Artificial Speaking Mouth for Dumb and Deaf Using Curie

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Abstract –*A system is developed for recognizing the signs and their conversions into speech. Here we are using Intel Curie board i.e. Arduino 101board at transmitter section. At receiver side we are using ATMEGA 16 microcontroller interfaces with Bluetooth HC-05 serial interface module for transmit and receive data. Also LCD is used to display the gestures performed by the person and voice circuit formed by recording IC AP8942a interfaced with ATMEGA 16 microcontroller and the 8 Ω speaker is used to announce the particular command which is also displayed on LCD. This system is dynamically reconfigured to work as a "Smart device".*

*Keywords***: Intel curie, microcontroller, LCD, Bluetooth HC-05, Serial interface, 8Ω speaker, Voice circuit, Arduino 101, IC AP8942a etc.**

1. INTRODUCTION

This multi-microcontroller based system is designed to communicate among the dumb, deaf and blind communities and their communication with normal people [5]. The deaf communities are very widespread in the world around 10 billion and culture among them was very rich [3] [1]. Sometimes they do not even intersect the culture of hearing population because of the communication difficulties caused by the impediments of hard-of-hearing to perceived aurally conveyed information [3]. Signed data involves simultaneously combined hand shapes, orientation and movement of hand, arm or body and facial expressions to express the speaker's thoughts [2].

Here the transmitter section consist of Intel Curie board which has inbuilt accelerometer/gyro meter, inbuilt Bluetooth. At receiver section we are using ATMEGA16 microcontroller interfaced with Bluetooth HC-05 module, Recording IC AP8942A and the speaker of 8Ω to announce the commands and also the 16×2 LCD to display the data which to be announcing. Hence in this system the data is wirelessly transferred to the receiver from the transmitter. This feature can reduce the wiring and complexity of hardware which is used in previous projects.
This system is beneficial for dumb and deaf people and also for blind communities [5]. Although sign is used primarily by deaf people, it is also used by others, such as people who can hear, but cannot physically speak.

1.1 Transmitter section:

The transmitter section consists of Intel Curie board provided with the 5V battery. The Arduino 101 board is simple. It is a board that combines the universal appeal of Arduino with latest technologies like- Intel Curie module having Bluetooth LE capabilities, 6 axis accelerometer/gyro meters. The block schematic of transmitter section is shown in following figure 1.
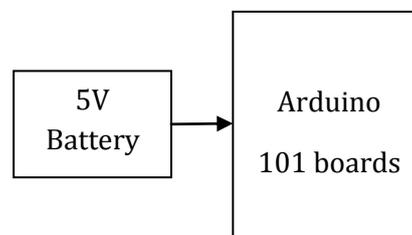

Fig -1: Transmitter section

The Arduino 101 contains the two tiny cores, an x86(Quark), and a 32 bit ARC architecture core both clocked at 32 Mhz. the board also comes with 14 input/output pins (4 can be used as PWM outputs) also the 6 analog inputs, a USB connectors for serial communication and a sketch upload, a power jack, an ISPC header with SPI signals and I2C dedicated pins. The board operating voltage and I/O is 3.3V but all pins are protected against the 5V overvoltage.

Due these features of Intel Curie we using the Arduino 101 board at transmitter. Also the size and hardware complexity is reduced.

1.2 Receiver section:

The schematic block diagram of receiver section is shown in figure 2. The receiver section consists of ATMEGA 16 microcontroller, Bluetooth module, AP8942a recording IC, speaker of 8Ω, LCD to display the data, the power supply of 5V.
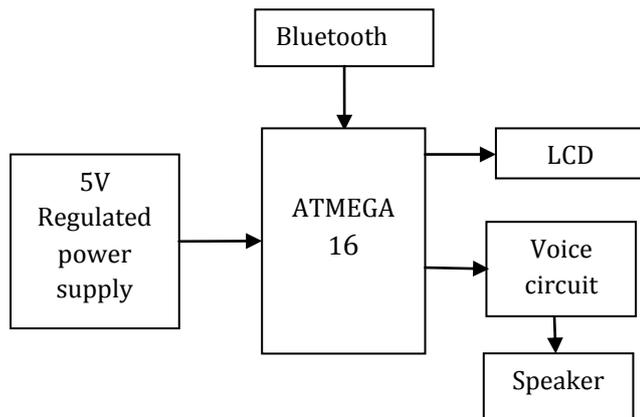
Fig -2: Receiver section

The ATMEGA 16 is used as controller which operates on 5V power supply. The Bluetooth HC-05 is used in slave mode which receives data from transmitter section and sends it to controller. Then the controller recognizes the data and sends it to LCD and voice circuit. The voice circuit is used to announce the converted gestures into voice with the 8Ω speaker. Here the AP8942a recording IC is used. It has the ability of storing 42seconds of voice length. The 16×2LCD is given for display the same data which is going to be announce.

2. Working

The overall working of the system can be dividing into two sections as transmitter and receiver section illustrated below.

2.1 Transmitter side:

In transmitter section we are using Arduino 101 board operated in 5V DC battery as the board is protected against the 5V supply. This board is attached on the hand of person whose gestures has to be detected. As the Intel Curie has inbuilt accelerometer/gyro meter, it will sense the motions. The curie board has inbuilt Bluetooth LE act in a master mode which sends the gestures and motion information to the receiver section serially. The programming of Curie is carried out in Arduino IDE software of Arduino 1.8.1 version. In programming we are going to add some movements for example 'MOVE ON', 'LET ME THINK' and so on. The pictorial diagram of Arduino 101 board is shown in figure 3.

Fig 3-: Arduino 101

2.2 Receiver section

The data transmitted by Intel curie via Bluetooth is received by the Bluetooth HC-05 module acts in the slave mode. It is given to Rxd pin of ATMEGA 16 microcontroller which is operating on 5V DC power supply. Then the received data is displayed on 16×2 LCD and also announced by the 8Ω speaker through the voice circuit. The voice circuit is consisting of the recording IC AP8942a. It has the ability of storing the 42 seconds recording. It is an embedded 1M bits EEPROM. The proteus software is circuit designing and PCB layout.

3. CONCLUSIONS

In this system we had designed the artificial speaking mouth with reduced sized, hardware and also wiring. By using Arduino 101 board we reduced the hardware of different sensors like accelerometer/gyro meter and Bluetooth. Hence this system becomes more reliable and efficient. Also the cost and maintenance is reduced.

Hence this system is more beneficial for reliable communication between dumb and deaf communities with rest world.

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