

# Digital Egg Incubator System (DEIS)

Sangeetha S, Sathiya Priya P, Selva S, Rushinth John, Gayathri C

Department of ECE, Sri Eshwar College of Engineering, Coimbatore, Tamil Nadu, India

## ABSTRACT

An incubator is a device which hatches and simulates avian incubation by keeping eggs warm and in the correct humidity. The incubators available in the market are mostly designed to support a specific type of egg and are quite expensive too. Limitations like cost, egg type, device specifications are the only problem that current device have. This project tries to overcome these limitations. In this project the incubators make use of heat sensors whose output is constantly monitored by a microcontroller so as to manage the temperature range of the specific egg. The microcontroller has been programmed to handle various eggs by predefining the requirements in its code and it is monitored using GSM. The egg type can be easily selected through buttons and an LCD display.

**Keywords :** GSM (Global System for Mobile communication), Microcontroller, Temperature and Humidity.

## I. INTRODUCTION

The purpose of this project is to design and develop the system of an incubator to incubate various types of egg named as Digital Egg Incubator System (DEIS) for various types of eggs. The DEIS is fitted with temperature and humidity sensor that can sense the condition of the incubator and automatically change the condition suitable for the egg which avoids improper control. The health of egg is very important for the development of embryo within the egg. In this project, incandescent lamp is used as a heater to give suitable temperature to the egg in addition water and controlling fan is also used, which make sure of humidity and ventilation is in good condition or not. For proper monitoring of eggs, the status condition will appear on the LCD screen display in the DEIS. To make sure all the eggs are heated equally, DC motor is used which rotates iron rod placed inside DEIS. The rotation of iron rod continuously changes the position of egg. The entire element is controlled using Mixed Signal Processing (MSP430G2553). The MSP430G2553 is a type of microcontroller that can process a data from sensor and will execute the control element to change the condition of DEIS. Our DEIS is user friendly product and by easy installation it helps people to handle properly. The DEIS can be monitored when required using GSM via standard text messages.

## II. METHODS AND MATERIAL

### Avian incubation:

Very few mammals lay eggs where they develop in uterus for some days, after that only few days of external incubation is required. For proper growth of various species of eggs, avian incubation is necessary which is built in our Digital Egg Incubator System (DEIS).



Figure 1. Available Incubator

Available incubators are expensive to buy and most of the incubators are highly priced and not affordable for small scale farmers. It requires a lot of labor since there

will be a lot of skills in order to manage and maintain an incubator. Incubator requires power source to work. In most rural and remote areas, reliable source of power is a major challenge. Also it can cause breakage of eggs, especially during egg turning.

## PROPOSED SYSTEM

Our proposed DEIS consists of six major units which are discussed as follows,

### 1. POWER SUPPLY UNIT

The AC voltage, typically 220 V RMS, is connected to a transformer, which steps down that voltage to the level of the desired DC output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a DC voltage. The resulting DC voltage usually has some ripple or AC voltage variation.

A regulator circuit removes the ripples and also retains the same DC value even if the input DC voltage varies, or the load connected to the output DC voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.



Figure 2. Block diagram (Power supply)

### HUMIDITY SENSOR

**Humidity** is the amount of water vapor in the air. Relative humidity is defined as the ratio of the partial pressure of water vapor in a parcel of air to the saturated vapor pressure at a prescribed temperature. Humidity may also be expressed as specific humidity. Relative humidity is an important metric used in forecasting weather. Humidity indicates the likelihood of precipitation, dew, or fog. High humidity makes people feel hotter outside in the summer because it reduces the effectiveness of sweating to cool the body by reducing the evaporation of perspiration from the skin. This effect is calculated in a heat index table.

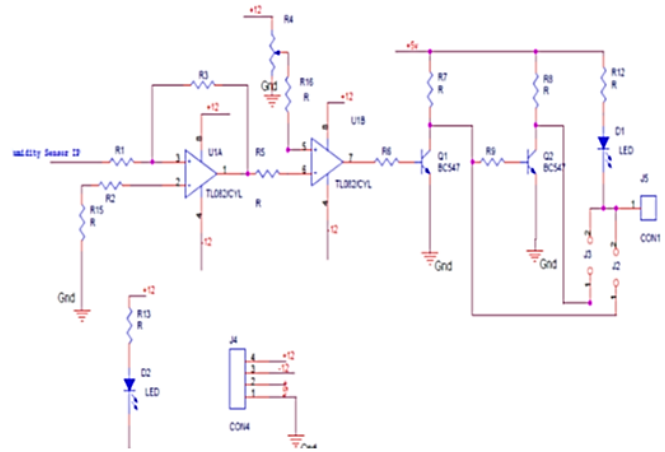


Figure 3. Circuit diagram for humidity measurement

### 3. LM35 (TEMPERATURE SENSOR)

Temperature is monitored using temperature sensor (LM35) for all types of incubation.

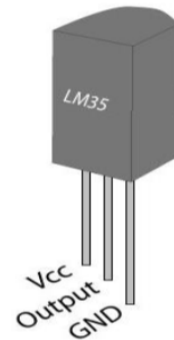


Figure 4. LM35 (Temperature Sensor)

**LM35** is a precision IC **temperature sensor** with its output proportional to the temperature (in °C). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With **LM35**, temperature can be measured more accurately than with a thermistor. It also possess low self heating and does not cause more than 0.1 °C temperature rise in still air. The operating temperature range is from -55 °C to 150 °C. The output voltage varies by 10 mV in response to every °C rise/fall in ambient temperature, *i.e.*, its scale factor is 0.01 V/°C.

### GSM and UART

A **UART** (Universal Asynchronous Receiver/Transmitter) is the microchip with programming that controls a computer's interface to its attached serial devices. The UART takes bytes of data and transmits the individual bits in a sequential fashion.

Serial transmission of digital information (bits) through a single wire or other medium is much more cost effective than parallel transmission through multiple wires.



**Figure 5.** UART GSM (Global System for Mobile communication) is a mobile communication modem; it stands for global system for mobile communication (GSM).

The idea of GSM was developed at Bell Laboratories in 1970. It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850 MHz, 900 MHz, 1800 MHz and 1900 MHz frequency bands. GSM system was developed as a digital system using time division multiple access (TDMA) technique for communication purpose. A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot. The digital system has an ability to carry 64 kbps to 120 Mbps of data rates.

#### 4. LCD DISPLAY

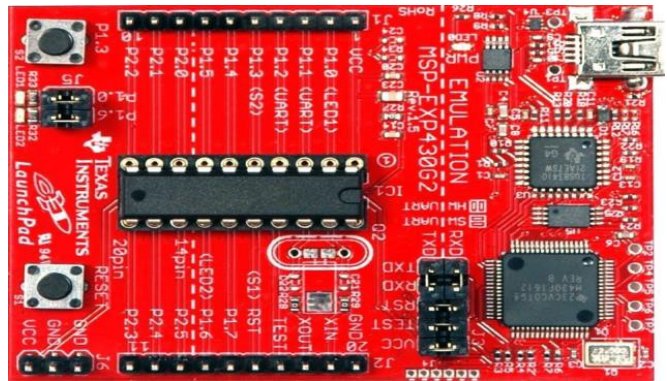
A liquid-crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in digital clock. The same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements. The LCD displays information about the steps that should be followed by the user etc.



**Figure 6.** LCD Display

#### MSP430G2553

MSP430G2553 is an ultra-low-power microcontroller that consist of several devices featuring different sets of peripherals targeted for various applications. The architecture, combined with five low power modes, is optimized to achieve extended battery life in portable measurement applications. The device features a powerful 16-bit RISC CPU, 16-bit registers, and constant generators that contribute to minimum code efficiency.



**Figure 7.** MSP430G2553

### III. RESULTS AND DISCUSSION

MSP430G2553 is an ultra-low-power microcontrollers consist of several devices featuring different sets of peripherals which is targeted with DEIS to ensure proper temperature and ventilation for the embryonic development of eggs. The present status of DEIS incubator will be updated by GSM via standard text messages to mobile phone. DEIS also performs AVIAN incubation where the temperature alone is just changed for that type of particular species.

### IV. CONCLUSION

DEIS performs AVIAN incubation that helps poultry farmers to incubate and hatch various types of eggs instead of a specific set of eggs. It is built in an optimal way which reduces the cost of manufacturing and makes it more flexible. GSM helps DEIS for correct monitoring and full automation by sending the updates to mobile phones whether the temperature and ventilation is sufficient for the embryonic development.

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