

A Morse Code Based Communication Device

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Abstract: This paper proposes a substitute answer for simple interaction by difficulty of hearing and dumb individuals. A gadget named "Deaf Vibe" has been created, which empowers difficulty of hearing and dumb individuals to impart rather effectively with others utilizing material faculties and motions. The gadget changes over voice contributions by typical individuals to vibro-tactile output in Morse code. Right now, voice message is changed over to content first and afterward to comparable Morse code signals utilizing an implicit Morse code transformation table. These signals drive vibration engines put inside the fingers of a wearable glove. An individual wearing the glove having difficulty in hearing detects the vibration in their fingers and comprehends the message. This gadget can likewise be utilized by a dumb individual to send messages by moving fingers in the Morse code arrangement. The flex sensors put inside the glove fingers sense the finger development and create identical electrical signs which are then changed over to content utilizing a book-to-voice synthesizer to be at last articulated and heard as perceptible messages. The subsequent gadget is a straightforward, low cost proficient and wearable arrangement which can be utilized by difficulty of hearing and, dumb individuals in their regular day to day existences as a powerful specialized apparatus.

Keywords: Flex sensor, Morse code, Vibro-tactile, Deaf-dumb, Messages, Hand gesture.

INTRODUCTION

Interaction is a key necessity in individuals' regular life, yet for difficulty of hearing and dumb individuals interaction can be a testing task. Consistently interaction is an exceptionally simple assignment for general individuals without any inabilities. However, for an individual with hearing and talking incapacities, a straightforward task of interaction turns into a gigantic test. Making a compelling and straightforward interaction mechanism for an individual with hearing and speech incapacities can be a troublesome assignment. Generally, strategies, for example, lip-match up and braille have been utilized by difficulty of hearing individuals as a compelling strategy for setting up interaction among ordinary and incapacitate individuals. Along with those techniques, Morse code can likewise be a viable technique for interaction for difficulty of hearing individuals also [1].

Moreover, Morse can make it simpler for people to transfer messages, as it is a straightforward blend of specks and runs which is close by; simple to learn and simple to execute. A difficulty of hearing individual may depend on vision and contact tactile observation as a strategy for successful interaction. Henceforth, a vibrotactile input element can be viewed as a reasonable strategy for practical assurance both for difficulty of hearing, speak and visually impaired (individuals unfit to see, hear and talk) people. In vibrotactile input element, the patient gets flags as vibrations, which the patient can feel through touch receptors and sees as needs bes. Consolidating a vibrotactile feedback system with Morse code ends up being a productive technique for interaction and, a great deal of exertion has been placed into discovering a solid strategy for permitting difficulty of hearing people to transmit messages to their non-impaired partners [2].

Numerous instruments have been planned and tried for the best result. One of the best arrangement is to utilize a wearable gadget that can recognize patients hand developments and decode those developments into reasonable interaction information.

A glove instrument with sensors added to the glove to recognize finger development appropriate arrangement. The gadget Deaf-Vibe utilizes vibrotactile criticism technique to transmit Morse code as vibrations [3]. The accompanying structure will clarify in restraints on how the structure functions.

STRUCTURE

A two-way specialized gadget to be utilized by individuals with hearing and talking inability has been proposed right now look into. The gadget comprises of two sections, one being the speech to Morse code transformation followed by vibrotactile output and the other depends on motions that are changed over to Morse code and afterward to speech. This is picked as the center part of the general structure [4]. The user wears the structured gadget as a glove which joins three vibration engines and three flex sensors. The structure moreover incorporates a mouthpiece. For understanding somebody's voice message, the vibration engines are made to produce vibration in the Morse code succession. For conveying message without talking, the flex sensors in the glove fingers catch finger signals in Morse code succession and are then changed over to sound. The Raspberry Pi is perfect for this gadget in view of its colossal handling power, multi-preparing ability and web ability as the gadget needs remote association for mechanized speech acknowledgment (ASR) which uses "Google Speech Recognizer" API [5].

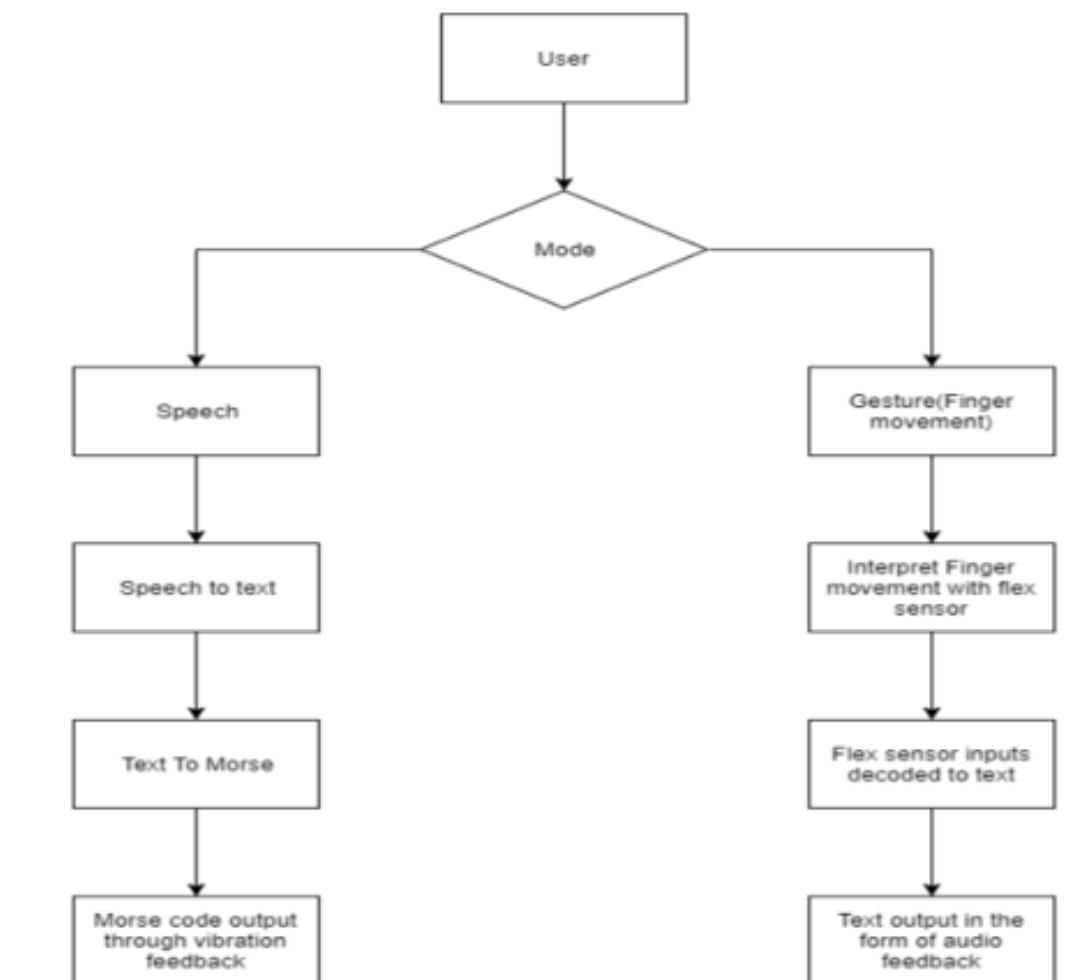


Figure 1: Flow chart for process

"Google Speech Recognizer" API is an online Google office that changes over sound into content by applying incredible neural arrange instruments. The planned gadget requires GPIO pins to interface with vibration engines to output Morse code and furthermore to flex sensors for detecting signal based Morse code input.

A. *Speech to Morse code to vibro-tactile output*

To set up a medium to speak with difficulty of hearing dumb people, speech should be changed over to Morse code and at that point to be transmitted as vibration criticism. The total methodology requires two stages: (1) Speech to content transformation, furthermore, (2) Text to vibration transformation.

1. Speech to Text Conversion:

At the point when somebody converses with a patient who is wearing this gadget, the voice is transmitted to Raspberry Pi by means of an amplifier. The Raspberry Pi has pre-defined codes running inside it which empowers it to get sound contributions to mp3 group and, store in mp3 documents. The program utilizes Google speech acknowledgment API to change over mp3 document into content. Programming interface takes mp3 document as info and transfers it to Google server. The sound document is utilized by a product module dependent on profound neural system inside the Raspberry Pi. The sound is cut into pieces of 20 milliseconds. For every one of the sound cut, it attempts to make sense of the letter that compares to the sound. Repetitive neural system is utilized which has memory that impacts future expectations. It can foresee the forthcoming letter from the ongoing letter [6].

For instance, if the individual says "HEL" at that point it predicts the remainder of the word to develop "Hi". Consequently, approaching past memory, the expectation technique enables the neural system to make increasingly precise expectations going ahead. After the whole sound clasp is run through the neural system each piece in turn, every sound piece is mapped to the letters in all likelihood expressed in the lump. Some may state "HULLO" rather than "Hi", yet the speech acknowledgment structure which is prepared with American English will never say or create "HULLO". Try to consolidate these articulation based forecasts with probability scores dependent on huge database of composed reading material, news articles and so on. The program additionally changes over the content into Morse code by taking each letter and whitespace from the content document and speaking to them with dabs, lines and spaces. The gadget has three vibration engines, every one of them is appointed with the undertaking of outputting one of the Morse code things which are dab, line furthermore, space. The space has been separated into two sorts, one is for space among letters and another is of space between words. Single vibration signal is transmitted for letter space furthermore, twofold vibrations is utilized for word space.

2. Text to Vibration Conversion

Three of them are utilized in light of the fact that the client may have issue in separating dabs, lines and spaces if just one engine was utilized. The span of the vibration is made rather long so the client can be sure which engine is vibrating [7].

Vibration engines are put in the tips of three glove fingers for three human fingers with most delicate skin of the body. Dab, line and space are output individually by the ring finger, the center finger and the forefinger.

3. Code clarification

Python gives an information structure called lexicon which stores data as key-esteem sets which is very advantageous for actualizing a figure, for example, the Morse code. The Morse code graph can be made in a lexicon where (key value sets) => (English Characters-Morse Code). The plaintext (English characters) replace keys and the figure content (Morse code) structure the estimations of the comparing keys. The estimations of keys can be received to from the word reference in a similar way to get the estimations of a cluster through their record and the other way around. A circle scans for the particular letter and whitespace from content record that it gets from Google Speech Recognizer API. For each letter and space, Morse code is produced utilizing the Morse Code Dictionary and is then put away into a string.

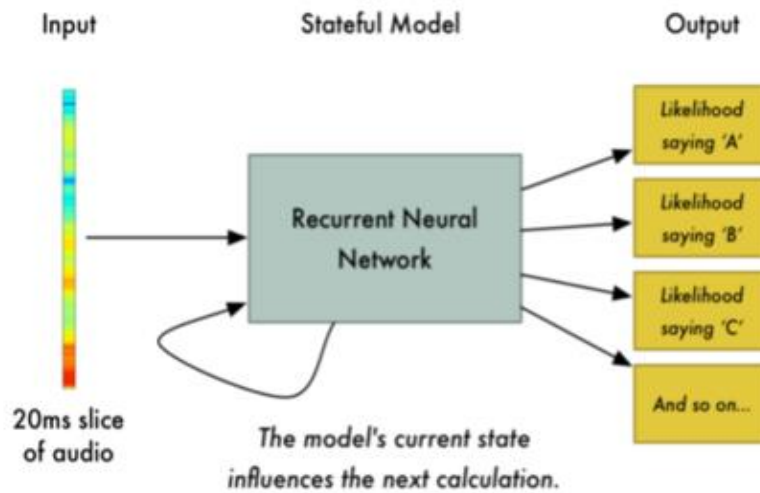


Figure 2: Speech to text recognition

B. Hand Gesture to Morse code to speech

Since the gadget executes two-way interaction, the client can likewise impart utilizing finger motions. Three flex sensors are associated with the Raspberry Pi through GPIO pins. The client inputs Morse code by bowing fingers that are decoded by the Raspberry Pi to produce plain content which is at long last played by a sound from speaker associated with the Raspberry Pi. Finger signals from the client are deciphered as dabs, runs and letter spaces which permits the client to transmit Morse code straightforwardly from twisting the fingers. Flex sensors are being utilized in light of the fact that it is anything but difficult to coordinate them and execute them in a glove plan [8].

1. Hand Gesture to Morse code

The plan utilizes three flex sensors put on the ring finger, the center finger and the forefinger. Speck, run and spaces are contribution by the ring finger, the center finger and the forefinger, individually. Flex sensor is really a variable resistor which is created utilizing conductive ink. Ink is imprinted onto an adaptable plastic substrate base. The sensor comes in as lengths between 1" to 5" The gadget has three 2" flex sensors. At the point when a flex sensor is diverted, it extends the conductive layer and consequently it broadens the length of the layer and lessens the cross-sectional zone. On the off chance that the length of a wire is expanded and the cross-sectional zone is diminished, the electrical opposition of the wire increments. A similar rule is utilized in the conductive ink of the flex sensors. At the point when the sensor is laid level, it is portrayed by a characteristic obstruction. The obstruction increments with avoidance of the sensor [9]. The plan utilizes three flex sensors put on the ring finger, the center finger and the forefinger. Spot, run and spaces are contribution by the ring finger, the center finger and the forefinger, individually.

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A variable redirection edge switch setup has been joined in the structure of the gadget. This setup permits the flex sensors to go about as switches which makes Morse transmission for the patient a lot simpler and helpful.

A flex sensor gives a perceived opposition when it remains level. As the flex sensor is twisted at a specific point, it gives a certain obstruction and as the point of twisting is expanded, the obstruction increments as needs be. An operational intensifier can be utilized and parallel computerized output can be accomplished from simple inputs relying upon the voltage of the altering input. Twisting of flex sensor at various points gives various protections. On the off chance that Ohm's law ($V=IR$) is considered right now, voltage increments if the opposition increments.

A comparator circuit thinks about two voltages and outputs either a 1 or a 0 (the voltage at the negative side) to show which is bigger [10]. The comparator circuit is utilized to take simple contributions from the twisting of the flex sensor in the reversing district of operation amp MCP6002. The reference voltage can be accomplished by utilizing voltage divider circuit in the noninverting district. In this way; in the event of a reversing comparator, the reference voltage is applied to the non-reversing input and voltage to be contrasted is applied with the transforming input (voltage in flex sensor at a specific point of twisting). At whatever point voltage in altering district goes over the voltage provided in non-altering district, the output swings to voltage provided to the circuit or the other way around and flex sensor gives a high or low signal when it is bowed at a specific edge.

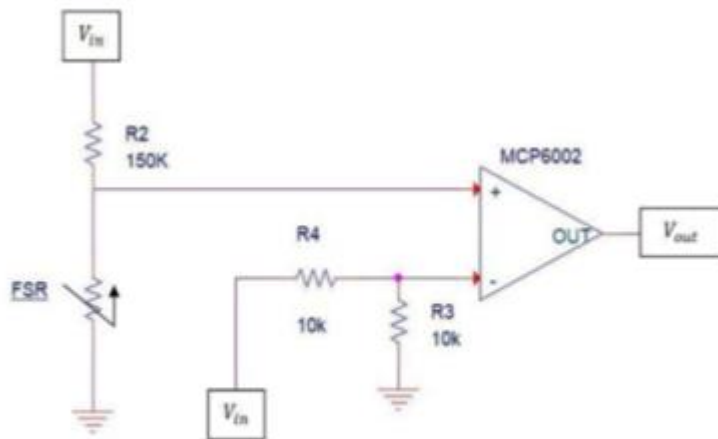


Figure 3: Morse code based communication device

2. Text to Speech

For content to speech, we have utilized speak which is an open source programming speech synthesizer for English language. E-Speak accepts message as its info and produces a sound stream as a WAV document. The speech synthesizer is partitioned into two-sections, content examination and sound age.

- a. Text examination: By the utilization of characteristic language rule, the content analyser figures out where the words are in a series of characters. The content examination additionally checks for syntactic subtleties, e.g., where the sentence starts or finishes, regardless of whether it is an announcement or a question and whether it is a sentence in past, present or future tense.
- b. Sound Generation: After content investigation is finished, the outcomes are sent to the sound age module which executes its very own portion examinations and afterward creates a fitting sound output [11]. There are synthesizers which create sounds algorithmically however gives mechanical voice or sounds. Most recent synthesizers utilize a database of sound where long periods of recorded speech are put away. The created sound is more reasonable than the sound produced from more established synthesizers.

RESULTS AND DISCUSSION

For the hand motion to voice, a few issues while taking in Morse code were confronted. A top notch receiver was utilized for diminishing the foundation clamour and reverberation for getting viable outcomes. And, Google Speech Recognizer was acquainted with defeat the varieties in complement. A powerful result of the voice acknowledgment was accomplished through limiting the outside commotion for a reasonable English intonation. In the event that there are no outer clamour and clear English intonation, great outcomes are achieved. Exchanging between voice to vibrations and hand motions to voice worked pleasantly albeit a 10 second postponement was taken note. This postponement came about because of the processor impediments and non-optimal measure of RAM in Raspberry Pi. The last powers the processor to utilize memory paging which lessens the generally speaking processor throughput.

CONCLUSION

Difficulty of hearing vibe, a specialized gadget dependent on Morse code for difficulty of hearing and dumb people has been made. The gadget can transmit interaction from a crippled individual to a non-disabled individual and the other way around. It is normal that this gadget will significantly upgrade the interaction capacities of difficulty of hearing and dumb people.

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