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IOT BASED INTELLIGENT PILLBOX (ANYTIME MEDICINE)

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ABSTRACT-Medicines is an essential part in looking after well being, averting ailment, overseeing, interminable conditions and curing sickness. Unsurpassed Medicine (ATM) is a machine which conveys the medication in crisis cases and guarantee accessibility of medications 24x7. ATM will be extremely valuable in sparing life if there should arise an occurrence of a mischance on parkways, remote ranges, provincial territories and spots where therapeutic stores are not inside the compass in the event of crisis.

Keywords—medicinedispenser, medical services, health, prescription, health security.

1. INTRODUCTION

ATM-Any Time Medicine, where the device can send out medicines. Device can fetch out the medicines automatically for the basic common symptoms for free of cost, and the medicines provided by the machine are only for the timely relief and in emergency case, where the person has to meet the doctor further. People at rural places cannot get access to medicines that are providing to them freely by the government. The aim of this project is that people would be able to access the drugs via patient kiosks in public places such as drug stores, malls, bus / railway stations, on highways, areas where medical stores are limited. Regular replenishment can help in not only tracking usage pattern and thus taking precautionary measures but also ensure availability of drugs 24x7. The device is designed taking under concern, such as lack of poverty and illiteracy in India.

2. LITERATURE SURVEY

2.1 Medicine dispensing machine using raspberry pi and Arduino Methodology [1] The authors propose a machine designed to provide such healthcare at areas where having a medical store may not be feasible or possible. It allows the user to select a medicine, pay the required amount after which it verifies the amount received and dispenses the medicine. The amount is authenticated and identified using an image processing unit controlled by a Raspberry Pi, a credit card sized controller capable of processing still images. The payment module and medicine dispensing module are controlled by the Arduino, a microcontroller-based development board. The communication between the Raspberry Pi and Arduino controllers is serial, through a USB cable. The machine is powered by a regular power outlet of 230V (alternating current). Due to the physical and infrastructural limitations in establishing a medical store at remote areas, this machine has been designed to be a standalone unit, requiring minimum supervision to operate for long periods of time.

2.2 Automated medication dispensing [2]

In this work a Smart Medicine Dispenser (SMD) prototype is proposed. The main purpose of this system is to help the patients, primarily seniors, take their medications on time in an easy way without the possibility of missing pills, and also reduce the risk of over or under dosing accidentally. Not taking medications correctly can have serious consequences such as delayed recovery, illness and even death. The smart medicine dispenser (SMD) could solve such problems by informing and alerting the patients to take the appropriate dose at the right time. Also, it provides direct communication between the patients and the caregivers as it will immediately notify the caregiver in case the patient missed his/her pill.

2.3 Design and Implementation of Automatic Medicine dispensing machine [3]

Distribution for the people in the remote tribal areas is finding tedious task for the Government's, the Automatic medicine dispensing machine can aid to resolve the above-mentioned requirement. The machine is equipped with some basic and emergency medication and can be refilled. It is a kind of computerized medicine storage system which can be easily accessed by the people in emergency without approaching any pharmacy; the machine can be easily installed in the remote areas like long highways, desert areas,remote tribal areasand rural areas. It is a microcontroller and motor-based system to dispense the medicines when accessed by the user through an input event, the data pertaining to the medicine storage can be ascertained from the remote area and based on that information refilling the machine can be easily done.

2.4 Real time healthcare monitoring, and monitoring and tracking system using GMS/GPS technology Methodology[4] :

Health monitoring systems have rapidly evolved recently, and smart system have been proposed to monitor patient current health conditions, the project focuses on monitoring the patient's blood pressure, and his body temperature. This paper proposes a system architecture for smart healthcare based on GSM and GPS technologies. The objective of this work is providing an effective application for Real Time Health Monitoring and Tracking. The system will track, trace, monitor patients and facilitate taking care of their health, so efficient

medical services could be provided at appropriate time. By Using specific sensors, the data will be captured and compared with a configurable threshold via microcontroller which is defined by a specialized doctor who follows the patient, in any case of emergency a short message service (SMS) will be sent to Doctor's Mobile number along with the measured values through GSM Module.

3.DESIGN AND IMPLEMENTATION

Figure 3.1: Block diagram of the system.

3.1 Hardware components

1. Arduino mega module

Arduino mega is an 8-bit RISK microcontroller board which controls the functionality of all the component in the system. (A reduced instruction set computer, or RISC is one whose instruction set architecture (ISA) allows it to have fewer cycles per instruction (CPI) than a complex instruction set computer (CISC)).

It's like a small computer on a single IC. It contains a processor core, ROM, RAM and I/O pins dedicated to performing various tasks. Microcontrollers are generally used in projects and applications that require direct control of user. Microprocessor has only a CPU inside them in one or few Integrated Circuits. Like microcontrollers it does not have RAM, ROM and other peripherals. They are dependent on external circuits of peripherals to work. But microprocessors are not made for specific task, but they are required where tasks are complex and tricky like development of software's, games and other applications that require high memory and where input and output are not defined.

Figure 3.1. Arduino mega module

2. GSM Module

The system is implemented with the GSM module. The GSM module is connected to the arduino mega. The VCC pin of GSM is connected to the +5V of Arduino mega. The ground pin of GSM is connected to the ground pin of arduino mega. The TX pin of GSM is connected to the RX pin of Arduino mega to establish communication. The RX pin of GSM is connected to the TX pin of Arduino mega to establish communication.

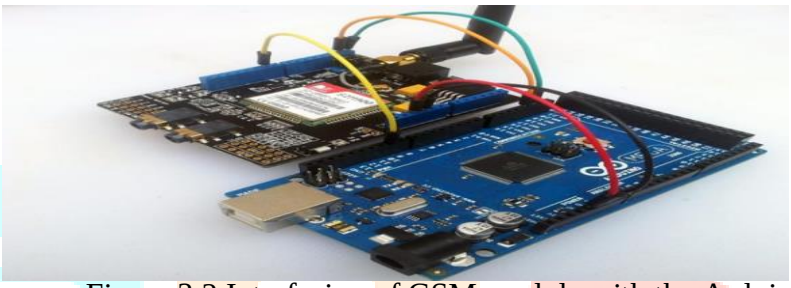

Figure 3.2 Interfacing of GSM module with the Arduino

3. RFID module

The system is implemented with the RFID card reader. The RFID card reader is connected to the Arduino mega. The VCC pin of RFID is connected to the +5V of Arduino mega. The ground pin of RFID is connected to the ground pin of arduino mega. The TX pin of RFID is connected to the RX pin of Arduino mega to establish communication.

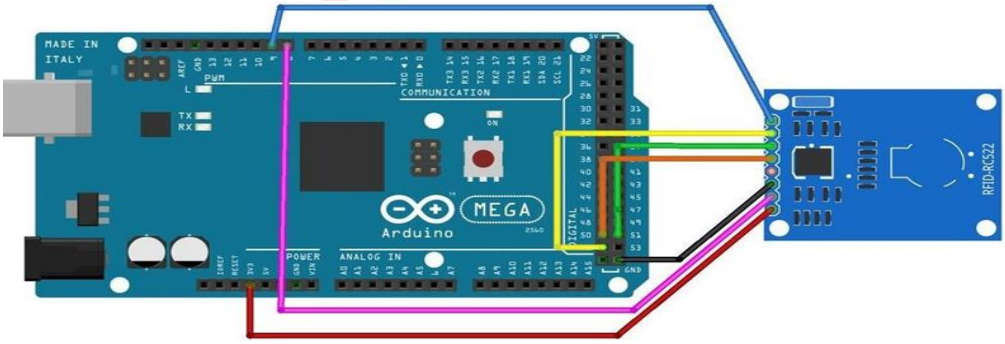

Figure 3.3 Interfacing of RFID module with the Arduino

4. LCD Module

The system is implemented with the LCD module. The LCD module is connected to the arduino mega to display the contents. The VCC pin of LCD is connected to the +5V of Arduino mega. The data pins of LCD D7 is connected to pin number 2 of arduino, The data pins of LCD D6 is connected to pin number 3 of arduino, The

data pins of LCD D5 is connected to pin number 4 of arduino, The data pins of LCD D4 is connected to pin number 5 of arduino, there are three control registers Rs, Rw, En. En of LCD is connected to pin number 11 of arduino. Rw is connected to ground pin of arduino. Rs is connected to pin number 12 of Arduino.

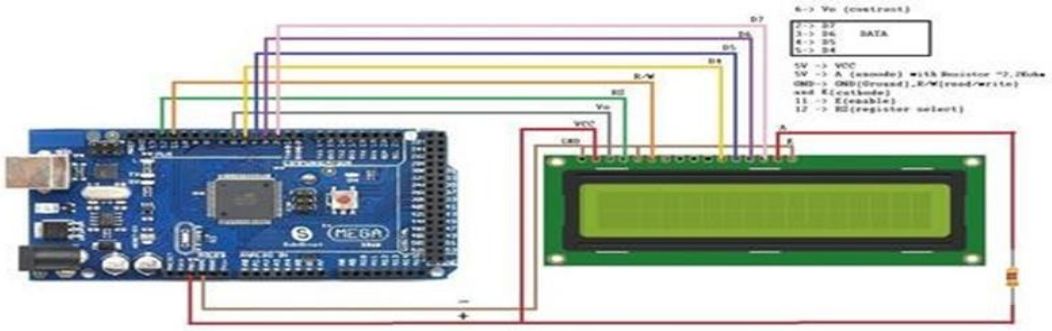

Figure 3.4 Interfacing LCD with the Arduino

5.Wi-Fi Module

The system is implemented with the Wi-Fi module. The Wi-Fi module is connected to the arduino mega. The VCC pin of Wi-Fi is connected to the +3.3V of Arduino mega. The ground pin of Wi-Fi is connected to the ground pin of arduino mega. The TX pin of Wi-Fi is connected to the RX pin of Arduino mega to establish communication. The RX pin of Wi-Fi is connected to the TX pin of Arduino mega to establish communication.

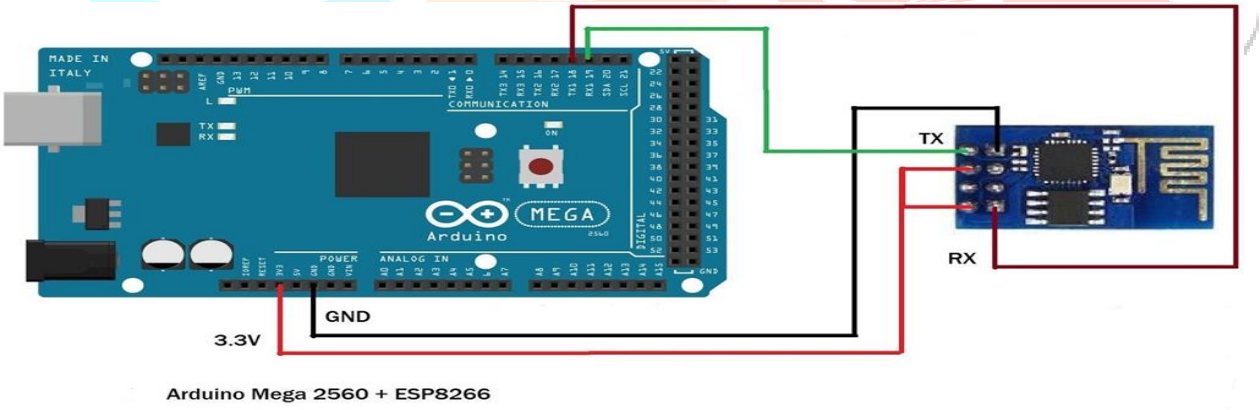

Figure 3.5 Interfacing Arduino mega with the Wi-Fi module

Steps involved in assembling all the devices and software requirements are as follows:

Step 1: Configuring the Programmable Devices

A software module for each programmable device which are Arduino Mega, GSM module SIM 800C-Shield, Flame Sensor, Flex Sensor, and IR Sensor is set on Arduino IDE. All the programmable devices are programmed in Arduino IDE using embedded C. This program should also have the functionality to communicate with the SIM 800C GSM module where the cell number of the user admin (concerned authority) and patient should be mentioned. SIM 800C GSM module should be set with a SIM card in it and it should configure as a GSM module.

Step 2: Setting up code in Arduino Mega:

The RFID module code should be dumped to the Arduino Mega board which is installed in the patient section. In the same way, the LCD module code should be dumped to the Arduino Mega board which is installed in the server section. The program for the Arduino may be kept in any folder but the path of the file should be mentioned at arduino.cc, so that the program runs automatically on the startup and Arduino could act as a micro-controller.

Step 3: Integrating the hardware modules

Arduino Mega would be connected to RFID reader, Wi-fi, LCD and relay.

Step 4: Connecting the SIM800C-Shield GSM module with Arduino

Signals from the Arduino Mega are sent to the GSM Modem SIM 800C-Shield.

Step 5: Powering up all the devices

In the proposed system, the main device that will be directly connected to the power source is Arduino Mega. Arduino needs to be connected with a 5v-2.5v power supply. The SIM 900A draws a good amount of power, so it needs a power supply adopter of 7v~12v to be functional. The voltage of the router depends on its model but it is generally 12v.

4.TESTING AND RESULTS

Sl # Test Case : -	**UTC-1**
Name of Test: -	**LCD Testing**
Items being tested: -	**LCD**
Sample Input: -	**Power supply**
Expected output: -	**LCD should display “Welcome to pillbox” message.**
Actual output: -	**LCD displays “Welcome to pillbox”.**
Remarks: -	**Pass**

Table 4.1.: Unit test case for LCD

Sl # Test Case : -	UTC-2
Name of Test: -	Scanning of RFID
Items being tested: -	RFID reader and tag
Sample Input: -	Scan the card
Expected output: -	RFID reader should only accept registered tag.
Actual output: -	RFID accepts registered tags.
Remarks: -	Pass

Table 4.2: Unit test case for RFID

Sl # Test Case : -	UTC-3
Name of Test: -	GSM message testing
Items being tested: -	GSM Module
Sample Input: -	Power supply, scanning the card
Expected output: -	Message should be sent to particular number given in the program
Actual output: -	Message sent to the registered number
Remarks: -	Pass

Table 4.3: Unit test case for GSM

Integration Testing

Integration testing is a level of software testing where individual units are combined and tested as a group. The purpose of this level of testing is to expose faults in the interaction between integrated units. Test drivers and test stubs are used to assist in Integration Testing. Integration testing is defined as the testing of combined parts of an application to determine if they function correctly. It occurs after unit testing and before validation testing. Integration testing can be done in two ways: Bottom-up integration testing and Top-down integration testing.

1.Bottom-up Integration:

This testing begins with unit testing, followed by tests of progressively higher-level combinations of units called modules or builds.

2.Top-down Integration

In this testing, the highest-level modules are tested first and progressively, lower-level modules are tested thereafter.

In a comprehensive software development environment, bottom-up testing is usually done first, followed by top-down testing. The process concludes with multiple tests of the complete application, preferably in scenarios designed to mimic actual situations.

Table 4.4 shows the test cases for integration testing and their results.

Sl # Test Case : -	ITC-1
Name of Test: -	Working of Arduino and LCD
Items being tested: -	RFID card and LCD display
Sample Input: -	Scan the card
Expected output: -	LCD should display prescription details.
Actual output: -	LCD displays user's prescription.
Remarks: -	Pass

Table 4.4: Integration test case for RFID card and LCD display

Sl # Test Case : -	ITC-2
Name of Test: -	Arduino, RFID and keypad testing
Items being tested: -	RFID and keypad
Sample Input: -	Scan the card and give input using keypad
Expected output: -	User's input should be accepted and displayed on the screen
Actual output: -	User's input displayed
Remarks: -	Pass

Table 4.5: Integration test case for RFID and Keypad

System Testing

System testing of software or hardware is testing conducted on a complete, integrated system to evaluate the system's compliance with its specified requirements. System testing falls within the scope of black-box testing, and as such, should require no knowledge of the inner design of the code or logic. System testing is important because of the following reasons:

• System testing is the first step in the Software Development Life Cycle, where the application is tested as a whole.

• The application is tested thoroughly to verify that it meets the functional and technical specifications.

• The application is tested in an environment that is very close to the production environment where the application will be deployed.

System Testing is shown in below table

Sl # Test Case : -	**STC-1**
Name of Test: -	**Synchronization Testing**
Items being tested: -	**RFID, dispenser, keypad and GSM**
Sample Input: -	**Input taken from RFID and keypad**
Expected output: -	**Device should scan, dispense and intimate using GSM**
Actual output: -	**All functions work properly**
Remarks: -	**Pass**

Table 4.6: System test case for RFID, Dispenser, Keypad, and GSM

RESULTS

Figure 4.7. Welcome message

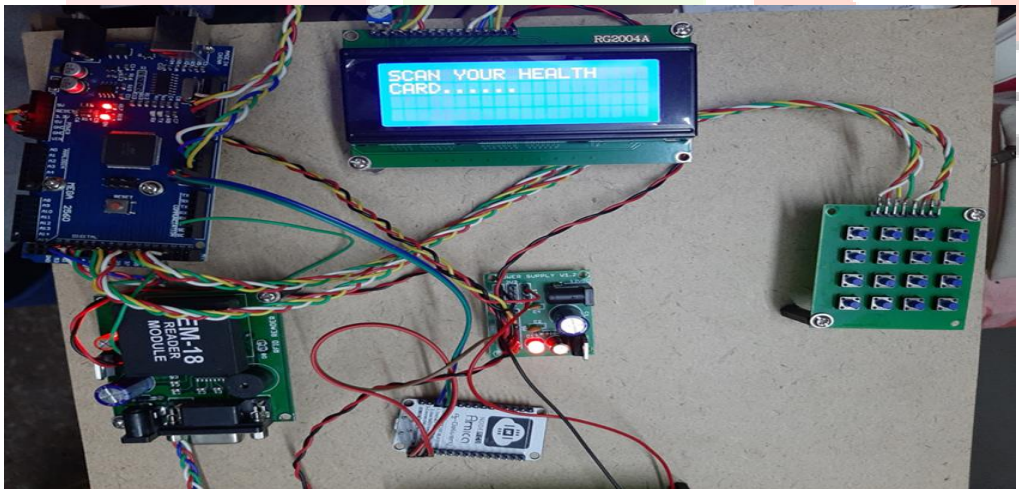

Figure 4.8. Scan your card

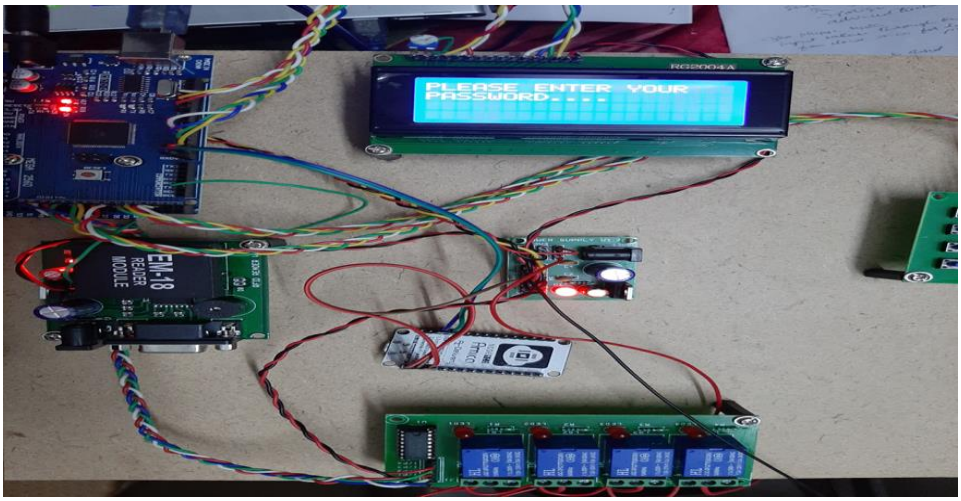

Figure 4.9. enter your password

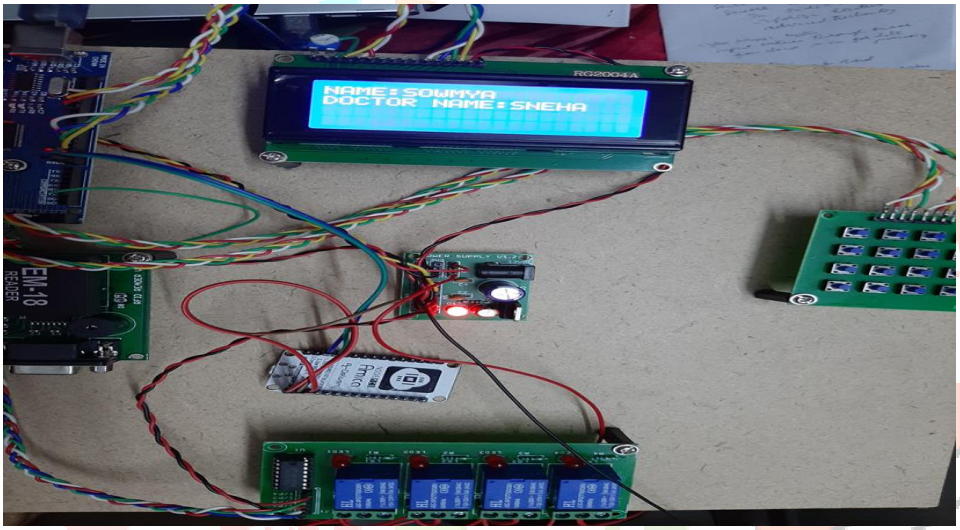

Figure 4.10. Prescribed doctor and patient name

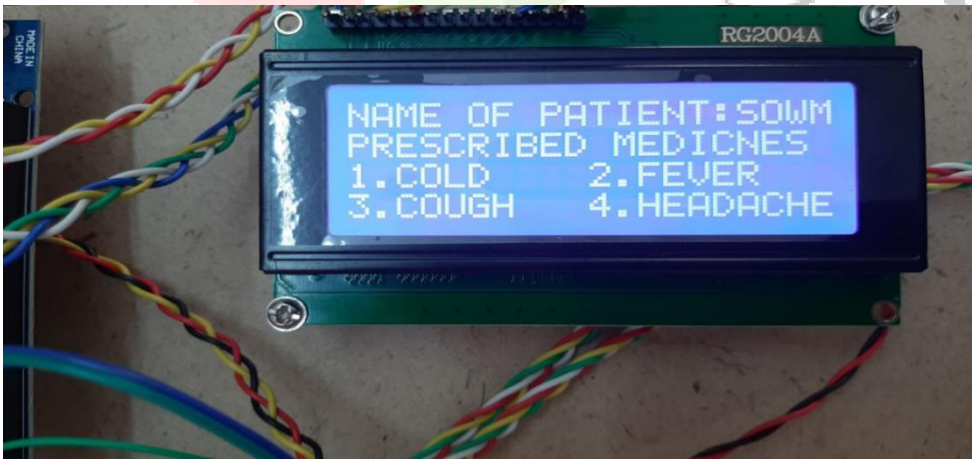

Figure 4.11. Medicine prescription

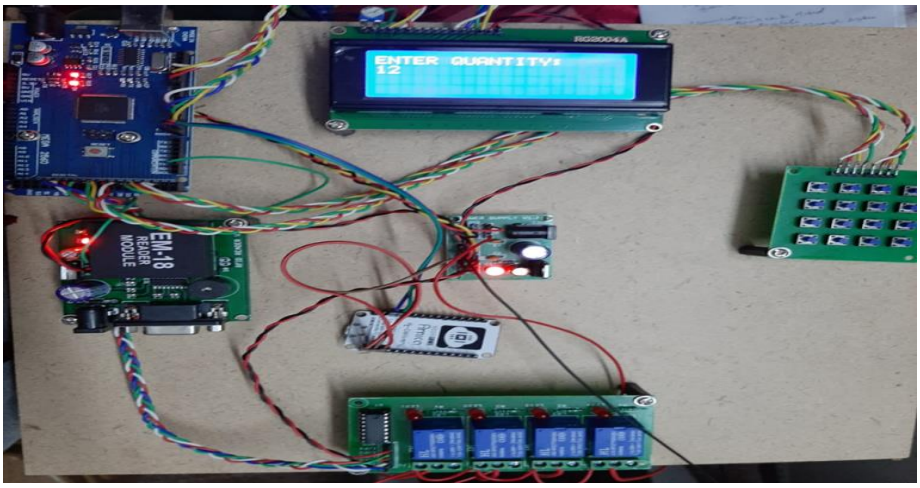

Figure 4.12. Quantity medicine

5.CONCLUSION

All Time Medicine (ATM) has been executed on ARM processor. The machine will apportion the solutions asked for by the approved client. To enhance the security, we utilize check card to get to the machine. The framework has been as of now actualized for 4 clients and 16 distinct solutions.

6.FUTURE ENHANCEMENTS

- Implementation of system using NFC card: Currently we are implementing the system RFID card and we could use NFC card instead.
- Delivery of OTC medicine and first aid along with prescribed medication.
- In current system only prescribed medicines are dispensed but in future user can dispense medicine which does not require prescription like medicines that relieve aches, pains, and itches and first aid.
- The pillbox will accept coin payment. Currently, the payment is being carried out using smart card and those who don't have it can't purchase medicine from the pillbox. But in future cash accepting module will be implemented which will use to concept of image processing from the reorganization of the coin

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