

# SMART PILL BOX

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**Abstract :** The smart pill box is an IOT based device primarily aiming at facilitating people to take their medicines on time. It consists of an android app which sends notification to the user at the designated time. This system has been designed to remind people about the medicines they have to take and the time at which it has to be taken. It makes extensive use of internet of things to enable communication between the app and the pill box.

**Keywords—***Internet of things , notification , android application , medicine*

## I. INTRODUCTION

The Internet of Things (IOT) is a concept that envisages a network of physical devices. These devices are usually inter-related computing devices, mechanical & digital machines, humans, animals, objects etc... like vehicles, home appliances that are embedded with electronics, softwares, sensors, actuators and have connectivity for data transfer.

Thus the Internet of Things extends internet connectivity beyond traditional devices like desktop and laptop computers, smartphones and tablets to a diverse range of devices and everyday things that utilize embedded technology to communicate and interact with the external environment, all via the Internet. The “Things” in a IoT network have unique identifiers (UIDs) and the ability and connectivity to transfer data over a network without requiring human-to-human or human-to-computer intervention. The field of application of IOT can be medical and health care, Transportation, building management, home automation etc... Typically a thing in the internet of things can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when the critical parameters deviate or a home appliance like An air conditioner that be remote commanded. These “Things” need an UID such as IP address and can transfer the data collected to a network. The use of IoT concept has rapidly increased in organizations across variety of industries to increase operational efficiency, better understanding customer needs and deliver enhanced customer’s experience. The data collected through IOT helps to improve decision-making and increase the value of the business by optimizing business parameters.

### 1.1 History and Evolution of IoT

The term “Internet of Things” was first coined by Kevin Ashton, co-founder of the Auto-ID Center at MIT, which he first mentioned in a presentation he made to Procter & Gamble (P&G) in 1999, while wanting to bring radio frequency ID (RFID) to the attention of P&G's senior management. MIT professor Neil Gershenfeld's book, *When Things Start to Think*, also appearing in 1999, didn't use the exact term but provided a clear vision of where IoT was headed. Although Ashton's was the first mention of the internet of things, the idea of connected devices has been around since the 1970s, under the monikers embedded internet and pervasive computing.

The concept of internetworking of smart devices was discussed as early as 1982 ,when a modified coke machine at Carnegie Mellon University , that could report inventory and temperature of the newly loaded stock became the first internet connected appliance. IoT is the outcome of the convergence of wireless technologies, microelectromechanical systems (MEMS), micro services and the internet. The convergence has helped tear down the wall separating the operational technology (OT) , that runs the physical of the ‘Things’ and information technology (IT) that enables thinking of the”Things”, thus making it possible to analyze unstructured machine-generated data for insights to drive improvements. The first generation of IoT evolved from machine-to-machine (M2M) communication, i.e., machines connecting to each other via a network without human interaction. M2M refers to connecting a device to the cloud, managing it and collecting data.

Taking M2M to the next level, IoT is a sensor network of billions of smart devices that connect people, systems and other applications to collect and share data. As its foundation, M2M offers the connectivity that enables IoT. The internet of things is also owes its emergence to “ SCADA” (supervisory control and data acquisition), a category of software application program for process control that gathers real time data from remotely located sensors to monitors and control equipments and process conditions. SCADA systems include hardware (pressure, temperature, flow, current,voltage,postion, movement sensors etc..and actuators) and software components. The hardware gathers and feeds data into a computer that has SCADA software installed, where it is then processed and presented in real time. It can be stated that the advanced late-generation SCADA systems developed into first-generation IoT systems. The concept of the IoT ecosystem, however, didn't really come into its own until the middle of 2010 when, in part, the government of China said it would make IoT a strategic priority in its five-year plan.

### 1.2 How IoT works:

The following basically form the components of an IoT eco system:

- **Smart devices** : These can be any day to day used object, even an otherwise dumb object that is web enabled and embedded with processors, sensors and communication hardware which they use to collect, send and act ,based on the data they acquire from the environments.
- **Gateway** : IoT devices share the sensor data they collect by connecting to a gateway or other edge device from where the data is either sent to cloud to be analyzed or analyzed locally.

These devices can also communicate with other related devices and act on the information they get from one another. The devices do most of the work without human intervention, although humans can interact with the devices -- for instance, to set them up, give them instructions or access the data. The connectivity, networking and communication protocols used with these web-enabled devices largely depend on the specific IoT applications deployed.

## II. SMART PILL BOX

### A. Existing System

The existing system is a traditional pill box which is operated manually by the person using it. People have to remember the time and medicine name which has to be taken. It does not indicate when a person has to take medicine. It does not indicate if the medicine is about to finish. You cannot check remotely, what all medicines are present in the box. It does not provide any restrictions to the children from taking any medicine. You cannot check remotely, how many tablets of each kind are present in the box. It does not have any indication about which medicine to take at what time.

### B. Proposed System

Proposed System is a smart pill box designed using internet of things and controlled by an android app. The android app facilitates the user to take the medicines at proper time by sending notifications. Also the pill box consists of LEDs which glow indicating the medicine to be taken at that time. The medical kit consists of a locking system such that only authorized user gets access to the Kit..

## III. WORKING OF THE SYSTEM

The system is a smart pill box which is IoT enabled and is controlled using an Android Application. The person using the kit has to enter the details of the medicine in the Android application. The medical kit has an Arduino Nano board and a Bluetooth module connected to it through breadboard. The smart phone is paired to kit through Bluetooth such that the Arduino board gets its input to notify the users. There are connections to LEDs which receives signal from Arduino and blinks at the specified time. The system consists of a servo motor to provide authorized access to the medical kit. The servo motor locks the board and can be unlocked only using the smart phone.

### A. Components

- 1) Arduino Nano
- 2) HC-05 (Bluetooth Module)
- 3) Breadboard
- 4) LEDs
- 5) Box
- 6) Resistors
- 7) Jumper Cables
- 8) Servo Motor

### B. Modules

#### I. Connection with Bluetooth module (HC-05)

- Step1: Connect the Tx pin of the Bluetooth module with the Rx pin of the arduino-nano board.
- Step2: Connect the Rx pin of the Bluetooth module with the Tx pin of the arduino-nano board.
- Step3: Connect the GND pin of the Bluetooth module with the GND pin of the arduino-nano board.
- Step4: Connect the VCC pin of the Bluetooth module with the 5V pin of the arduino-nano board.
- Step5: Pair the module with the app installed in the smart phone.

#### II. Connection with the Application

- Step1: Pair the smart phone with the Bluetooth module.
- Step2: Enter the password for completing the pairing process.
- Step3: Commands such as 'U' and 'L' are used to unlock and lock the medical kit.
- Step4: Commands such as '0' and '1' are used to turn off and turn on the LED bulbs respectively.

#### III. Connection with the Servo Motor

- Step1: Connect the GND pin of the servo motor with the GND pin of the arduino-nano board.
- Step2: Connect the VCC pin of the servo motor with the 5V pin of the arduino-nano board.
- Step3: Connect the input pin of the servo motor to the digital output pin of the arduino-nano board.

### C. Architecture

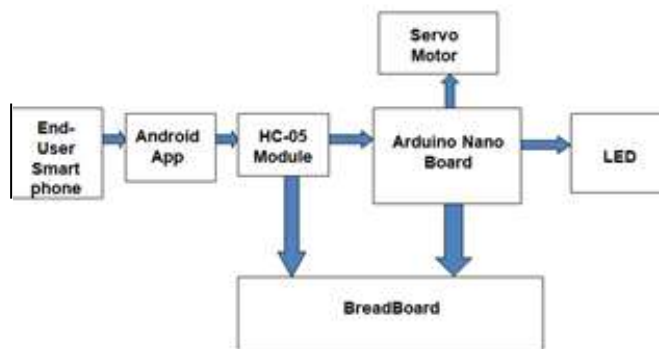


Fig 1: Block Diagram

### D. Circuit Diagram

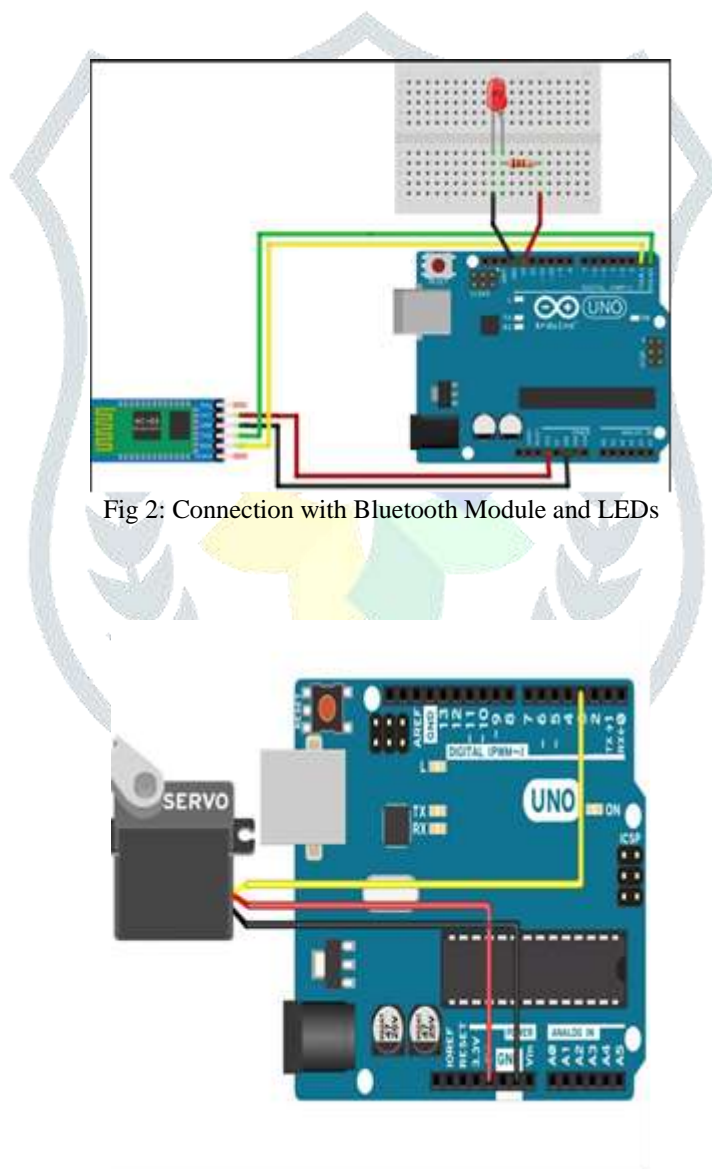


Fig 3: Connection with Servo Motor

### IV. CONCLUSION

The smart pill box has been designed to ensure that people take medicines on time by reminding them at the prescribed time and providing notification about which medicine to take. The notification is provided by making a LED blink at the particular compartment. The system is mainly aimed at providing elder people a simple and convenient way to remember taking their medicines on time. It has been built to be very user friendly so that it is easy to handle even for a naïve user. The Android application through which the system is controlled makes it very easy to use. The application has been designed with simple details

to be entered by user such as name of medicine, dosage and time. The components used to build the system are quiet easily available in the market which makes the system very cost effective as well as user friendly as compared to other systems consisting of more complex components which are difficult to handle.

## V FUTURE SCOPE

The system is designed to be open for many future enhancements, some of which are as below:

The system can be upgraded for use by attendants of children, who need not essentially have a medical background. The system can be improvised for use by vision impaired patients, by providing brail key pad for programming or voice command capability and compartmentalized vibration to help them to identify the location of the pill in the box.

It can be used in hospitals for each individual patients to notify the duty nurse or attendants for dispensing medicines. A nurse who is responsible for more than a few critical care patients at any time will find this extremely useful assistant and takes the stress out of a nurse's mind to remember the medicine dispensing without skipping and in time. It can be enhanced to a full scale medical assistant for reminding and notifying the patient and attendants on periodical in home health checks ( like sugar and BP check) , scheduling appointment visit to diagnostic center for elaborate health checks, scheduling appointment with doctors, keep a record of test results for ready reckoning by doctor and so on.

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