Smart Medication Pill Box For Blind People with Pulse Sensor

M.Shailaja, K.Lokeshwaran, S.Sheik Faritha Begum

Abstract: *Internet of Things (IoT) is an environment which connects all the physical things or objects through the internet. IoT has many applications such as smart home, smart healthcare, smart city, etc. Majorly IoT healthcare system is developed for patients, hospitals and healthcare centres that are regularly taking care of patients and also checks whether the patient has taken the prescribed medicine or not. Especially, elder people are not having proper care. Recently, people spend most of their money in Hospitals and medicines only. Hence, it proves our negligence towards our health. Not only that, most of the people are moving abroad leaving their old parents in their hometowns, so that they cannot take care of their parent's health. Not only the elders are suffering but also the visually challenged people are suffering a lot to intake the medicines properly. A smart pill box can be very helpful if you take many types of medications each day. I offer a free pill box that has 5 compartments that will hold each day's worth of medication. If you order more than 5 prescription medications with our pharmacy, you qualify for a free pill box. It is easy for the seniors to take pills in a correct time. Medication reminders prevent this from happening. There is nothing your senior has to read or figure out. They simply need to take the pills in the compartment after the reminder beeps. If it comes to blind people it's really a big issue to maintain the medication schedule and there might be a chance that blind people may take wrong medicines due to their lack of vision. To overcome all the issues and impossibilities in medication field I propose a project model where normal people as well as blind people both can be beneficiary.*

Index Terms: *Smart med box, sensors, voice module, dc motor, motor driver, Internet of Things(IOT), flex sensor, healthcare.*

I. INTRODUCTION

The name "Internet of Things (IOT)" was first instituted by Kevin Ashton official chief of the Auto-ID Center in 1999. By then, he saw Radio-recurrence recognizable proof (RFID) as basic to the Internet of things, which would enable PCs to deal with every individual thing. IOT comprises things that have unique identities and are associated with the Internet. While many existing gadgets, for example, organized PCs or 4G empowered cell phones, as of now have a few type of remarkable characters and furthermore associated with the Internet, the emphasis on IoT in the setup, control and systems administration by means of the Internet of gadgets or "things" that are generally not related with the Internet[1]. These incorporate gadgets includes indoor regulators, utility meters, a Bluetooth-associated headset, water system siphons and sensors, or control circuits for an electric vehicle's motor.

IoT is a mix of associated physical gadgets that are available through the web. As innovation has been blasting step by step, it is being utilized by organizations which can improve business proficiency, increment profitability, and diminish organization's expense.

The extent of IoT isn't constrained to simply associating things to the Web. IoT enables these things to convey and trade information while executing significant applications towards a typical client or machine objective. It has a wide scope of spaces including homes, urban areas, condition, vitality frameworks, retail, coordinations, industry, farming and wellbeing. The objective of my undertaking is to give solid and pressure free life to those clients who are taking pills consistently and to give the item at moderate expense too. My undertaking is significantly useful for the outwardly tested individuals. This framework makes great correspondence interface between the specialist, tolerant and the Pharmacist which makes the visually impaired man agreeable[2]. Numerous patients don't adhere to medicinal services supplier guidelines on the most proficient method to take drugs for different reasons.

Gadgets and items with inherent sensors are associated with an IOT stage which incorporates information from the various gadgets and applies investigation to share the most profitable data with applications worked to address explicit requirements. These ground-breaking IoT stages can pinpoint precisely what data is valuable and what can securely be disregarded. This data can be utilized to identify designs, make proposals, and identify potential issues before they happen.

As indicated by World Health Organization (WHO), over 80% of the general population over the age of 60 years are endorsed drugs that are to be controlled 2 - multiple times a day. Be that as it may, among this another 40-60% is having the issues identified with overlooking the taking of drugs at correct time[3]. The present normal strategies utilized in market for the update incorporates the ordinary caution with a pill box. Be that as it may, this does not check for overdose and off-base measurement among the patients. It just uses a clock, which on entry of a set time creates a caution. Additionally the opportune alarming for the re-dialing of the pill box to client is likewise missing coming about frequently in breaks over the span of treatment. The detecting of openings of the pill box should be possible by both Load Sensing technique and by Light based detecting[4]. The upsides of the space based detecting is that singular minute detecting is workable for distinguishing over dose issues and off base dose issues. The study for different

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methods of detecting the openings has been performed both scientifically and for all intents and purposes and examinations between the modes have been performed.

II. RELATED WORK

In this busy life, individuals don't have sufficient opportunity to visit a specialist for the standard registration so the medical problems continue expanding and individuals experience the ill effects of it. The Same situation is looked by senior resident's they can't visit the medical clinics consistently. Individuals are additionally not prepared to hold up in the line and arrangements for the registration[5]. In some cases, if the individual is experiencing a noteworthy wellbeing condition what's more, the treatment isn't accessible in the close-by territory so he needs to make a trip right to where the treatment is accessible.

More than 1.8 million patients in India pass on because of heart ailments, out of which 42.7% bite the dust on their way to the emergency clinic. The reason behind this is an absence of appropriate observing in the rescue vehicle/the vehicle conveying the patient. The improvement of patient checking framework is of extraordinary significance in the present quick paced life. The present situation in India, as indicated by the legislature measurements 2016 there is just a single paramedic accessible for 3200 Indians. It's to be sure a disturbing circumstance[6]. According to WHO insights uncover that consistently a human is losing his/her life over the globe because of inaccessibility of fundamental wellbeing enhancements. Some other creating nations have tried endeavors and manufactured a general access to tolerable human services for their kin. So as to improve the present paramedic situation in India, this undertaking is an incredible shelter. We will structure and build up a wellbeing checking framework utilizing Internet of Things (IoT) which is dependable, vitality proficient patient checking framework. It can send parameters of a patient continuously to specialist utilizing these parameters like (temperature, heartbeat) specialist can without much of a stretch perceive the individual wellbeing conditions and can endorse the fundamental prescriptions.

Taking Medicine at perfect time in legitimate sum will lead towards the quicker recuperation. In actuality what happens is that, they get their recommended drug be that as it may, neglect to pursue their social insurance expert's directions. Numerous individuals while taking prescript medicine don't adhere to their specialists' guidelines. Some regular explanations behind this are People may begin feeling much improved and choose to not complete the majority of the prescription. Individuals may not see an improvement in their side effects immediately and may quit taking the medicine since they think it isn't working[7]. A few meds are costly, and individuals may skip portions or take short of what they were endorsed to attempt to set aside some cash. With fuse if Information and Communication Technologies (ICT) Health care industry has advanced as electronic Wellbeing to address the issues of diminishing postponement in conveying diagnostics systems and medications, following patients records, refreshing remedies by checking the vitals progressively. The new worldview in e-Health is the fuse of

versatile innovation with detecting and systems administration framework with setting mindful conditions. The worldwide e-Health for 2014 was esteemed at USD 85.44 billion and expected to reach USD 308.0billion by 2022. The report additionally feature key portions like e-Health diagnostics to increment by 15% over next seven years and Mobile Health damage ket to increment by 24% by 2022[8]. In this manner demonstrating higher market development in brilliant medicinal services frameworks. Future prepared Smart Healthcare frameworks are required to convey nonstop administration through an incorporated human services chain that is self-checked and kept up lessens restorative mistakes also, gives quicker access to patient's vitals and records.

The other major existing systems are as follows:

Here, they proposes the Smart HealthCare Architecture structure named BCEP Care that chips away at complex occasion apportioning and grouping calculations to improve the execution of expansive scale IoT Based Healthcare application. The work portrayed proposes to decrease the intricacy and streamlines the occasion to lessen wastage of framework assets continuously when contrasted with Esper model. The process includes following advances – 1) Decompose CEP and generate number of sub-occasions, 2) Determine connection among the sub-occasions lastly 3) utilizing the bunching calculation kill the duplication and accomplish outstanding task at hand parity[9].

In this paper, the proposed paper tells us the Smart Hospital System (SHS) in view of RFID, WSN and savvy portable interoperating with one another through CoAP/6LoWPAN/REST arrange framework. The proposed work can gather constant variety of any basic patient's physiological parameter just as ecological condition. The three primary structure squares of SHS are 1) RFID improved WSN - the basic Architecture that underpins every single significant usefulness to be specific Hybrid Sensing Network (HSN), 2) IoT Smart Gateway – accountable for information gathering and preparing, framework the executives also, administration execution and 3) User Interface-grants approved client get to by means of internet browser by both fixed workspaces and versatile administrations[10]. The paper acquaint IOT HEALTHCARE with give improved patients checking and finding for moving toward anticipation and early identification of illness and the individuals who need serious checking for wellbeing conditions. Usage of IoT human services is partitioned into five key qualities: Stability, conti-nuity, secrecy, unwavering quality and proficiency must be connected to the keen medicinal services framework to solid the highlights of the IoT.

Discusses IoT as an insightful synergistic security model for keen medicinal services framework that incorporates united innovations like wearable gadgets, Ambient Assisted Living (AAL) knowledge furthermore, huge information. The AAL tends to the social insurance issues of maturing what's more, distinctively abled people by having a measured engineering that depends on computerization, security, control and

correspondence[11]. This empowers compelling support of the old people, guardians, doctors and relatives. Web of m-Health Things (m-IoT) coordinates versatile figuring, therapeutic sensors, and communication innovations utilizing 6LoWPAN. Its application incorporates detecting of glucose levels.

The paper presents two versatile cloud empowered body sensors for human services applications 1. Ingestible smaller than normal gadget, Wearable Capsule Endoscope (WCE), is utilized to review gastrointestinal tract where in picture outlines are transmitted to cloud for further handling and upgrade indicative capacity, 2. Wearable gadgets for consistent and long – term checking of Electrocardiogram (ECG) and Photoplethysmogram (PPG) by Ag-Ag/Cl electrodes and infrared sensors and further using distributed storage assets[12]. The main objective of this project is to tell about the usage of different methods of medications that is done in Internet of Things (IOT).

III. PROPOSED WORK

The current social insurance framework in India appears to have a few escape clauses in the middle of it is conceivable to sort out our social insurance framework distinctively so every individual in the nation can utilize it for their advantages. My idea is to make a convenient gadget that can quantify the patient heartbeat. This will guarantee everybody a tolerable medicinal services[13]. This paper proposes a technique for better usage of wellbeing observing utilizing Internet of Things (IoT).

This undertaking proposes a structure where it makes dazzle people require their medications on investment. This structure contains a pill which can be controlled through flex sensor, which has been fixed on the patient's hand to give a movement yield. The pill box's plate improvement has been controlled through a stepper motor so we can isolate a single section into two: one as before food and another as after food. The correspondence between the pill box and the flex sensor is given in wifi so they can put the pill box wherever and moreover be controlled from wherever.
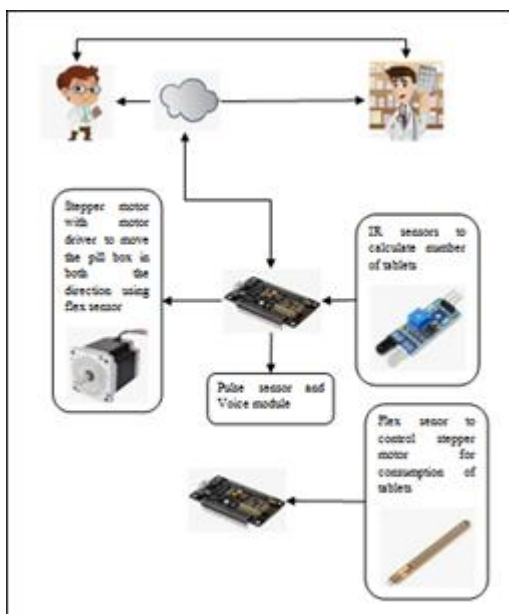

Fig 1: Architecture Diagram

I have affixed an IR sensor to the plate with the objective that the patient can check how various tablets are taken from the compartment. The details regarding the tablet count is transferred to the Pharmacist's site to refill when tablet gets unfilled or going to be void. Exactly when this situation happens, the pharmacist sends an request to the Doctor concerning drug required or not. The Doctor will check the patient details in the website provided for each patient and gives reply to the pharmacists. The patient history will be stored in the web so that doctor can check the health condition of the patient periodically.

Specialist sends a demand to the patient to check their heart beat through the sensor attached in the pill box, and this will be played through the speaker since they are visually impaired. At the point when the Pharmacist gets the affirmation, the pill box gets refilled furthermore, sent to the patient.

IV. ANALYSIS

Some of the major discoveries in existing frameworks:

Every time clients need to enter the name of the tablet manually. They need to enter the amount of the tablet. They also need to update the current status of the tablet count in a manual process. Which means everything should be done manually. To avoid these difficulties they have created an application which can reduce the humans work. I also found a few distinctive pillbox items accessible in the market. The least expensive one was the traditional pillbox, which contained seven boxes for seven diverse days of seven days. Such pillbox regularly cost around 200 INR. However, users need to stack the pills to the cases each week[14]. They additionally discovered another kind of pillbox, which had the sound update, and had the capacity to remind the patients to take medication at regular indicated time. Furthermore, it could just remind the users to take pills once every day. The normal expenses of this type of pillbox were around 1000 INR. Therefore, from this survey, I thought it was important to manufacture a modest and practical smart Medicine box that could bring more comfort for the people. From the writing referred to, the examination proposed an thought of Smart Medicine Box that will adjust the highlights of time following and alert activating Furthermore, when contrasted with the current framework, it will remind the people to take prescription not for once per day but thrice per day alongside that users does not have to refill the container consistently.

V. COMPONENTS USED

There are few significant components talked about in my paper and they are as pursued:

A. Node MCU

Node MCU is the open source IOT arrange. Node MCU Development board is featured with wifi capacity, simple stick, advanced pins and sequential

correspondence conventions. Node MCU Dev Kit has Arduino like Analog (for instance A0) additionally, Digital (D0-D8) sticks on its board. It bolsters UART, SPI, I2C, etc.

The ESP8266 is the name of a little scale controller planned by Espressif Frameworks[15]. The ESP8266 itself is an autonomous WiFi sorting out course of action promoting as a platform from existing little scale controller to WiFi and is in like manner prepared for running free applications. This module goes with an innate USB connector and a rich accumulation of stick outs.

Fig 2: ESP8266 NodeMCU WiFi Devkit

With a little scale USB connect, you can relate NodeMCU devkit to your workstation and flash it without any trouble, just like Arduino. It is also breadboard friendly.

PIN DEFINITION
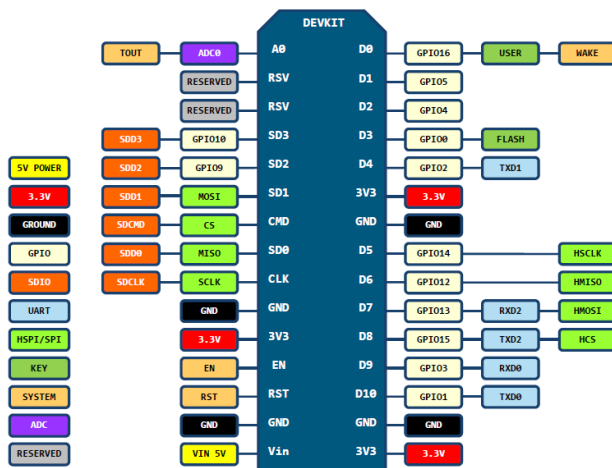
D0(GPIO16) can only be used as gpio read/write, no interrupt supported, no pwm/i2c/ow supported.

Fig 3: Pin Definition of Node MCU

1) *Flashing NodeMCU Firmware on the ESP8266 using Windows:*

Why flashing your ESP8266 module with NodeMCU?

NodeMCU is a firmware that enables you to program the ESP8266 modules with LUA content. Also, you'll see it fundamentally the same as the manner in which you program your Arduino. With only a couple of lines of code you can build up a WiFi association, control the ESP8266 GPIOs, transforming your ESP8266 into a web server and much more. Here, another ESP8266 module with stick header connector board is utilized, which is breadboard well disposed.
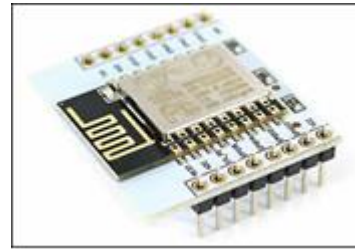

Fig 4: ESP8266 Module Breadboard Friendly with Header Connector

B. Motor driver:

Stepper motor drivers convert pulse signals from the controller into engine development to achieve definite circumstance. The CVK Series SC speed control structure offers a fundamental setup including a stepper motor, driver and programmable controller. The working pace, accelerating and deceleration time, running ebb and flow and stream can be set by methods for the driver switches, and simply turning the FWD (RVS) commitment to ON or OFF considers basic control.

C. DC motor:

A DC motor is an electromechanical contraption it changes over electrical power into mechanical power. In like manner it is a brushless, synchronous electric engine that can segment a full transformation into an expansive number of steps[16].The engine's position can be controlled unequivocally with no analysis instrument, as long as the motor is carefully estimated to the application.

1) *DME (Motors with pulse generators)*

There are two sorts of heartbeat generators that are included in DME arrangement engines : the attractive and optical upheaval sensor. (Note, the optical upset sensor is accessible just in the DME34 model.) Both are gradual insurgency sensor. And all the above generators can yield Single Phase beat flag as it were.

a) *Magnetic Revolution Sensor:*

Contrasted with the optical upheaval sensor, the attractive transformation sensor is progressively impervious to high temperatures, dust defilements, vibrations and effect stuns. The plan of the attractive unrest sensor type engine is additionally more basic.

Fig 5: DC motor

In steady kind

transformation sensor, beat yield signals are sent to a counter wherein the augmented esteem is shown. Flag commotion, here, lead to execution mistakes. Attractive sort insurgency sensors are particularly defenseless against flag commotion since the flag levels are generally low (20mA to 30mA)[17]. Accordingly, ensure attractive insurgency sensor type engines are given legitimate attractive protecting, and flag lines are as short as could reasonably be expected (in a perfect world inside 5m).

Fig 6: Magnetic Revolution Sensor

b) *Optical Revolution Sensor:*

Long-life LED is utilized as the light producer, and a photograph transistor is utilized as the light indicator. When utilizing optical insurgency sensor type engines, unique contemplations are expected to ensure against residue and outrageous temperatures[18]. The most continuous reasons for inconvenience in optical upheaval sensors are : dust fabricate ups weakening appropriate optical properties ; and extraordinary prompting disintegration in light emanation execution. Japan Servo would thus be able to guarantee full evaluated execution just in surrounding temperatures between 0 to 40 degrees centigrade, and in residue free conditions.

Fig 7: Optical Revolution Sensor

D. IR Proximity Sensor:

The Multipurpose Infrared Sensor works by perceiving reflected light beginning from its very own infrared LED[19]. By assessing the proportion of reflected infrared light, it can perceive light or diminish (lines) or even articles explicitly before it[20]. A RED LED is utilized to demonstrate the proximity of an article or recognize line. The size of the board is 50x20x10 (LxBxH).

Recognizing range is adaptable with inbuilt variable resistor. The sensor has a 3-stick header which interfaces with the microcontroller board or Arduino board by methods for female to female or female to male jumper wires. A mounting hole for adequately interface no less than one sensor to the front or then again back of your robot case.

Fig 8: IR Sensor

E. Flex sensor:

The flex sensor can be bent upto 180 degree. The life cycle of the sensor is more than one million. The height of the flex sensor is 0.43m (0.017"). The temperature range of the flex sensor is about -35 degree Celsius to +85 degree Celsius. Also the power rating of the sensor is about 0.50 watt.

1) How It Works:

Right when the sensor is straight, the particles give the ink a restriction of about 30k Ohms. At the point when the sensor is bent a long way from the ink, the conductive particles move additionally isolated, growing this restriction (to about 50k-70K Ohms when the sensor is contorted to 90°. At the point when the sensor redresses afresh, the restriction returns to the main regard. By assessing the resistance, you can choose how much the sensor is being turned.
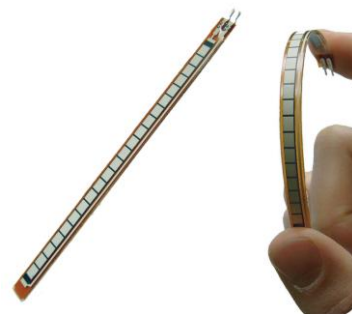

Fig 9: Flex Sensor

a) *Adjustable Buffer* – it is used to adjust the sensitivity range.

b) *Variable Deflection Threshold Switch* – this one acts as a switch without microcontroller.

c) *Resistance to Voltage Converter* - Ought to be utilized in circumstances when you need yield at a low level of bending.
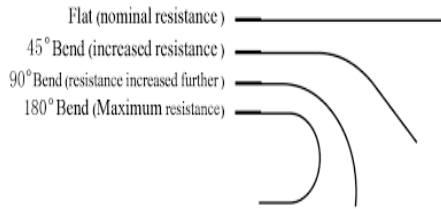
Fig 10: Working of flex sensor

F. Heartbeat Sensor:

Heartbeat Sensor is an arranged connection attachment and-play beat sensor for Arduino. It will in general be used by understudies, craftsmen, competitors, producers, and amusement and portable engineers who need to effortlessly join live pulse information into their activities[21]. The sensor cuts onto a fingertip or ear ligament and fittings legitimately into Arduino with some jumper wires. It in like manner fuses an open-source checking application that charts your pulse in certifiable time.

The Pulse Sensor Kit consolidates:
1) A 24-inch Color-Coded Cable, with (male) header connectors. It makes us extremely easy to embed the sensor into your task, and partner with an Arduino. No binding is required.

2) An Ear Clip, radiantly assessed to the sensor. We looked various spots to find only the right fasten. It might be hot-adhered to the back of the sensor and adequately worn on the ear ligament.
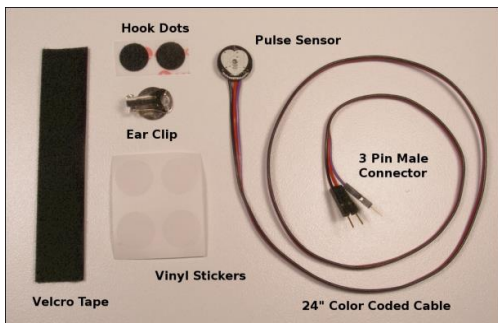

Fig 11: Pulse Sensor Kit

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3) 2 Velcro Dots. These are 'snare' side and are in like manner perfectly assessed to the sensor. You'll utilize these velcro bits amazingly supportive if you have to make a velcro (or surface) lash to overlay over a fingertip.

4) Velcro tape to crease the Pulse Sensor over your finger.

5) 3 Transparent Stickers. These are used on the exterior of the Pulse Sensor to verify it from smooth fingers and sweat-splashed ear ligament.

6) The Pulse Sensor has 3 holes around the outside edge which make it easy to sew it into almost anything.
The front of the sensor is the entirely side with the Heart logo. This is the side that reaches the skin. On the front you see a little round opening, which is where the LED radiates through from the back, and there is likewise somewhat square just

under the LED. The square is an encompassing light sensor, precisely like the one utilized in cellphones, tablets, and PCs, to change the screen brilliance in various light conditions. The LED sparkles light into the fingertip or ear cartilage, or other narrow tissue, and sensor peruses the light that skips back. The back of the sensor is the place the remainder of the parts are mounted. We put them there so they would not get in the method for the of the sensor on the front. Indeed, even the LED we are utilizing is a switch mount Driven. For progressively about the circuit usefulness, look at the Hardware page. The link is a 24" level shading coded strip link with 3 male header connectors.
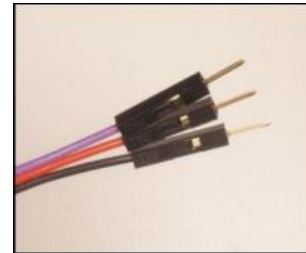

Fig 12: Three Wires of Pulse sensor

➢ RED wire = +3V to +5V
➢ BLACK wire = GND
➢ PURPLE wire = Signal

The Pulse Sensor can be associated with arduino, or connected to a breadboard. Before we get it ready for action, we have to ensure the uncovered hardware so you can get a solid heart beat signal[22]. Preparing the Pulse Sensor Before you truly begin utilizing the sensor you need to protect the board from your (normally) damp with sweat/slick fingers. The Pulse Sensor is an uncovered circuit board, and in the event that you contact the patch focuses, you could short the board, or present undesirable flag commotion. We will utilize a meager film of vinyl to seal the sensor side. Locate the little page of four clear round stickers in your pack, and strip one off. At that point focus it on the Pulse Sensor and furthermore it should fit splendidly.

G. Voice module:

This module board depends on ISD18B20, which is a solitary chip single-message record/playback gadget. Accounts are put away into on-chip non-unpredictable memory, giving zero-control message stockpiling. With the installed Flash memory utilized, information maintenance as long as 100 years and regular 100,000 eradicate/record cycles can be come to. Time for recording is 8-20 seconds.

1) Functions

a) REC:

The REC input is a functioning HIGH record flag. The gadget records at whatever point REC is HIGH. This stick must stay HIGH for the length of the recording. REC outweighs either playback (PLAYL or PLAYE) flag. In the event that REC is pulled HIGH amid a playback cycle, the playback quickly stops also, recording starts. A record

cycle is finished when REC is pulled LOW. An End-of-Message (EOM) marker is inside recorded, empowering a consequent playback cycle to end fittingly. The gadget naturally shuts down to backup mode when REC goes LOW. This bind has an inner force gadget. Holding this stick HIGH will expand reserve current utilization.

b)   PLAY:

There are two modes to play the voice in the voice chip: edge actuated mode constrained by PLAYE stick and level initiated mode constrained by PLAYL stick.
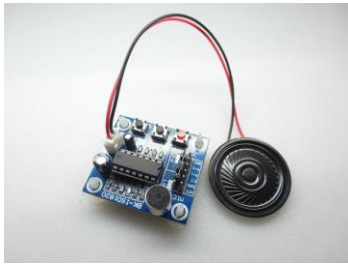

Fig 13: Voice Module

(i) Playback, Edge-activated: When a HIGH-going change is identified on this input stick, a playback cycle starts. Playback proceeds until an End-of-Message (EOM)[23] marker is experienced or the finish of the memory space is come to. Upon culmination of the playback cycle, the gadget consequently shuts down into reserve mode. Taking PLAYE LOW amid a playback cycle won't end the current cycle. This bind has an inside force gadget. Holding this stick HIGH will expand backup current utilization.

(ii) Playback, Level-activated: When this info stick level travels from LOW to HIGH, a playback cycle is started. Playback proceeds until PLAYL is pulled LOW or an End-of-Message (EOM) marker is distinguished, or the finish of the memory space is come to. The gadget naturally shuts down to reserve mode upon finishing of the playback cycle. This bind has an interior draw device. Holding this stick HIGH will build backup current utilization. FWD (forward).

On the board there are two switches for Feed Through capacity and REPEAT.

(1) Feed Through: This mode permits utilization of the speaker drivers for outside signals. The flag between the MIC and MIC_REF pins will go through the AGC, the channel and the speaker drivers to the speaker yields SP+ and SP-[24]. The input FT controls the feed through mode. To work this mode, the control pins REC, PLAYE and PLAYL are held LOW at Vss. The stick FT is held HIGH to Vcc. For typical activity of record, play and shut down, the FT stick is held at Vss. The FT bind has a feeble dismantle to Vss.

(2) REPEAT: If this switch is on, the present voice clasp will be played back more than once.

VI. CONCLUSION

For the most part, People are involved in their booked work. They don't have time even to eat their nourishment, at that point how they will manage their prosperity? Especially old people are not taking thought really in light of family units condition. This ought to be halted and furthermore they ought to figure out how to deal with themselves.

So my thought in this paper will doubtlessly comfort all of the challenges and makes the outwardly disabled man to feel pleasant and it makes the outwardly weakened man to take the correct medicine at the proper time[25]. In future, I hope that the energy saving mode and portable devies can be considered. Also, this device helps in keeping up fitting drug to the patients, and aides extending their future.

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