we used a 600-watt lamp capable of providing the appropriate heat, which is higher than 37C.



3-humidity source: An electric evaporator was used capable of providing a high humidity inside the incubator that corresponds to the required environment inside the incubator, higher than (50%).

4-air source: (56A_24/fan), We used this fan that provides suitable air inside the incubator and the air is positive inside the incubator, so that no air enters the incubator through the hand openings

5-air filter: The air filter before the fan was used to clean the air entering the incubator from dust, smoke and microbes.

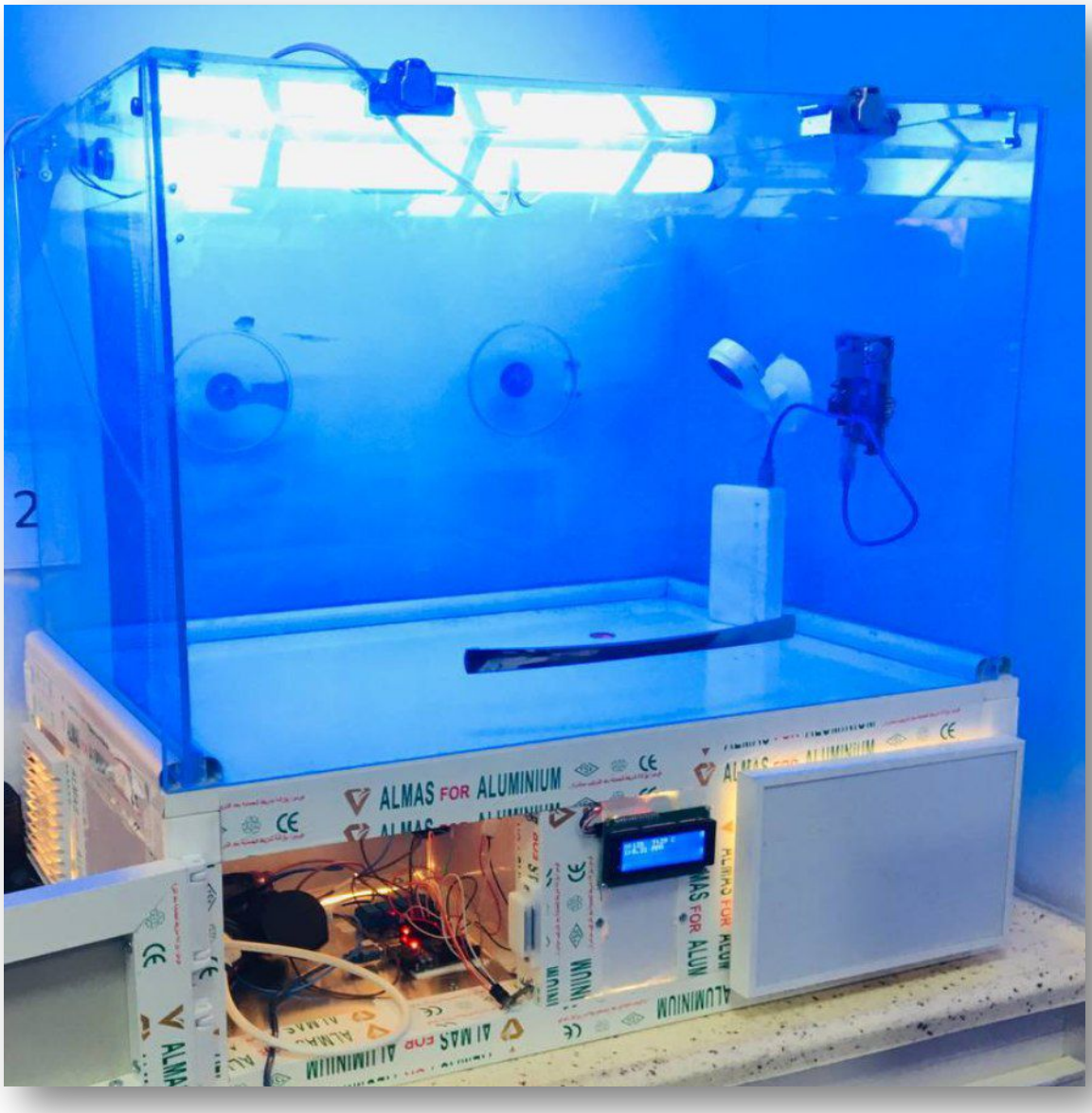
Electronic materials

We used wireless technology in the work of the preterm incubator, which is the basis of the wireless technology (Arduino), and the work of the preterm incubator consists of two main parts

1-part one (transmitter): Which consists of the electronic parts that are (temperature sensor (DHT11), humidity sensor (DH11), pollution sensor (MQ2), Arduino (UNO) and a piece and a radio transmitter piece (NRF24L01)), where these pieces are connected to the Arduino where it senses the sensors and the Arduino sends the results of wireless sensors via (NRF24L01) to the second part.

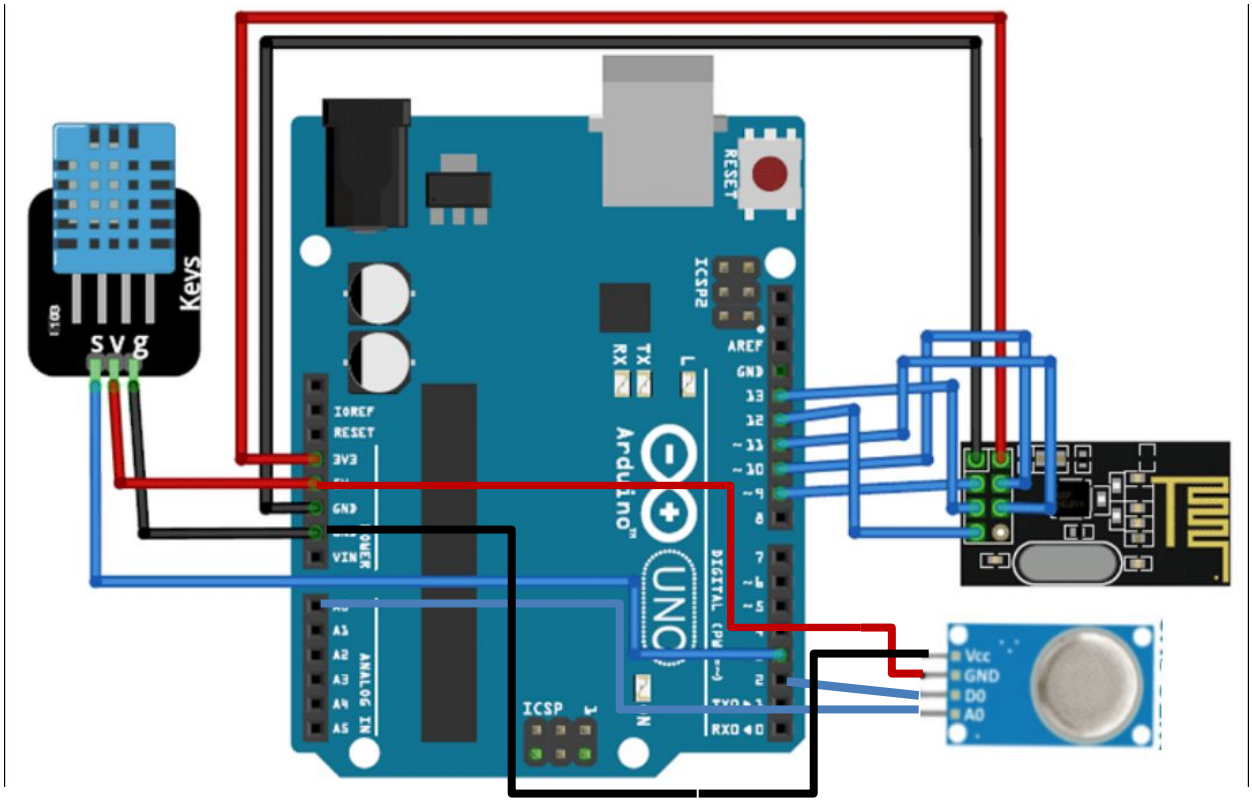
2-part second(receiver and control): Arduino (UNO), (NRF24L01), Display (LCD) and Riley. Arduino receives sensor readings via nRF24L01, then displays the results on an LCD screen. After that, the Arduino controls the electrical circuit for the heat and humidity source.

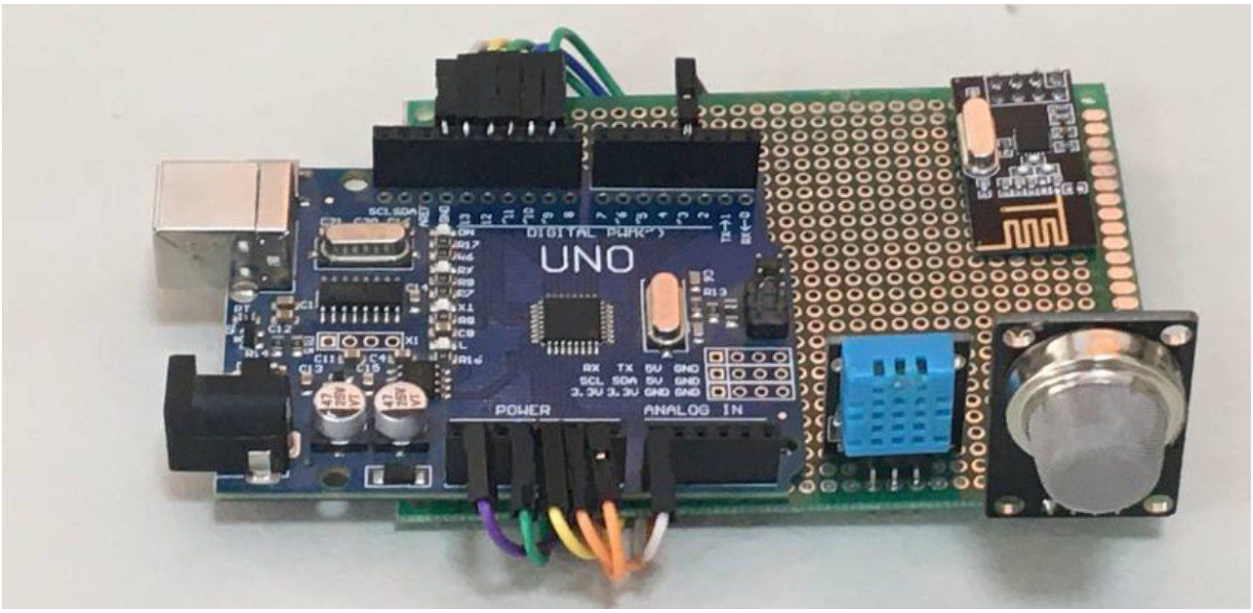
Design infant incubator



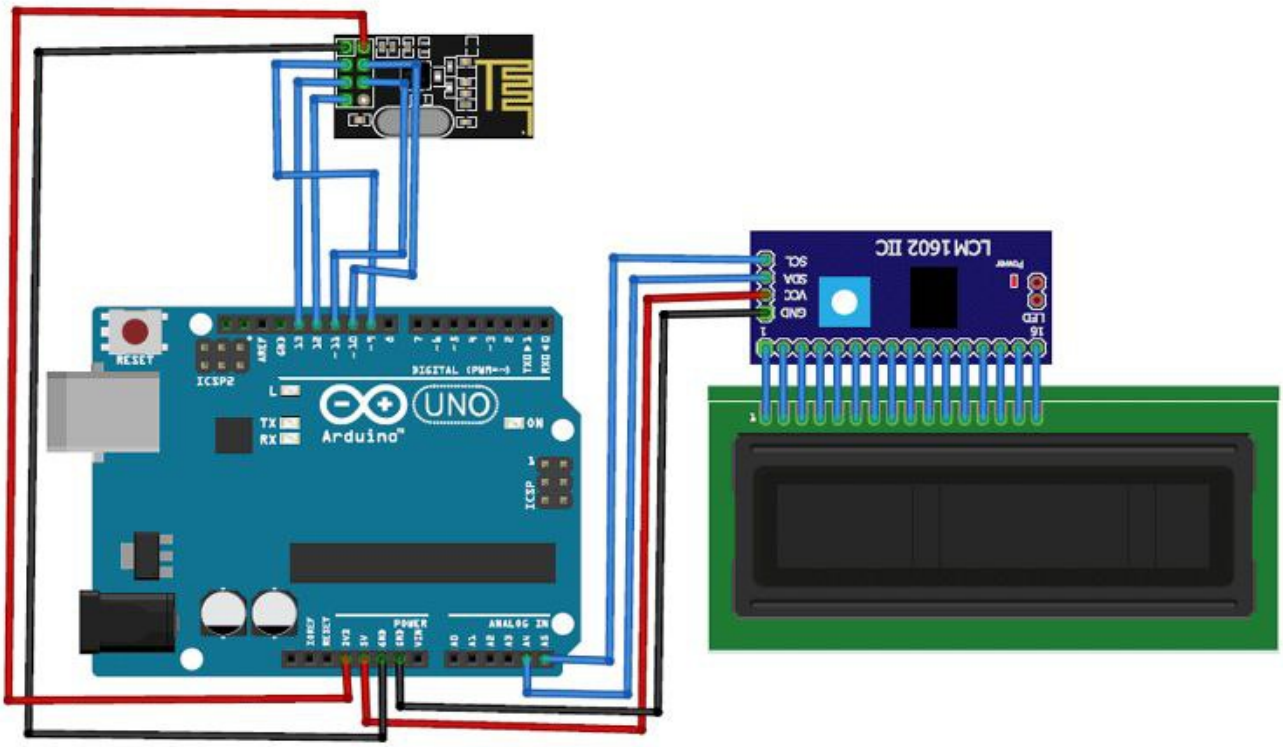
4-4 connecting

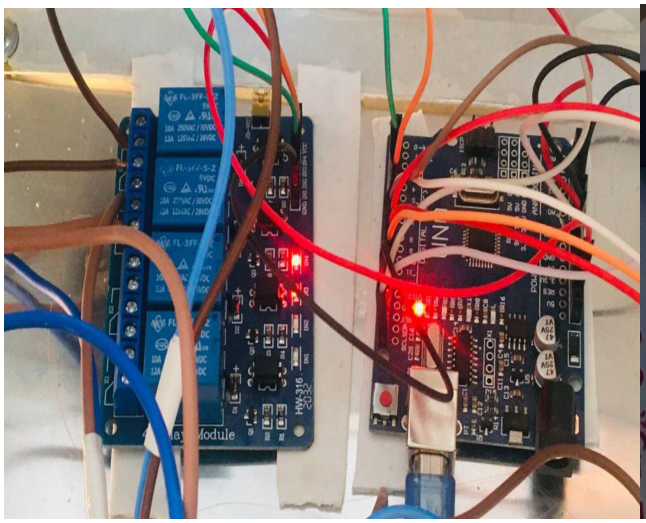
-part one (transmitter):





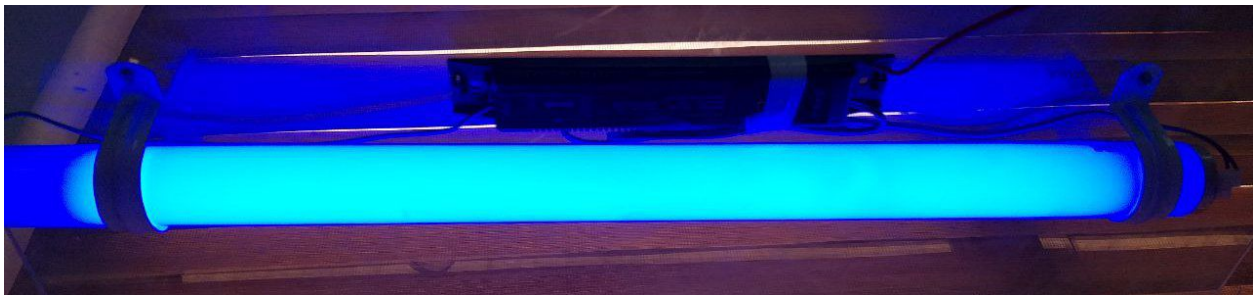
-part second (receiver and control):





4-5 Addition on the infant incubator

1-Phototherapy: It is a treatment used to treat jaundice, which is caused by high levels of bilirubin in the blood, the inability of the liver to break down bilirubin in the blood, so a light with a frequency of (400nm) is provided that is able to break down bilirubin in the blood.



2-camera: We used a camera placed inside the incubator that depicts the child inside the incubator and is connected by wireless or internet, which is linked to a website, and the child's family can see the child via the phone through a special application, the camera, which is linked to the website. The reason we put the camera is because the premature baby stays in the incubator for a long time, so the baby's family cannot see the baby, so we put a camera.

Conclusion and Future Work

5-1 conclusion

In this project, we designed the preterm incubator that saves the lives of approximately 15 million premature infants born annually according to the World Health Organization. The Arduino project was used and we added wireless technology in the preterm incubator that transmits readings from the sensors inside the preterm incubator to the controller who displays the results of the sensors on A screen and it controls the proportion of heat and humidity, and we added to the premature incubator phototherapy that treats jaundice, and we added a camera inside the incubator that connects wirelessly to the Internet and is displayed in an application and the child's family sees the child anywhere there is the Internet through the phone The mobile that connects to the camera app .

5-2 Future Work

For future work, it's necessary for the following ideas can be considered:

1- Making an (oxygen generator) is used to provide oxygen to the baby inside the incubator

2- Making a (patient monitor) that measures the child's temperature, heart rate and the child's ECG

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