A SIMPLE NOVEL SECRET CODE DETECTION USING ARDUINO IDE CONTROL

A MINI PROJECT REPORT

Submitted by

P. SRIDHARAN 1NH17EE037

In partial fulfilment for the word of the degree of

BACHELOR OF ENGINEERING

IN

ELECTRICAL AND ELECTRONICS ENGINEERING

TABLE OF CONTENTS

TABLE OF FIGURES

CHAPTER 1:

1. HISTORY

Early in the nineteenth century, European experimenters made progress with electrical signalling systems, using a variety of techniques including static electricity and electricity from Voltaic piles producing electrochemical and electromagnetic changes. These numerous ingenious experimental designs were precursors to practical telegraphic applications.

Following the discovery of electromagnetism by Hans Christian Orsted in 1820 and the invention of the electromagnet by William Sturgeon in 1824, there were developments in electromagnetic telegraphy in Europe and America. Pulses of electric current were sent along wires to control an electromagnet in the receiving instrument. Many of the earliest telegraph systems used a single-needle system which gave a very simple and robust instrument. However, it was slow, as the receiving operator had to alternate between looking at the needle and writing down the message. In Morse code, a deflection of the needle to the left corresponded to a dot and a deflection to the right to a dash. By making the two clicks sound different with one ivory and one metal stop, the single needle device became an audible instrument, which led in turn to the Double Plate Sounder System.

The American artist Samuel F. B. Morse, the American physicist Joseph Henry, and Alfred Vail developed an electrical telegraph system. It needed a method to transmit natural language using only electrical pulses and the silence between them. Around 1837, Morse, therefore, developed an early forerunner to the modern International Morse code. William Cooke and Charles Wheatstone in Britain developed an electrical telegraph that used electromagnets in its receivers. They obtained an English patent in June 1837 and demonstrated it on the London and Birmingham Railway, making it the first commercial telegraph. Carl Friedrich Gauss and Wilhelm Eduard Weber (1833) as well as Carl August von Steinheil (1837) used codes with varying word lengths for their telegraphs. In 1841, Cooke and Wheatstone built a telegraph that printed the letters from a wheel of typefaces struck by a hammer.

The Morse system for telegraphy, which was first used in about 1844, was designed to make indentations on a paper tape when electric currents were received. Morse's original telegraph receiver used mechanical clockwork to move a paper tape. When an electrical

current was received, an electromagnet engaged an armature that pushed a stylus onto the moving paper tape, making an indentation on the tape. When the current was interrupted, a spring retracted the stylus and that portion of the moving tape remained unmarked. Morse code was developed so that operators could translate the indentations marked on the paper tape into text messages. In his earliest code, Morse had planned to transmit only numerals and to use a codebook to look up each word according to the number which had been sent. However, the code was soon expanded by Alfred Vail in 1840 to include letters and special characters so it could be used more generally. Vail estimated the frequency of use of letters in the English language by counting the movable type he found in the type-cases of a local newspaper in Morristown. The shorter marks were called "dots" and the longer ones "dashes", and the letters most commonly used were assigned the shorter sequences of dots and dashes. This code was used since 1844 and became known as Morse landline code or American Morse code.

In the 1890s, Morse code began to be used extensively for early radio communication before it was possible to transmit voice. In the late 19th and early 20th centuries, most high-speed international communication used Morse code on telegraph lines, undersea cables and radio circuits. In aviation, Morse code in radio systems started to be used on a regular basis in the 1920s. Although previous transmitters were bulky and the spark gap system of transmission was difficult to use, there had been some earlier attempts. In 1910, the US Navy experimented with sending Morse from an airplane. That same year, a radio on the airship America had been instrumental in coordinating the rescue of its crew. Zeppelin airships equipped with radio were used for bombing and naval scouting during World War I, and ground-based radio direction finders were used for airship navigation. Allied airships and military aircraft also made some use of radiotelegraphy. However, there was little aeronautical radio in general use during World War I, and in the 1920s, there was no radio system used by such important flights as that of Charles Lindbergh from New York to Paris in 1927. Once he and the Spirit of St. Louis were off the ground, Lindbergh was truly alone and incommunicado. On the other hand, when the first airplane flight was made from California to Australia in 1928 on the Southern Cross, one of its four crewmen was its radio operator who communicated with ground stations via radio telegraph.

CHAPTER 2:

2. ABSTRACT

This project proposes a Morse code decoder. Before mobile phones even before phones, individuals imparted through Morse code. Despite being an innovation that is more than 160 years of age, it's despite everything utilized today among beginner radio clients and on certain boats. The point of the project is to deliver an advanced framework equipped for disentangling Morse code dots and dashes, and showing the yield as content on a screen. Just as that, it should be conceivable to deliver "great" Morse code by yielding Morse code encoded letters from a console. Morsecode decoder shows the decoded message on a screen. The framework likewise produces Morse code signals through contribution from a console. The centre of the venture is a Morse code decoder that takes as its info a progression of heartbeats, and a screen driver that renders the decoded message on a screen. Potential augmentations to the task incorporated A Morse code indicator which can guess regardless of whether a self-assertive sign contains a Morse code message, channels to confine a Morse code beats from that signal and a Morse code generator that delivers a progression of heartbeats from input employing a console.

CHAPTER 3:

3. INTRODUCTION:

Communicating in a coded way,besides being so enthralling has numerous applications in various fields. One of the familiar methods of code communication is the Samuel F.B.Morse method known as “Morse Code”. Like any other language, Morse code has its own way to represent alphabets, numerals and punctuation marks by using an arrangement of dots (dits), dashes (dahs) and spaces. This Morse code can be transmitted in several ways: formerly as electrical pulses, it can also take forms like an audio tone, a radio signal, light, etc. After the introduction of this language in Europe, it was noticeable that Morse code was meagre for transmission of some Non- English text as it was deficit in code for letters with diacritic marks. To resolve this problem, an improved version called the International Morse Code was developed by a conference of European Nations back in the year 1851. This new code is termed as Continental Morse Code. Morse code can be learnt, and this code signaling in a form is distinguishable by the human senses, directly understood by persons trained in this skill. The main advantage of using Morse code is the ability to transmit messages over thousands of miles on a moderately low amount of power. Before the era of smart phones and landlines, messages were passed using handwritten letters sent on horsebacks, telegraphs and Morse code. Morse code is accepted as a universal language. It is one of those cherished custom tracing us back to the period of radio. Morse code has netted an enormous share in the field of security from the olden days till today. The US Navy and Coast Guards still make use of signal lamps to communicate via the Morse code to maintain secrecy. The code is more like a security enhancer. The code finds application in several fields like aviation, military securities, amateur radios and assistive technology.

3.1. MORSE CODE **:**

Morse code is usually transmitted by on-off keying of an information-carrying medium such as electric current, radio waves, visible light, or sound waves. Morse code is a method used in telecommunication to encode text characters as standardized sequences of two different signal durations, called dots and dashes or dits and dahs.

3.2. REPRESENTATION:

Morse code sequence may be made from a combination of the following five bit-strings:

- short mark, dot or "dit" (**.**)"dot duration" is one time unit long
- longer mark, dash or "dah" (**-**): three time units long
- inter-element gap between the dots and dashes within a character: one dot duration or one unit long
- short gap (between letters): three time units long
- medium gap (between words): seven time units long

3.2.1 TIMING:

```
M------   O----------   R------   S----   E      C----------   O----------   D------   E


===.===...===.===.===...=.===.=...=.=.=...=.......===.=.===.=...===.===.===...===.=.=...=
  ^           ^   ^     ^          ^
  |           dah  dit     |          |
Symbol space              letter space    word space
```

3.2.2 SPEED**:**

Usually, speeds are stated in words per minute. That introduces ambiguity because words have different numbers of characters, and characters have different dot lengths. It is not immediately clear how a specific word rate determines the dot duration in milliseconds.

Some method to standardize the transformation of a word rate to a dot duration is useful. A simple way to do this is to choose a dot duration that would send a typical word the desired number of times in one minute. If, for example, the operator wanted a character speed of 13 words per minute, the operator would choose a dot rate that would send the typical word 13 times in exactly one minute.

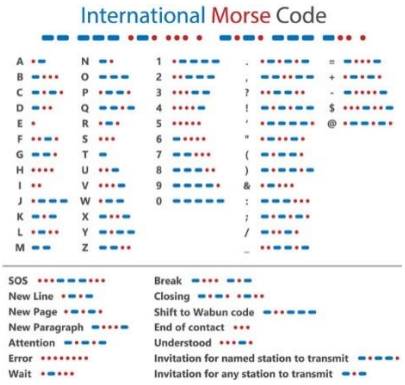

Fig.1. International Morse Code Representation

For commercial radiotelegraph licenses in the United States, the Federal Communications Commission specifies tests for Morse code proficiency in words per minute and in code groups per minute. The Commission specifies Morse code test elements at 16 code groups per minute, 20 words per minute, 20 code groups per minute, and 25 words per minute.

Based upon a 50 dot duration standard word such as PARIS, the time for one dot duration or one unit can be computed by the formula:

$$T = 1200 / W$$

Where: *T* is the unit time, or dot duration in milliseconds, and *W* is the speed in wpm.

CHAPTER4:

4 PROPOSED METHODOLOGY:

4.1 LIGHT SIGNALING:

Morse code is normally transmitted as a visual sign utilizing blazing lights or reflections however can likewise be utilized as a non-noticeable type of correspondence utilizing the tapping of fingers or in any event, squinting of eyes. To utilize Morse code utilizing light, you need a hand held light which can turn on and off by utilization of a catch ideally. In the Royal Navy and most different Navies a 5 inch hand light (close signalling), 10 inch light (mid - skyline signalling) and 15 inch lights (skyline signalling) are utilized. You should guarantee that the light is pointed straightforwardly at the collector consistently any wanderer development can bring about the recipient not seeing the letter or even message being sent. Basic press and discharge the catch on your light rapidly or gradually to show a spot or a scramble. Leave a significant stretch between words, so as not to befuddle the beneficiary, additionally hold up until the collector gives one long blaze to demonstrate they got the word effectively.

On the off chance that you commit an error during a word you have to give 8 dots which shows a blunder, you then resend your statement.

4.2 SOUND SIGNALING:

An ongoing and incredible learning tool is the Morse code interpreter with sound. The content changed over to Morse code can be utilized to prepare individuals with hearing incapacities. The procedure is joined by printing the code on the screen letter by letter in full sync with the sound, hence making learning quicker and simpler.

CHAPTER 5:

5 BLOCK DIAGRAM:

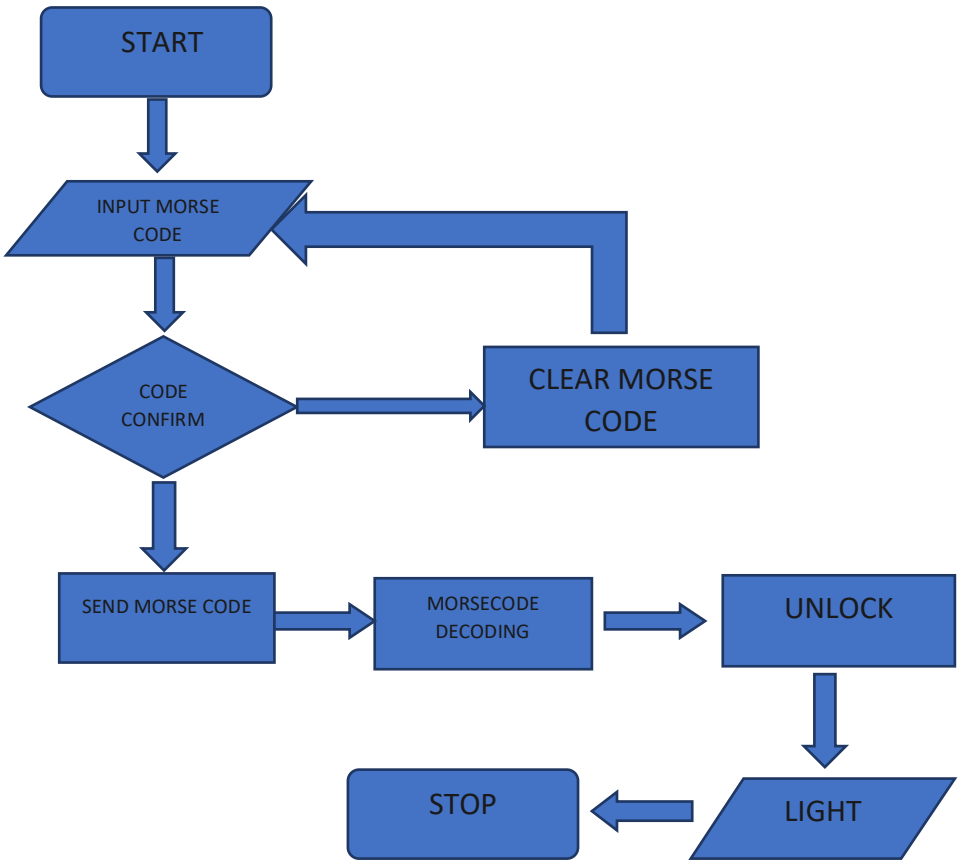

Fig.2. Decoding of Morse code

When the Morse code program is run, it asks the user to input the Morse code, then the Arduino IDE identifies the given Morse code, if an error is identified in the given input, it asks the user to re-enter the Morse code, else it moves to the next stage of decoding the given code.

The given Morse code is decoded to its corresponding sentence that could be understood by the user. During the decoding, as per the used methodology, LED/buzzer glows giving a light/sound signal respectively. The process stops once the given code is converted.

CHAPTER 6:

6 COMPONENTS:

6.1 ARDUINO UNO

Fig.3**.** Arduino UNO

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your Uno without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

6.2 PUSH BUTTON

Fig.4**.** Push Button

A push-button or simply button is a simple switch mechanism to control some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal.The surface is usually flat or shaped to accommodate the human finger or hand, so as to be easily depressed or pushed. Buttons are most often biased switches, although many un-biased buttons (due to their physical nature) still require a spring to return to their un-pushed state.

6.3 MCL053MD – LED, Red

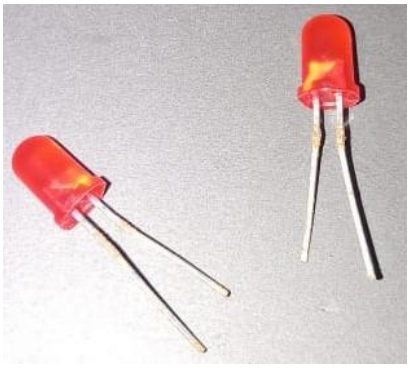

Fig.5.LED (generic)

- The MCL053MD is a 5mm HE red round LED Lamp with red diffused lens, through hole mounting, round-shaped lens, 15mcd luminous intensity, 625nm peak wavelength, 45° viewing angle. This LED lamp is made with GaAsP on GaP.
- 85mW Power dissipation
- -40 to +85°C Operating temperature range,

6.4 BREADBOARD

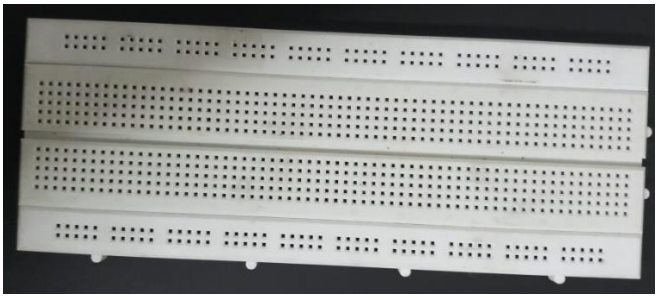

Fig.6. MCBB400 - Breadboard, Solderless

A **breadboard** is a platform you can use to build and test electronic circuits, usually without having to do any soldering. Certain parts of the breadboard are wired together so that electricity can flow from component to component in orderly rows.

6.5 BUZZER

Fig.7. Fast Pulse Piezo Audio Indicator Buzzer

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

The buzzer consists of an outside case with two pins to attach it to power and ground. When current is applied to the buzzer it causes the ceramic disk to contract or expand. Changing this then causes the surrounding disc to vibrate. That's the sound that you hear.

6.6 RESISTOR

Fig.8. Resistor 330 ohm

Resistor is an electrical component that reduces the electric current. The **resistor's** ability to reduce the current is called resistance and is measured in units of ohms (symbol: Ω). If we make an analogy to water flow through pipes, the **resistor** is a thin pipe that reduces the water flow.

6.7 JUMPER WIRE

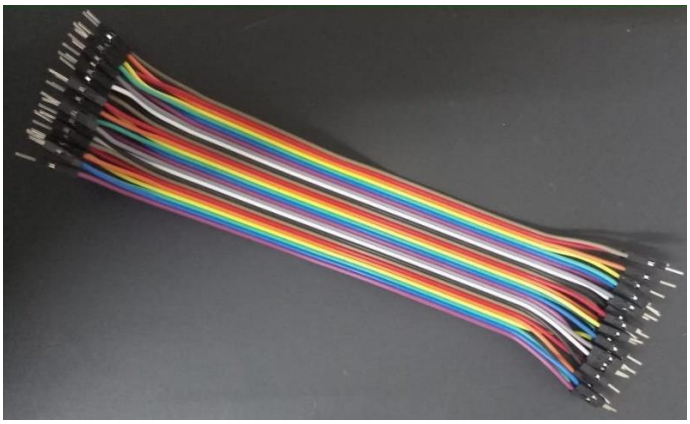

Fig.9. Jumper wires

Jumper cables are a smaller and more bendable corrugated cable which is used to connect antennas and other components to network cabling.

The term "jumper wire" simply refers to a conducting wire that establishes an electrical connection between two points in a circuit. You can use jumper wires to modify a circuit or to diagnose problems in a circuit.

CHAPTER 7:

7 SCHEMATIC

Instructions for Digital Pins from Arduino To Breadboard:

- Pin D2 is connected to one leg of push button1.
- Pin D7 is connected to one leg of push button2.
- Pin D8 is connected to +ve terminal leg LED through resistor.
- And finally, pin D12 is connected to +ve terminal leg buzzer through resistor.

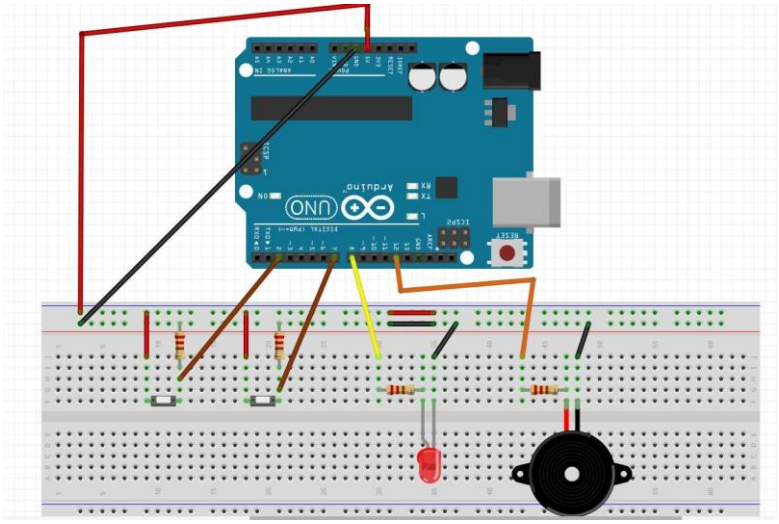

Fig.10. Schematic

When you done making circuit on breadboard and uploaded Sketch. Click Serial Monitor and you will see it like below image

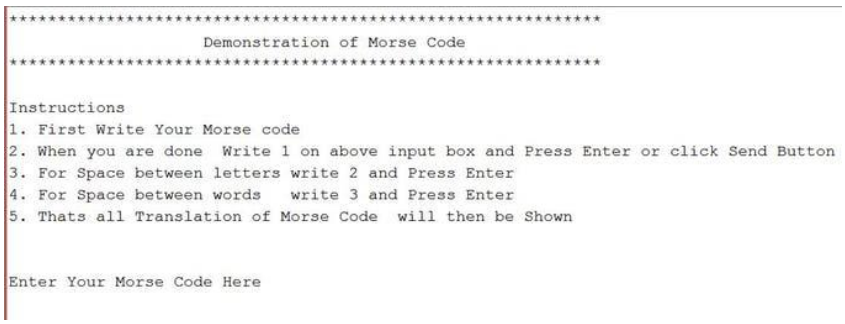

Fig.11. Serial Monitor Picture

CHAPTER 8:

8 APPS AND ONLINE SERVICES

Fig.12. ARDUINO IDE

The Arduino Integrated Development Environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in functions from C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.

Arduino IDE is software used to work Arduino UNO in our task. It is the medium used to change over Morse code into typical language. we have programmed code for our project (code used to translate Morsecode) usingArduino Ide software.

The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main()* into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution.The Arduino IDE employs the program *avrdude* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware. By default, avrdude is used as the uploading tool to flash the user code onto official Arduino boards.

CHAPTER 9:

9 MORSE CODE TRANSLATOR CODE :

```
intledPin=8;

//For letters
char*letters[] = {
".-", "-...", "-.-.", "-..", ".", "..-.", "--.", "....", "..", // A-I
".---", "-.-", ".-..", "--", "-.", "---", ".--.", "--.-", ".-.", // J-R
"...", "-", "..-", "...-", ".--", "-..-", "-.--", "--.." // S-Z
};

//For Numbers
char* numbers[] = {
  "-----", ".----", "..---", "...--", "....-", ".....",
"-....", "--...", "---..", "----."
};
intdotDelay = 200;

voidsetup() {
  // put your setup code here, to run once:

pinMode(ledPin, OUTPUT);
Serial.begin(9600);

}

voidloop() {
// put your main code here, to run repeatedly:
charch;
if (Serial.available())
{
ch=Serial.read(); // read a single letter if (ch>= 'a' &&ch<= 'z')
if (ch>= 'a' &&ch<= 'z')
{
flashSequence(letters[ch - 'a']);
}
elseif(ch>= 'A' &&ch<= 'Z') {
flashSequence(letters[ch - 'A']); }
elseif (ch>='0'&&ch<='9') {
flashSequence(numbers[ch-'0']); }
```

```
elseif (ch==' ') {
delay(dotDelay*4);
}
}

}

voidflashSequence(char*sequence) {
inti=0;
while (sequence[i] !=NULL) {
flashDotOrDash(sequence[i]);
i++; }
delay(dotDelay*3);
}


voidflashDotOrDash(chardotOrDash) {
digitalWrite(ledPin, HIGH); if (dotOrDash=='.')
{
delay(dotDelay);
  }
else// must be a -
{
delay(dotDelay*3); }
digitalWrite(ledPin, LOW); delay(dotDelay);
}
```

To run this code on your Arduino, upload button in the Arduino IDE. It looks like a green arrow:

The code will upload to your Arduino, and you'll see the SOS morse code flashing.

CHAPTER 10:

10 MERITS AND DEMERITS

10.1 Merits

- Modest -The utilization of the Morse code is a less expensive approach to send data over significant distances. For more than a long time since data transmits effectively over longer separation by means of radio waves in a simple and modest manner.

- Remote -The absence of wires has made the use of Morse code differing since it is quietly sent and gotten at any attractive speed. Its remote nature makes Morse code receivable, however, any noticeable methods.

- Easy to utilize.

- Can be utilized by somebody's inability as well.

- No force required for transmission.

- Restricted data transfer capacity required.

- Simpler to sift through background noise.

10.2 Demerits

- Learning the Morse Code-The Morse code isn't a simple idea to comprehend and it is to a great extent a save of a couple of radio programmers. The idea is not to ease to adapt either and the machines are in shortage in the advanced age.

- Extreme speed -20 WPM

CHAPTER 11:

11 CONCLUSION

In this project we have endeavoured translating Morse code and have been fruitful. we have been fruitful in making a model of mode code decoder. this has significant application in

Morse code may have a little effect in history since it just aided during the common war. Indeed, even today, Morse code is utilized in the military because of its minimal effort and basic use. Notwithstanding the creation of Morse code and broadcast, the Internet, radio, the phone may never have been created. This innovation may be a little start yet a significant one without a doubt.

CHAPTER 12:

12 FUTURE SCOPE

You might notice that our Morse code flasher has some flaws. It doesn't do anything to handle messages with spaces in them. With their shortcomings in mind, here are a few small additional challenges you could try:

- Modify the program to handle Morse code messages that contain spaces.
- Modify the program to translate the ASCII characters once, at program startup. The setup function would be the ideal place to do this, since the Arduino will only call it once.
- Implement a hash table in C, or find a pre-made hash table implementation you like. Modify the program to use a hash table to map the ASCII characters to Morse code characters instead of doing an array lookup.
- Acquire a breadboard, a speaker, some resistors, and some jumper wires. Create a simple circuit that connects the speaker to the Arduino, and modify the program to play the Morse code message using the speaker instead of flashing it out via the LED. Or, for even more fun, make your Morse code message play via the LED and the speaker at the same time!

CHAPTER 13:

13 REFERENCES

[1] "*Morse Code:Wikipedia"*. [Online].Available :https://en.wikipedia.org/wiki/Morse_code

[2]*"Morse Code communication using Arduino-Morse Code Translator"*.[Online].Available:https://electropeak.com/learn/morse-code-communication-using-arduino/

[3]Brett,'BecomeaMorseCodeExpert',2019.[Online].Available:https://www.artofmanliness.com/articles/morse-code/