IoT Based Speech to Braille Letter Generate Using Arduino

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of
Bachelor of Science in Computer Science and Engineering

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DHAKA, BANGLADESH

JULY 2020

APPROVAL

This Project titled "**IoT Based Speech to Braille Letter Generate Using Arduino**", submitted by Abu Raihan Choudhury to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on July 2020.

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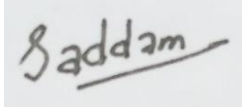**Gazi Zahirul Islam**   **Internal Examiner**

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DECLARATION

I, hereby declare that, this project has been done by me under the supervision of **Mr. Aniruddha Rakshit, Senior Lecturer, Department of CSE** Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.
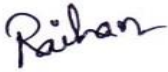
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ACKNOWLEDGEMENT

First, I express our heartiest thanks and gratefulness to almighty for His divine blessing that makes me possible to complete the final year project/internship successfully.

I am really grateful and wish my profound our indebtedness to **Mr. Aniruddha Rakshit**, **Senior Lecturer**, Department of CSE Daffodil International University, Dhaka. Deep Knowledge & keen interest of my supervisor in the field of "*IoT*" to carry out this project. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior drafts and correcting them at all stage have made it possible to complete this project.

I would like to express my heartiest gratitude to **Dr. Syed Akhter Hossain**, Head**,** Department of CSE, for his kind help to finish my project and also to other faculty members and the staff of CSE department of Daffodil International University.

I would like to thank my entire course mate in Daffodil International University, who took part in this discuss while completing the course work.

Finally, I must acknowledge with due respect the constant support and patience of my parents.

ABSTRACT

The braille system which is being utilized for the visually impaired individuals everywhere throughout the world. For a visually impaired individual this is the best way to get instructed and satisfy the fantasy about being set up without anyone else. I simply attempted to give a lift in their manner accomplishment through the braille system. This project has been made by thinking about the government assistance of the visually impaired individuals around us to make their life simpler and comfortable. This is a push to carry a change to the entire braille system. The device I made is exceptionally easy to utilize. In spite of the fact that its usefulness is unpredictable however I kept the utilizing part as straightforward as could reasonably be expected. The device takes voice order as input and can change over it into text format of braille. Basic however compelling. This device is low on cost and can be a generally excellent method for correspondence for the visually impaired individuals in their everyday life. This device has two finishes Producers and clients. The clients can utilize this device as they need. They can keep the printed braille paper for themselves or they can print for others as well. I hope that this will bring a contrast among before and after of this device.

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Introduction

1.1 Introduction

In this 21st century, individuals are changing their contemplation's. Day by day it's being demonstrated that nothing is much stronger than a will of somebody. Regardless of whether he/she is genuinely tested or visually impaired and so forth. This in view of the cutting edge innovations. Furthermore, we are fortunate to live in a time of the unrest of advances. In my project I am attempting to take some assistance of this revolution.

Globally, at least 2.2 billion people have a vision impairment or blindness, of whom at least 1 billion have a vision impairment that could have been prevented or has yet to be addressed. [1]

The evaluated number of individuals who are visually impaired in the world is 314 million. 45 million of them are totally visually impaired. [2] 55% of visually impaired individuals are women. [3] All inclusive, at regular intervals one individual goes visually impaired and consistently one kid goes dazzle. [4] And in Bangladesh roughly 750k individuals experiences visual deficiency. [5] Braille literacy for visually challenged individuals have same job as typical instructive techniques have for individuals with vision. The proportion of Braille literacy to the number of inhabitants in visually challenged individuals is poor. As indicated by certainty sheet of WHO for visual hindrance refreshed August 2019, 314 million individuals in the world are visually impaired with 89% living in developing countries. [6] In a country like India, a large portion of the instructors for encouraging Braille are visually challenged themselves. Because of this, literacy rate for visually challenged individuals is as low as 3% to 5% in most developing countries. 26 million out of all visually impaired individuals are utilized. Instructors, school teachers and direction guides, Social laborers and analysts these are the employments daze individuals do the most. [7] And a portion of the appropriate employments for them are monetary counsel,

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physical specialist, word related advisor, discourse language pathologist and so on [8] Dazzle individuals go up against various difficulties consistently. Blindness affects an individual's capacity to self-explore outside notable condition and even just strolling down a jam-packed road. I will make a device that will take input signal from outside receiver from individuals who are visually impaired. I have produced this project thought to fathom their everyday life issues. Also, in addition I am attempting to build up this project in Bengali Language also. This will help them from their everyday life to instructive and official and public activity. In a word it will be useful in each phase of their life.

The fundamental Braille system utilizes a mix of six raised dabs giving a potential blend of 64 unique signs. There are three degrees of Braille encoding of which the main level is significantly utilized for learning Braille. This level presents a coordinated mapping of letters in order, numerals and extraordinary characters. The traditional Braille system utilizes record and pointer. The pointer can be utilized to punch openings on a Braille material and recreate the blend of words, letter sets and numerals. The far edge of the punched area can be utilized by the visually impaired to detect the Braille codes.

The traditional strategy for learning Braille is massive and needs help. These were the essential explanations behind building up the arrangement which is free, self-sufficient and easy to use. The primary focal point of this project is to upgrade the pace of education among visually challenged individuals. The arrangement can likewise work to prepare an individual with typical vision; whereby helping other visually challenged understudies in learning the equivalent.

1.2 Motivation

26% of the visually impaired individuals who are employed, most of them are braille readers. The amendment of clear-braille is a critical apparatus for visually impaired individuals to get proficient. What's more, there are individuals who are physically challenged likewise (like handicapped). This idea inspires me to build up a device which will create braille from speech commands. We actually attempted to visit some

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establishment of visually impaired individuals. We talked with some of them. We have an unmistakable thought how the braille system impacts their life. With braille it's a lot simpler for them to discuss and examine. This nearly makes their lives as ordinary as our own. This makes my will solid to improve for them. And that's why I am working on it.

1.3 Objectives

The world is changing fastidiously now-a-days. This change is a blend of both great and awful. Relies upon how somebody acting with it. The mechanical change is particularly viable among this. I took some constructive assistance of this changing innovation to make something useful for the underwhelmed or we can say a little less blessed people around us.

The visually impaired individuals are one of them. They can't investigate the world like us. Be that as it may, they can't be deserted. They are venturing forward in their own specific manners. I simply attempted to support their progression. This will help them a great deal and will definitely build their certainty to another level.

I attempted to make a device that will take a voice input signal from an individual utilizing outer mouthpiece who is visually impaired or incapacitated. At that point it will change over the voice order into a book organization of braille. Which will be effectively reasonable for an individual who can understand braille. Discourse sign will be produced from an outside mouthpiece. This is a finished device to make a voice order into braille.

The individual who will utilize this device can get numerous comforts. Before this device a visually impaired individual needs to compose on his/her own which is a troublesome assignment for somebody in that condition. Be that as it may, utilizing this device will wipe out every one of these obstructions. He/she simply need to provide voice order to compose something in braille.

1.4 Expected Outcome

- This device will appropriately print the braille paper.
- Take the voice order appropriately.
- The printed braille paper will be more obvious.
- Make a change to the correspondence and study system of the visually impaired individuals.
- Make the everyday existence of a visually impaired individual simpler.

1.5 Report Layout

- The examination of the idea of standards, hypothesizes and strategies enlisted by jurisdiction.
- The vital investigation of idea has been placed in inside the order.

CHAPTER 2

Background

2.1 Introduction

It's a gift for us that we're living in the era of modern technology. Modern technologies are improving step by step. These technologies are being utilized in pretty much each and every piece of our life. It has stood out enough to be noticed and bound us with it. For a model we can think about a cell phone. We can't think a day without it now-a-days.

As I'm a student of computer science, technology has a colossal impact in my life. So, I along with my honorable advisor tried to come up with an innovative idea. A thought which isn't presented around us yet. After thinking and discussing we finally came up with this project idea

This project is tied in with making a device which will help and make the existence simpler for the visually impaired individuals around us.

2.2 Related Works

Braille system is the main route for the visually impaired individuals of their instruction. They don't have some other method to satisfy the fantasy of their investigation.

There are a great deal of work finished with braille previously. Be that as it may, our thought is somewhat extraordinary and exceptional among them all. Nobody accomplished something like this before supposedly.

iPhone presented a braille voice over system. They provided some particular order for the braille clients. They likewise gave a braille show on their cell phone. In any case, that isn't printable as braille and the orders are constrained.

Some analyst's expounded on braille voice command system. Yet, they didn't have any significant bearing it.

Tirthankar Dasgupta, Anuparn Basu, 2008 introduced a transliteration system from Indian language's text to braille position. In a vision of expelling the hole between a located and visually impaired individual they took the progression to make such a device. This was an astounding exertion. However, the system of the project is simple. It required braille console and stuff like what the visually impaired individual needs to perform. What's more, that is tough for a visually impaired individual [9].

Melissa Ramírez, Miguel Sotaquira, Alberto De La Cruz, Esther Mar ́ıa, **Gustavo Avellaneda, Ana Ochoa,** 2016 delivered an automated speech recognition system which will assist the visually impaired kids with learning braille. This project presented another preparation calculation and tried the device which emphatically came about in around 89%. A visually impaired individual doesn't have to type all alone. The command can be given through a mic which will be gotten by the device and give as text position. Be that as it may, this is generally reasonable for kids as it is intended for them and this device is costly [10].

Shaheena Sultana, M. A. H. Akhand, Prodip Kumer Das, M. M. Hafizur Rahman, 2012 worked with speech to text change. In any case, the scientists organize Bengali language. This project should have been worked with speech application program interface (SAPI). In spite of the fact that the project worked with Bengali letters and everything except it is likewise helpful for the individuals who are working with something identified with speech to text recognition. Since this project gives a clear idea regarding the topic [11].

Sadaoki Furui, Tomonori Kikuchi, Yousuke Shinnaka, Chiori Hori, 2004 make the automatic speech into talks, introductions, speech to speech change and speech to text transformation additionally analyst followed two phase outline strategy and researched about speech sentence recognition. This project concentrated on speech to speech and

speech to text transformation which is extremely useful for the other people who are chipping away at something identified with this sort of work [12].

W.Chou, B.H. Jzlang, C.H. Lee, 1992 introduced a new training algorithm based on hidden markov model (HMM). This algorithm perceives the speech utilizing Viterbi disentangling. The reason for the calculation's recognition of pretty much every speech is it was prepared utilizing traditional preparing strategies. This is something new for the recognition of the speech [13].

Swagat Das, Sonal Patro, Ritika Das and Antara Mishra, 2019 took a stab at something new for the visually impaired individuals. An automated device which will identify snags around its 50cm. This device even works appropriately in a packed spot. At the point when the device finds any sort of deterrent it signals or vibrates mindful the client. This is an inventive idea however it is particularly financially savvy [14].

Joyce Siqueira, Fabrízzio Alphonsus Alves de Melo Nunes Soares, Deller James Ferreira, Cleyton Rafael Gomes Silva, Luciana de Oliveira Berretta, Cristiane Bastos Rocha Ferreira, Igor Moreira Félix, Anderson da Silva Soares, Ronaldo Martins da Costa, Mateus Machado Luna, 2016 presented an innovative idea which is the braille text section on cell phone. The scientists concentrated on the future and accepted that the vast majority of the telephone clients will move to the touchscreen cell phone that is the manner by which the idea came up. This idea gave me an idea of utilizing a cell phone in my project too [15].

Rohit Rastogi, Shashank Mittal, Sajan Agarwal, 2015 drew closer to make a device or device which will have the option to dispose of the correspondence hole between the three sort of distinctively abled individuals like visually impaired, moronic and hard of hearing. The scientists principally attempting to utilize information passage glove and multi modular interfaces. The contraption will take the info message from the distinctively abled individual and covert that message to be changed according to the prerequisites. In the wake of getting transmitted the message will reach to the recipient and will be conveyed

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according to the prerequisite. An incredible exertion by the examination group yet this is as yet an idea. This idea isn't executed yet [16].

Farig Yousuf Sadeque, Samin Yasar, Md. Monirul Islam, 2013 made a fake voice tool that changes over text record to speech. There are very number of techniques yet they keep it as straightforward as could reasonably be expected. Additionally, they utilized syllabic strategy for unit which made it simpler to utilize. In any case, in this project the issue is text position needs to give by the client. The fake voice will change over that text into speech. In this way, they redesigned they system however insufficient which would be too a lot simpler for any visually impaired individual [17].

In spite of the fact that, there are such a large number of endeavors in creating braille letter generator yet no exploration work has experienced to create braille letter on paper from a speech signal. Our created device can take voice command as info, changes over the command into text position. At that point, our device prints that text record as braille.

We joined the idea of causing the device and attempted to cause it as perfect as we to can.

2.3 Research Summary

I gave a push to accumulate as much information as possible in regards to this project. I nearly followed each paper composed on braille topic. The braille letter composing, making a word utilizing braille and so on.

I nearly contemplated several papers composed on braille. At that point I chose the papers I need. At that point altogether read the papers over and over to comprehend the center things. Attempted to make the synopsis of every single paper to make it simple for me. I can review a few papers as guides to make it understood.

Pitch and speech rate conversion using envelope modulation modeling, this a thesis paper which was distributed in Japan gives me the idea about altering the speech rate without relinquishing coherence.

Bangla Text to Speech Conversion: a Syllabic Unit Selection Approach, it's a thesis paper where I become more acquainted with about the advancement procedure of text assortment and furthermore text examination and speech combination is additionally depicted in this paper.

Like these papers I took the assistance of around 20/25 papers to arrive at our definitive objective. I assembled the information, investigate them and afterward applied in our project. These investigations were an absolute necessity for me. I wouldn't have the option to come this far without the assistance of these papers.

Like these papers I took the help of about 20/25 papers to reach our ultimate goal. I gathered the knowledge, analyze them and then applied in our project. These studies were a must for me. I wouldn't be able to come this far without the help of these papers.

2.4 Scope of the Problem

Each coin has an alternate side. The project I am doing was not done previously. In this way, the odds of issues are somewhat less. Be that as it may, on the other hand issues can be occurred.

Everybody demonstrates the compassion to the individuals who are physically challenged, visually impaired or something different like these issues. In any case, nobody comes to get them out.

I attempted to make a device which will make their life somewhat simpler than previously. I might want to accept this item as a market item. In the event that I do so it'll be accessible to anybody. On the off chance that somebody make an abuse of this device or make copy of this that would be an enormous issue.

2.5 Challenges

I attempted our level best to make a perfect project as I anticipated. I've confronted a ton of difficulties while doing this.

I didn't have the best possible flexibly of instruments. A significant parts which is the servo motor was not accessible even in our nation! This is just an example. I confronted a ton of difficulties like this. I anyway figured out how to mastermind them.

I had a little knowledge about wire the executives. I here and there consumed our parts for making an off-base association.

Some high points and low points experienced. A few sections were not working appropriately and at a specific time while everything was fine then the device was not reacting. In any case, after all these at long last it's finished. After all the good and bad times I've made our project. Furthermore, seeking after the best for the device I made.

CHAPTER 3

Research Methodology

3.1 Introduction

To make something appropriately work we have to explore on that specific topic. On the off chance that we do a legitimate research on a specific topic, at that point it gets simpler to make it work.

Research procedure is something to that effect. The make our device we required strategies. I utilized the strategies to make the device work. That required a ton of information about the techniques we utilized. I expected to go further with the goal that I don't commit any errors. For these reasons I began examining about the techniques.

I attempted my best to make an appropriate research on the strategies. It helped a ton to fabricate my device and make my project occurred as we needed.
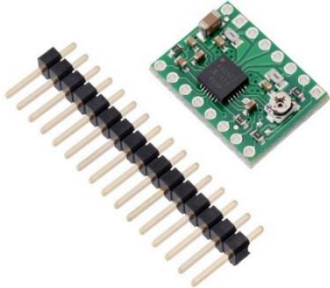
3.2 Implementation Requirements

Implementation requirement implies the software and the hardware tools and parts we expected to construct our device. It was probably the hardest piece of our work. To deal with the parts were most testing really. In any case, by beauty of Almighty we advance out and met our requirements.

The software related things I needed are:

- NLP (Natural Language Processing)
- Speech Recognition
- Servo AH

The hardware-based things I needed are:

Device Name	Description	Functionality	Figure
Arduino Uno	The Arduino Uno is an open source microcontroller board dependent on the Microchip ATmega328P microcontroller and created by Arduino.cc. The board is outfitted with sets of advanced and simple info/yield (I/O) sticks that might be interfaced to different development sheets (shields) and different circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) through a kind B USB link. It very well may be fueled by the USB link or by an outer 9-volt battery, however it acknowledges voltages somewhere in the range of 7 and 20 volts [18]. I utilized the Arduino Uno in my project for speech to text change.		 Figure 1.1

A-4988 Stepper Motor Driver	This breakout board for Allegro's A4988 smaller scale venturing bipolar stepper motor driver highlights movable momentum restricting, over-flow and over-temperature insurance, and five diverse miniaturized scale step goals (down to 1/16-advance). It works from 8 V to 35 V and can convey up to around 1 A for every stage without a warmth sink or constrained wind stream (it is evaluated for 2 A for each curl with adequate extra cooling). This board ships with 0.1″ male header pins included however not patched in [19]. The stepper motor driver is utilized for running the stepper motor. Without the driver the stepper motor won't run.		Figure 1.2
X-Axis Stepper Motor	The X-hub stepper motor moves in the x-pivot. It is constrained by the stepper motor driver. The driver controls the moving way of the x-hub stepper motor.		Figure 1.3

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	I utilized the x-hub stepper motor to turn the pen. For making the spots in the paper turning the pen is an absolute necessity. Thus, we utilized the x-pivot stepper motor for this.		
HC-05 Bluetooth Module	HC-05 Bluetooth module is intended for remote correspondence. This module can be utilized in an ace or slave arrangement. This Bluetooth module has 6 pins. These pins are utilized for the association, information trading, voltage and so on. In our project Bluetooth module is particularly significant. Without it the project would be fragmented. The Bluetooth module gets the voice input from the user.		 Figure 1.4

SG90 180 Degree Servo Motor	The SG90 servo is lightweight, high-caliber and exceptionally quick. The servo is intended for practically all the radio control system. This servo motor encourages the pin to make spots in the paper. Braille system needs spots in the braille paper with the goal that the visually impaired individuals can peruse. To make the specks we use pin. What's more, to control and help the pin 180-degree servo motor is utilized.		 Figure 1.5
MG996 360 Degree Servo Motor	I utilized the 360-degree servo motor to roll the braille paper. As the speck making system is automatic in our project (in the wake of providing the order) so it works completely. It is highly unlikely to utilize hands while the spots are being made. Yet, I have to roll the paper. In this way, I utilized the 360-degree servo motor to roll the paper.		 Figure 1.6

Chapter 4

Experimental Results and Discussion

4.1 Introduction

Experiment is the most significant piece of any sort of work or innovation. No work should be possible flawlessly at its first endeavor. First it should be tested. From test I can see whether there is a major issue with the project. I can discover the wellspring of the issue and fix it.

Analysis offers me the chance to make any work, project or creation great.

I made examinations with my device. During the examination numerous things occurred. Toward the start of the analysis I discovered that my device is getting warmed.

At that point I discovered wires are being separated. The motors were not working appropriately now and again. Confronted issue with the braille composing pen. Broke the breadboard during the analysis.

Surely, I confronted issues with pretty much all aspects of my project. Along these lines, explore allowed me to fix all the issues I were having. On the off chance that the investigation didn't occur and everybody expected to introduce their project or any sort of work they did at the principal endeavor then practically all the works would be fell.

4.2 Experimental Results

The experiments I made with my device gave me a few outcomes. I broke down the outcomes, estimated them and ensure that the ultimate result come out accurately. As there is no equational estimation in our project so we are attempting to give the outcomes quickly.

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Braille Alphabet

The six dots of the braille cell are arranged and numbered:

The capital sign, dot 6, placed before a letter makes a capital letter.

The number sign, dots 3, 4, 5, 6 placed before the characters a through j, makes the numbers 1 through 0. For example a preceded by the number sign is 1, b is 2, etc.

a   b   c   d   e   f   g   h   i   j

k   l   m   n   o   p   q   r   s   t

u   v   w   x   y   z

Capital Sign   Number Sign   Period   Comma   Question Mark   Semi-colon   Exclamation point   Opening quote   Closing quote

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Figure 2.1: Braille Alphabet

This is the braille letter composing position. The individuals who are identified with braille, keep this organization as standard. As I chipped away at the braille so I likewise followed this configuration. My vision was to give the device the guidance which will cause it to perceive the braille letters with the goal that it can give the best possible output.
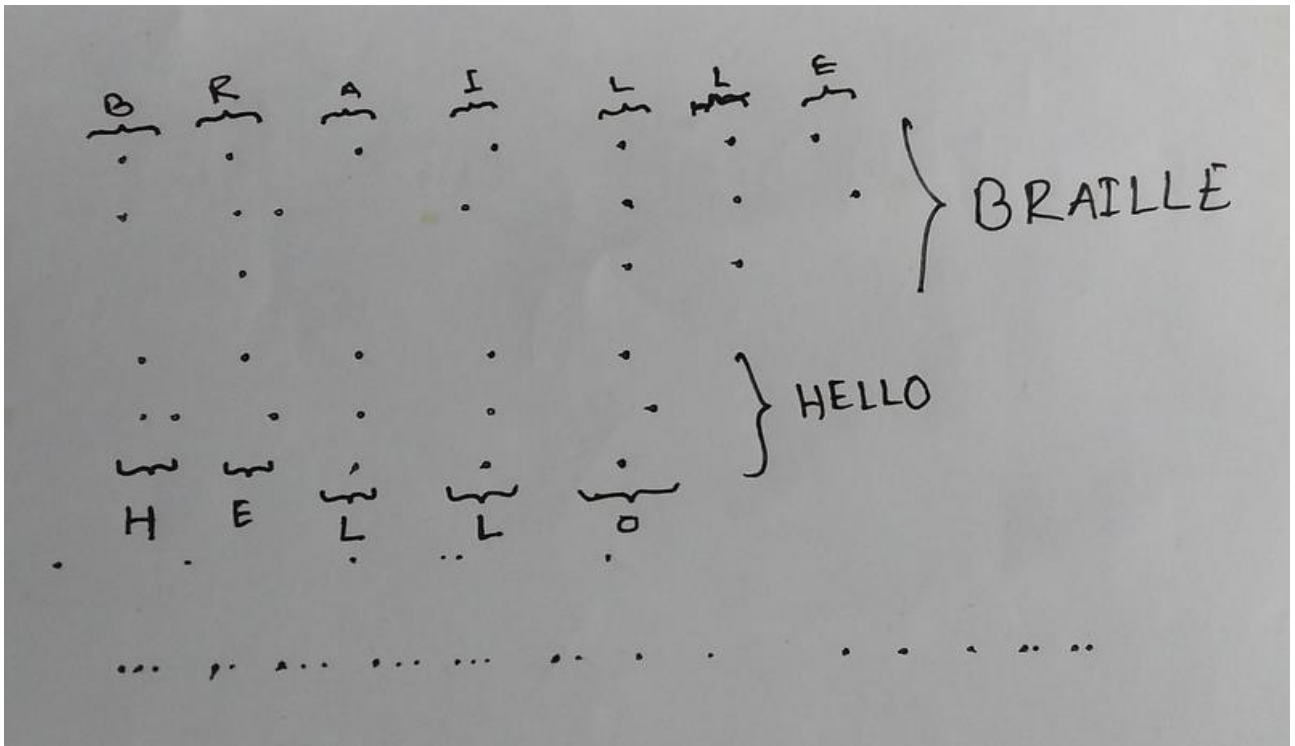
Figure 2.2: Braille Print

This is the output of my device. The vision of my project is taking the voice command as input, changing over them into text configuration and afterward print them as braille. After a ton of exertion at last I got the correct output. Toward the starting braille letters weren't printing effectively. The specks were being off-base. I at that point expected to reproduce my techniques. Of course for a similar issue I recover my codes. Subsequent to doing all these at last our fabricated device works appropriately. It takes the input appropriately and the primary concern, the output is completely right. Presently I can provide any command as input. The device gets the command and prints it in braille.

4.3 Descriptive Analysis

This speech input segment will take users voice command as input. At that point it will change over the speech into string. The Bluetooth module will be associated with a cell phone and Arduino UNO. This module will be the extension among cell phone and Arduino

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UNO. It will get the string and sends it to the Arduino. Arduino will get the string and match it. In the wake of being coordinated the match string will pay special mind to space between the voice commands. At that point it will make a sentence. For instance: "My name is X." When the user will provide this as a command the device will get it single word after another as like, first "my" at that point "name" at that point "is" and afterward "X". In the wake of getting the entire command and completing the lines the device will print them. The printed paper letters will be as braille letters which is effectively justifiable for an individual who knows braille.
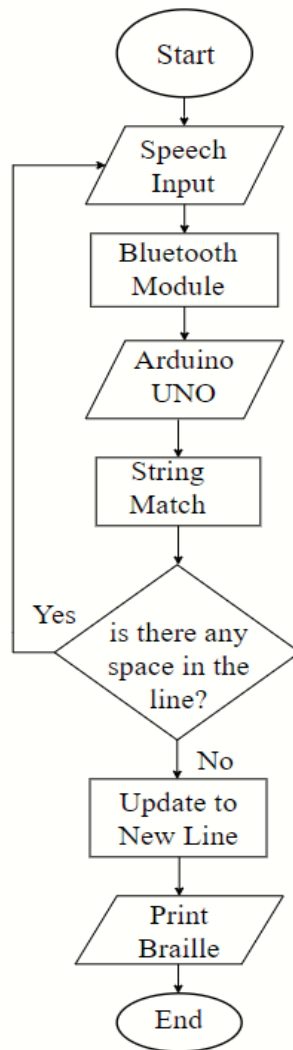

Figure 2.3: Speech to braille conversion

From the start, we have to take the voice input. To take the voice input we need a cell phone or external mouthpiece. Through this we will give the voice input. At that point the concealed markov model (HMM) voice recognition will perceive the voice and accept it as an input. In the wake of taking the input it will change over the input into string. A Bluetooth module will get the string and send it to the Arduino. The Arduino Uno will coordinate the string utilizing a switch case. On the off chance that the string doesn't coordinate, at that point the strategy will begin from the earliest starting point, in any case the braille transformation will occur. After the braille change, at last the input will come out as braille output similarly as we wanted.
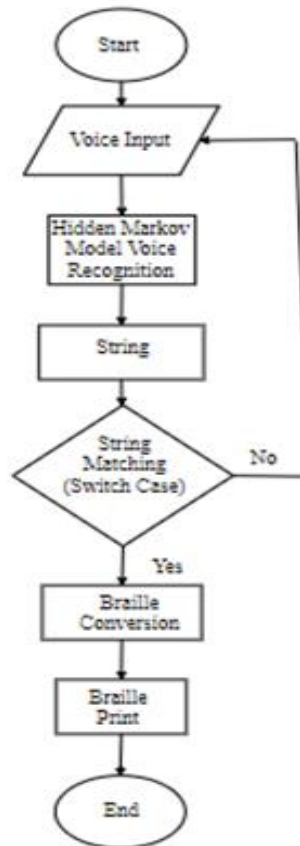

Figure 2.4: Speech to braille conversion using HMM

Voice recognition has an immense impact in speech to text change. A lot of jargon is required for the recognizer to the sound. From the waveform of a sound input highlight extraction successively changes over the input. The fixed size acoustic vectors help the element extraction. Decoder at that point makes it way out with acoustic models, elocution and language model. Among these, articulation word reference is one of the most significant parts. In such a case that the articulation turns out badly with the recognizer then the entire procedure will be stopped. Thus, remembering all these the entire procedure needs to run. What's more, subsequent to making all these ideal at long last the output of the input voice will come out as text format.
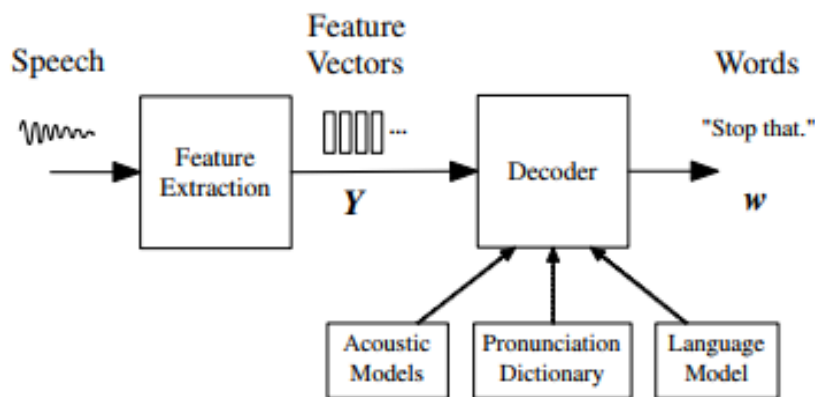

Figure 2.5: Speech to word

The major components of a large vocabulary continuous speech recognizer are illustrated in the equation. The input audio waveform from a voice receiver is converted into a sequence of fixed size acoustic vectors Y 1:T = $y1….yT$ in a process called feature extraction.

The feature extraction comes with the vision to provide a solid representation of the speech waveform. Feature vectors overlap in every 10ms using an analysis window of around 25ms. One of the simplest and most widely used encoding schemes is based on mel frequency cepstral coefficients (MFCCs).

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In addition to the spectral coefficients, first order (delta) and second-order (delta–delta) regression coefficients are often appended in a heuristic attempt to compensate for the conditional independence assumption made by the HMM-based acoustic models.

$$\Delta y_t^S = \frac{\sum_{i=1}^{n} w_i(y_{t+i}^S - y_{t-i}^S)}{2 \sum_{i=1}^{n} w_i^2}$$

If the original (static) feature vector is Δy_t^S, then the delta parameter, Δy_t^S, is given by where n is the window width and w_i are the regression coefficients.3 The delta–delta parameters,2 Δy_t^S, are derived in the same fashion, but using differences of the delta parameters.

Each spoken word w is decomposed into a sequence of Kw basic sounds called *base phones*. This sequence is called its pronunciation q(1:wK)w=q1,...,qKw. To allow for the possibility of multiple pronunciations, the likelihood $p(Y /w)$ can be computed over multiple pronunciations where the summation is over all valid pronunciation sequences for w, Q is a particular sequence of pronunciations,

$$P(Q|w) = \prod_{i=1}^{L} P(q^{wl}|wl)$$

where each q(wl) is a valid pronunciation for word wl. In practice, there will only be a very small number of alternative pronunciations for each wl making the summation in easily tractable.

To recognize a large vocabulary, the conditioning word history is usually shortened to N-1 words to form an N-gram language model

$$P(w) = \prod_{k=1}^{K} P(w_k|w_{k-1}, w_{k-2}, \ldots, w_{k-N+1})$$

where N is typically in the range 2–4. Language models are often assessed in terms of their perplexity. Like, if it finds the pronunciation of the word "lord" as "lor" then it will match "lor" with "lord".

The almost certainly word sequence $w\hat{}$ given a sequence of feature vectors Y 1:T is found by searching all possible state sequences arising from all possible word sequences for the sequence which was most likely to have generated the observed data Y.

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$$\emptyset_t^{(j)} = max_i\{\emptyset_{t-1}^{(i)}a_{ij}\}b_j(y_t)$$

It is initialized by setting $\emptyset_0^{(j)}$ to 1 for the initial, non-emitting, entry state and 0 for all other states. The probability of the most likely word sequence is then given by $max_j\{\emptyset_0^{(j)}\}$ and if every maximization decision is recorded, a trace back will yield the required best matching state/word sequence.
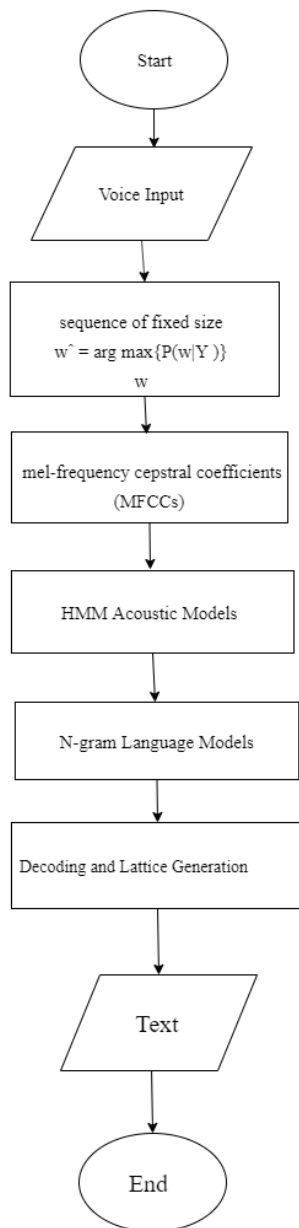
Figure 2.6: Speech to text using HMM

4.4 Summary

There is a saying by an English poet named William Blake "The true method of knowledge is experiment." So, the greater investigation happens the more flawlessness happens.

Nothing is flawless on the planet toward the start. We make something great. What's more, to make something impeccable we have to take a shot at it. Attempt with the project/item or that can be something different if that is toward the starting stage, we have to ensure that we are buckling down on it. At exactly that point a cooperative attitude come out.

Here we attempted to give our projects exploratory presentation appropriately. We attempted to clarify how trial functions and how it impacts any work.

An analysis is a technique done to help, counter, or approve a theory. That implies an analysis typically tests a theory, which is an assumption regarding how a specific system functions.

At that point the exploratory outcomes. It shows the method for flawlessness to any work.

Nobody can simply take birth and run. To begin with, he needs to figure out how to slither. At that point he gets the hang of standing, at that point strolling and afterward he at last figures out how to run.

Much the same as the above model this examination, its outcomes and the conversations show us the means and method for flawlessness of any project.

Chapter 5
Summary, Conclusion, Recommendation and Implication for Future Research

5.1 Summary of the Study

In this entire procedure of work I've learned such things I had no clue previously. Before this project I had a little thought regarding braille system. I just realized it like a perusing procedure for the visually impaired individuals. In any case, it assumes such a tremendous job in the whole existence of a visually impaired individuals. We came to think pretty much this in the wake of dealing with this project.

In this project we worked with a considerable amount of programming and equipment. I were not very much aware of all these previously.

I really began working with this project knowing basically nothing. I just expected to do the project appropriately at any expense. Along these lines, we began working and gradually began to discover about the things we need. At the point when we discovered we need something new began to search for it and oversee it. One of our parts were not by any means accessible in our nation. I some way or another oversaw it from an online market.

Thus, here in our entire project report we attempted to clarify about what we are doing in our project. We clarified that we manufactured a device which can take voice command from the client and give the output in braille.

I depicted my working system, approach, and the issues we looked to do this project. I've analyzed my work and made test with the device to make it perfect.

5.2 Conclusion

In this research work, I have dissected and tried with the necessary standards essential for this project. As there is no such project like speech to braille out there, individuals are less

known to this sort of things. I need to ensure that individuals are understanding what I am introducing, how much the project is successful and how splendidly this functions.

The individuals around us used to imagine that the visually impaired individuals are only a weight to the general public. Be that as it may, in actuality, the visually impaired individuals are entirely abled. Their senses are obviously superior to a normal individual. I need to cause them to feel like an ordinary individual. To help their certainty, self-reliance, the speech to braille project is a little exertion from my side.

The individuals around us used to imagine that the visually impaired individuals are only a weight to the general public. For this sort of reasoning they don't treat the visually impaired individuals like a typical individual. It affects a visually impaired individual. His good goes down, gets demotivated and then some over loses his fearlessness. All these drove him to a problematic future. In any case, in all actuality, the visually impaired individuals are very abled. Their senses are far superior to a customary individual. I need to cause them to feel like a typical individual. To help their certainty, self-reliance, the speech to braille project is a little exertion from us.

5.3 Implication for Further Study

Braille is a sort of a sort of topic that everybody doesn't know about. It's getting victory step by step. It's extremely ideal to see that individuals are currently begun considering the diversely abled individuals them.

The device we made is uniquely for the vision impaired individuals. They can utilize this device in their everyday life. It will help them nearly inside and out of their correspondence and study. It will make their day by day life a lot simpler than previously.

As this is our first made device so there are some ailing in it, we feel. We make them plan with this device in not so distant future.

The device resembles a prototype now. I'm utilizing it as a prototype. I'll attempt to make the device well carriable. The instruments I've utilized, I'll include the littler renditions of them. A completely useful very much wrapped device will be out there.

This device currently prints the braille position. In any case, I'll likewise include the ordinary composing system in it with the voice command. That will help the debilitated individuals a great deal. They would likewise have the option to utilize the device at that point.

I have these couple of thoughts and highlight for our project. I'm unable to do it now in light of the deficiency of time. And furthermore, for the deficiency of financing.

So, we are hoping that we would be able to execute our features in the near future.

Appendix

Appendix A: Related issues

NLP (Natural Language Processing): NLP resembles a sub-stage. The software engineering, information designing, semantics, and man-made reasoning are worried about the associations among PCs and human dialects. NLP assumes its job in these communications. To process, investigate and program PCs information NLP is chiefly utilized.

Speech Recognition: Speech recognition is an innovation that permits machine or program to distinguish words and expressions in addressed it. In the wake of recognizing them it changes over them into machine clear format. Speech recognition system has a few constraints. It can't distinguish something addressed it too quick. The words or sentences addressed it must be clear and very much articulated.

Servo AH: Servo AH is a library. It is really a servo library for Arduino. It is utilized to run and control the servo motor. It utilizes clock to control the motors. Servos have incorporated riggings and shaft. Servo library can control 12 servo motors one after another utilizing only 1 timer.

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