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Data Acquisition for Improve Poultry Farm Productivity using Embedded Platform

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Abstract

This paper focuses on designs an embedded system that enhancements the productivity of poultry farm. Data acquisition of poultry farms environment depends on numerous factors among which are lighting, temperature, and humidity. These can be achieves by multiple sensors for indicating these parameters, here are DHT11 sensor, lighting dependent resistor (LDR) sensor. Graphical User Interface (GUI) was used through LabVIEW Firmware of Arduino Mega2560 and sensors which obtains multiple data inputs and digital outputs for measuring the reasonable temperature, humidity, and lighting for providing both profitable and sustainability of poultry production.

Keywords: Arduino Mega2560, LabVIEW2016, data acquisition, embedded system, DHT11, GUI, LDR.

1. Introduction

Poultry farms can be classified into two main types: farms for egg production and farms for meat production [1].To do a feasibility study for a poultry farm, the purpose of the farm should be clear because this affects equipment required, water requirements, and the type of waste management system that will be used. When estimating costs for establishing and running the business, the poultry producer should consider potential extremes in costs, in addition to current costs [2].Traditional backyard poultry production in most countries is a primary source of animal protein and supplementary income for the down trodden rural poor and only source of poultry egg and meat for city dwellers before poultry industrialization. Importance of backyard poultry production has been globally recognized to overcome the worsening problems of poverty, hunger and malnutrition in developing countries [2]. Many equipment required for poultry environmental, but in this paper it is added an embedded system for managing the reasonable environmental for enhancement poultry productivity. The poultry farm is affected by many surround environmental conditions. The important environmental parameters for the quality and better productivity are temperature, relative humidity and lighting in poultry.

2. Embedded System Design

An embedded system composed out of Arduino Mega 2560 platform, Multi sensors (DHT11-LDR) and Labview. Embedded system block diagram illustrated in figure (1).

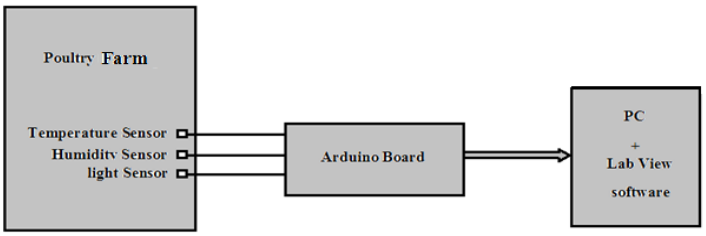

Figure (1): Embedded system architecture

3. Embedded system functionality

Embedded system functionality mainly depends on Arduino Mega 2560 which has inbuilt an analog to digital converter and others peripheral circuitry necessary for operation. So many physical parameters produced by sensors and its converted into analog signals. These signal fed to the Arduino board. These signals processed in the microcontroller and sent to computer through the USB

serial port .The serial port data is then accessed and imported in LabVIEW for computational and graphical representation.

4. System components

A- Group of sensors

The task of this group is to convert physical phenomena from poultry farm to electrical signal.

1- Temperature and humidity sensor

DHT11 digital temperature and humidity sensor is a composite sensor that contains a calibrated digital signal output of temperature and humidity [3]. This sensor includes a resistive-type humidity measurement component and a negative temperature coefficient (NTC) temperature measurement component. The output is directly connected with the Arduino microcontroller I/O port digital pin (7). The technical specifications of DHT11 sensor illustrated in table (1)

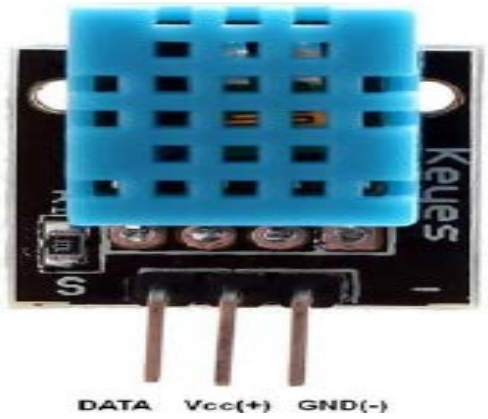

Figure (2) DHT11 sensor

Table (1) Technical Specifications of DHT11 sensor

Measurement Range	Humidity Accuracy	Temperature Accuracy	Resolution
20-90%RH 0-50 ℃	±5%RH	±2℃	1

2- Light Dependent Resistor (LDR)

The photo sensitive resistance light sensor is used to adjust the amount of light that needed for poultry farm [4]. An LDR is a component which has a resistance that changes with the light intensity falls upon it.

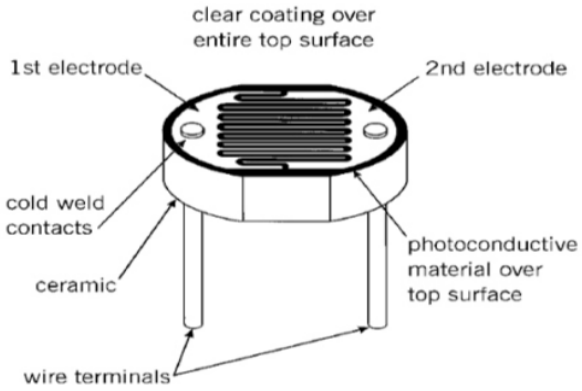

Figure (3) Light Dependent Resistor (LDR)

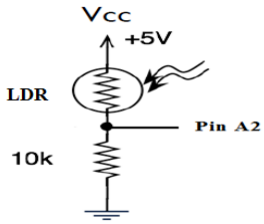

Figure (4) Light sensor circuit

B- Arduino Microcontroller Board

The core of the hardware part is Arduino Mega 2560 which receives signal from group of sensors and transmitting data to a personal computer via interface software. The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has16 analog inputs pins and 54 digital input/output pins.

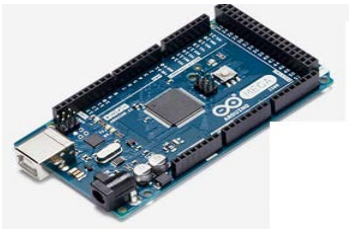

Figure.5 Arduino Mega 2560

The embedded system design shown in figure (6)

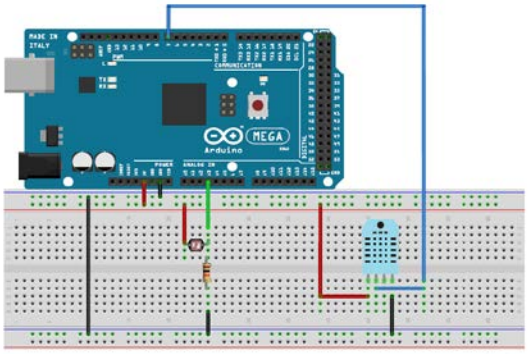

Figure.6 Embedded System

C-Software

1- The software is integrated package which is developing under the graphical program structure in LabVIEW 2016 for data acquisition from poultry farm. LabVIEW system design software is at the center of the National Instruments platform. Providing complete tools that are needed to build any measurement or control application [5].

2. Software interfacing

LabVIEW Interface for Arduino (LIFA) is the toolkit that allows developers to acquire data from Arduino microcontroller and process it in the LabVIEW. The block diagram of the system has been configured by using LabVIEW tools which illustrated in figure (7), also the other LabVIEW screen (Virtual Instrument) used to indicate the system results (humidity, temperature, and light intensity) shown in figure (8). These results have been calibrated to the standard values to achieve the maximum productivity of poultry farm.

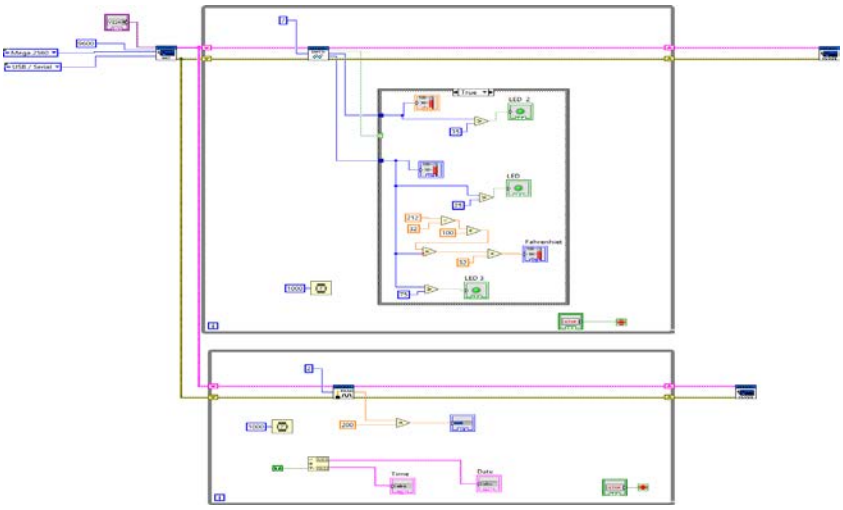

Figure (7) Embedded System block diagram in LabVIEW

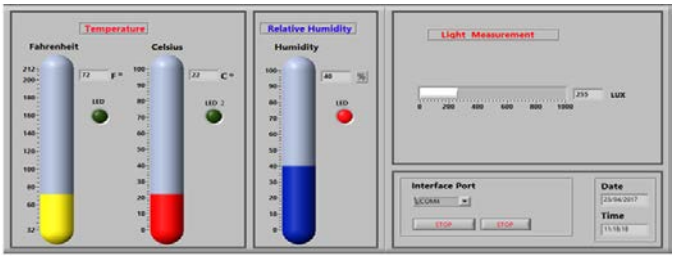

Figure (8) Virtual instrument for illustrated System results

5. Conclusion

An embedded system discussed for improving the poultry farm environmental condition (temperature, humidity, and lighting) in order to improvement its productivity. This paper conclude the effectiveness of Labview for designed and implemented the data acquisition systems which obtaining a reasonable results, also Labview will be a very helpful for researchers and students to understand an interfacing between sensors and a computer under Arduino microcontroller.

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