

MORSE CODE DECODER

-Barak

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Problem Statement

Developed in 1837 by the American artist Samuel F. B. Morse, Morse code is a character encoding scheme based on standard sequences of two different signal durations (dots and dashes). You are required to develop a Morse code transmission and reception system over a single wire channel using a set of ICs and microcontrollers.

Constraints

1. A dot is to be represented by a digital '0' and a dash by a digital '1'. Example - 01 for A.
2. ITU standard for Morse code must be followed.
3. At most two buttons 'must' be used for input and transmission.
4. Since Morse code contains maximum 5-bit information, design a 5-bit(minimum) shift register/flip flops to store the current letter.
5. The clock 'must' be provided by a 555-timer circuit or other electronic circuits (microcontroller pins as clocks are not to be used).
6. In one clock cycle, a bit is stored into the register. You can come up with creative ways to store the information (or add some more information) so that it can be efficiently decoded in the receiver.

For Example: Two presses for 1 and a single press for 0. However, the 'information stored' (other than additional bits before or after the Morse letter for decoding) in the register should be in the format as given in point 1.

No additional data can be stored between the information i.e. If X represents additional bits, XX01XX is valid for A in point 1 X0X1XX is invalid for A in point 1.

7. Once the data is taken, the other button can be used as the transmission trigger.

8. The data is transmitted along a single wire to the decoder module, which is a microcontroller (like Arduino) for decoding. The decoded data must be displayed on an LCD screen.

Idea

Every MORSE-CODE character has at most '5' bits. Hence we are using a 5-bit register to store the data and then send it to a data path logic circuit. This logic circuit processes the 5-bits sent to it and gives a serial output which would be transmitted to the ARDUINO (micro-controller) where the decoding part of the morse-code is done. The Arduino code can be found [here](#).

Components used

- 1 5-bit Register (JK Flip-Flops)
- 2 push buttons' (One for input and other for transmission)
- 2 555- Timer 1 74150 IC (MuX)
- 1 74154 IC (DeCoder)
- 1 74160 IC (Decade Counter)
- Few 74112 IC's(Flip-flops)
- 1 LCD Screen
- 1 Arduino MEGA

Circuit Explanation

- In this model, we represent **DOT** with binary '0' **DASH** with binary '1'.
- The input given to the 5 bit register is a clock with a small frequency and the input push button is a clock to this register .This input button is also a clock to MOD 5 counter which counts the number of bits of the particular morse-code.
- The transmit button triggers the data path logic and a part of that triggers a Decade counter whose output is given as a select input to a 8x1 Multiplexer which already has a start and end signal as its starting and ending inputs.
- The above configuration helps the MuX to give serial output in a suitable manner which helps the Arduino to decode the Code.

- The serial output sent to the Arduino is of this pattern: There will be series of '0' 's initially and then whenever a '1' signal is obtained then the decoding starts
- The decoding is done in such a way that 8 bits after the '1' detected are considered and our code received is in between start and the last '10' pattern and that sent code is decoded accordingly.

