

Chapter 5

System Implementation and Testing

5.1 Implementation

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5.2.1 Unit Testing

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The idea of the project came from seeing the patients who suffer from chronic diseases such as pressure , diabetes and other diseases, where our system provides the patient with easy handling of taking the drug in it's time by the doctor supervisor, who is not much interested in timing or the amount of medicine remaining or the expire date. Here comes the importance of electronic pharmacy, in the fact that the patients has full control over these matters.

5.1 Implementation

We began to gather information about the implementation of the project by asking some patients and the importance of providing such a device for them. They were very interested for the idea and encouraged it. First by thinking about the design phase of the device, we started how to link dates with the real time of occurrence. Here we have the use of (RTC 1307) because of the time synchronization of the drug with real time. To allow the patient to determine the intend time to use keypad. Then to display these values to the patient we resorted to the use of the LCD screen. If the patient cannot move there is no other problems, we decided to use GSM to send a text message to the patient's guardian. To determine the number of pills remaining in the box, RGB LED was used. Here comes the role of microprocessor to connect all these devices with each other and for many of us we have used Arduino MEGA for this purpose.

The prototype system is applied and tested in this chapter. Figure 5.1 depicts the pharmacy containing solution pathways, sensors, RTC, servo motor, Keypad, led and the Arduino controller is implemented.



Fig 5.1 the pharmacy containing the electronic pieces inside it

An implementation of each stage in the system is performed according to the system requirements. The hardware and software components are then examined by doing the appropriate test for each stage as will be discussed in the following sections.

5.2 Testing

Testing plan is one of the modules of the system analysis and the design, which has greater importance. After system is ready it should go for testing. Testing is one of the critical phases. Various Testing Methods are [4] :

5.2.1 Unit Testing

In Unit Testing, individual components are tested for their validations to ensure that they operate correctly[5].

5.2.1.1 Test Temperature and Humidity With Arduino

The DHT11 Sensory has been linked with Arduino with the path of the solution. Because of the test, the sensore measures when raising the temperature and humidity of the pharmacy, results are obtained on the screen that was connected with the sensore and the Arduino through the Arduino programming as shown in Figure 5.2.



Fig 5.2temperature and humidity and display.

When the temperature and pharmaceutical humidity are raised, the sensor is affected quickly and the results appear on the screen that is connected with the sensor and the arduino as shown in Figure 5.3



Fig5.3 temperature and humidity

5.2.1.2 Test Real Time Clock With Arduino

The time and date were determined by the RTC, which was programmed with Arduino. The tests were conducted and showed the exact time and date on which the full work was performed to perform the tasks required of the pharmacy. Thus, through time knowing, Patient will be alerted and received a message on Phone

5.2.1.3 Test RGB-LED Testing With Arduino

RGB LED means red, blue and green LEDs. These products were used as a medicine pill counter when the patient took the medicine to give the patient a warning according to Table 5.1 in order to attract the attention of the patient so as to provide the medication at the appropriate time.

Table 5.1: RGB-LED Reading

Drug pills	RGB-LED Reading
10-8	green
7-4	blue
3-0	red

Figure 5.5 shows the place of RGB-LED for the drawer and here it is green, as the number of pills inside the drawer is 8-10.

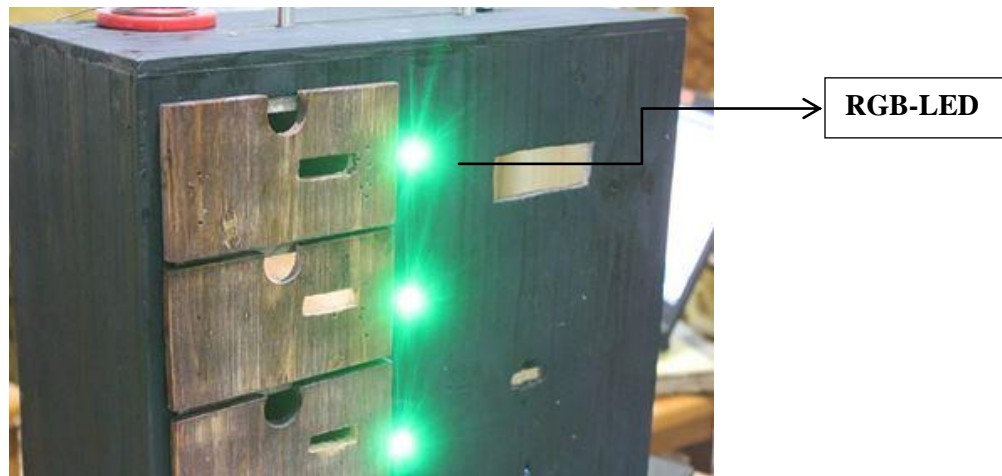


Fig5.4 RGB-LED

5.2.2 Integration Testing

The next level is called Integration Testing. In this many unit tested modules are combined into subsystems, which are then tested. The goal here is to see if the modules can be integrated properly. This testing activity can be considered testing the design.

5.2.2.1 Temperature and Humidity Sensor with The Fan Test

As mentioned previously, the temperature and humidity of the pharmacy is measured through the Sensor Dht11 and because the pharmacy is working to save the medicine when increasing the temperature of 27 and the humidity of 60% Arduino gives the fan to run to reduce the temperature and humidity and return to normal condition without affecting the drug

and so the drug is saved in the pharmacyas shown in Table 5.2.

Table 5.2: Reading of humidity-temp Sensor with LCD &FAN.

Sensor red	LCD Reading	FAN
tem	25>	ON
hum	60%>	ON

Figure 5.6 shows the connection of the sensor with the Arduino and shows the temperature on the LCD ,the fan is turned on if the temperature and humidity increase.

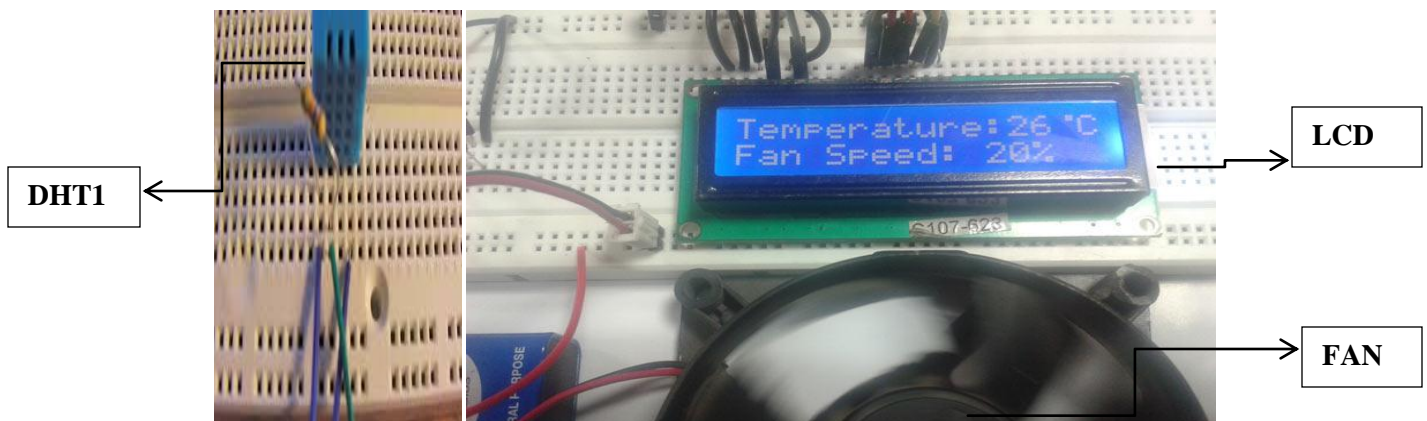


Fig5.6 temperature and fan sensors and display

5.2.2.2 Real Time test with the Keypad, Servo Motor and GSM

When the time of the drug occurs the pharmacy is working on warning the patient with a voice and optical signal and which is determined from the piece RTC and send a message to the patient's phone is done by a piece of GSM works to store the patient number and send the message to him through a piece inside and also at on the time of medicine Servo Motor opens the lock of the tractor for the patient to take as in the form 5.7.



Fig5.7Real Time with the Keypad, Servo Motor and Sim900

5.2.3 System Testing

After testing each piece separately and connecting two or more pieces and testing them, we worked to connect all parts of the project so that the work coincides with each other to give the desired results while the date of the drug occurs, it is turned on the light and it works as an alert as well as the sound alarm and also works as a motor vehicle to unlock, at the same time It sends a message to the patient's phone via a GSM segment and acts as a protective system to enter the hemorrhoid through the keyboard that appears on the LCD screen.

We also used the RGB-LED indicator to count the medicine beads and so was connected to all parts of the electronic project. Figure 5.8 shows the link of the project pieces.

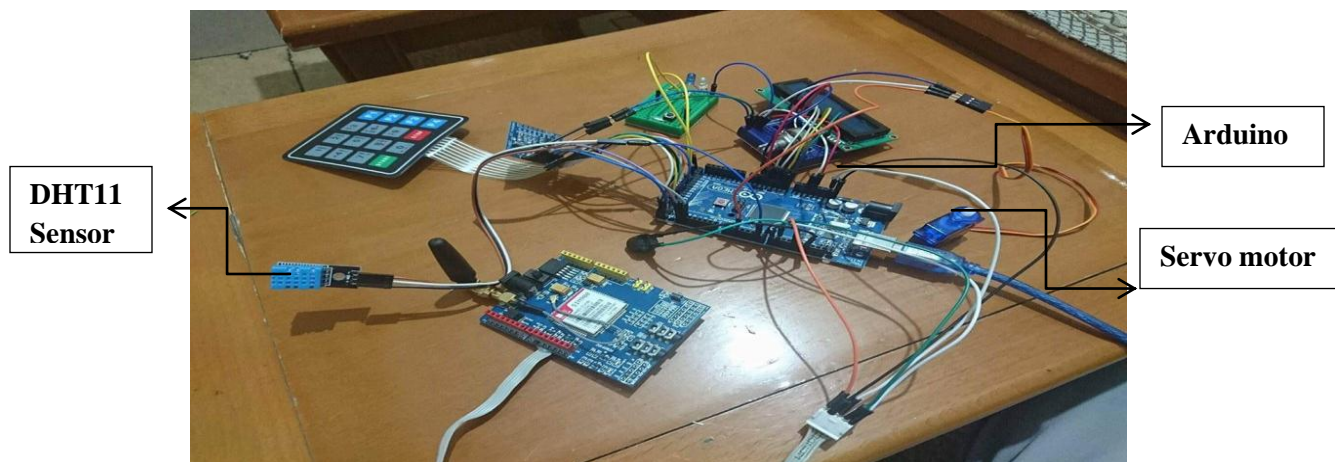


Fig 5.8 all parts of the project

5.2.4 Acceptance Testing

Finally, the electronic parts were connected until the system was completed, the aluminum parts were placed in the wooden box which keeps the electronic parts and the medicine so that the fan was placed on the back side until it works on the cooling and placed the RGB-LED beside the drawer until it alert the patient to the end of the number of pills per drawer. We put the keyboard in the right side of the drawer under the LCD until we enter the required information and LCD is used to show and insert the required data from the patient.

The electronic pieces were placed on the right side of the pharmacy from the inside so that we protect them as shows the Figure 5.9.



Fig5.9 Accepting electronic parts in wood Box