# Low power microcontroller based intelligent token number speaker and display system

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***Abstract*—These People normally stand in a line to get service in many public servicing places. People also face many problems there. Because, People break their serials and create a noisy situation. Our proposed device can overcome this problem. Our proposed device can show any three digit number from 0 to 999 and it can also speak this number. The voice of this device is so clear that, anyone can listen and understand it easily. Already we had known about such a device "Low Power Microcontroller Based Simple Smart Token Number Display System" which published in 2009 Fifth International Conference on MEMS NANO By Mr.Rajesh Kannan Megalingam. His device could show digit but could not speak the number. But our proposed device can overcome this problem.**

***Index Terms*—Microcontroller, Token Number Display, number announcement, digits.**

## I. Introduction

In a developing and populous country like Bangladesh, we have to stand in a queue to get demandable services. Such as in banks, hospitals, canteens etc. In the above mentioned places the device of Rajesh Mr. Kannan Megalingam is an essential device to keep discipline. But, in maximum cases there are more than 99 people in the serial. Then his device becomes poor. Regarding this problem, we have devised a device which can show more digit number to serve this huge number of people more comfortably. So, we have designed the device to show three digits and our device has another speciality to speak the number in the loud speaker. Mr. Kannan Megalingam suggests to use ICs like SP0256 to design the device. But, this Ic is not available in our country. And this Ic is very costly. But we have designed the device without using this type of voice synthesizer Ic. We have done It using only an ATmega128 microcontroller Ic. So that, the task has become more critical to design the software for us and we had to work very hard to design it. We hope that, using our device everybody will feel comfort and it will save time too. In this paper, we have started with the block diagram of our proposed device. Then we described methodology of our proposed device. We described our software part by flow chart. We also have given the picture of our practical device. We also described the utility of our device against the device of Mr. Kannan Megalingam in our varsity canteen and we have showed how our device is unique and more comfortable. Then we finished with conclusion.

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## II. General Overview of the System

The token number display system basically consists of eight blocks as shown in figure(2). They are, AVR microcontroller (ATmega128) , key button, display unit ,digital to analog converter IC (DAC 0800), A voltage amplifier (LM741), Soundmodule,5v power supply. A detail description of each block has given below.

## III. Microcontroller (at MEGA 128)

AT MEGA128 is one of the most popular microcontrollers used specially in automotive, industrial appliances and consumer applications. High-performance, Low-power Atmel AVR 8-bit Microcontroller. 128 Kbytes of In-System Self-programmable Flash program memory.Besides that other remarkable features are:

*1) 4 Kbytes EEPROM*

4 Kbytes Internal SRAM

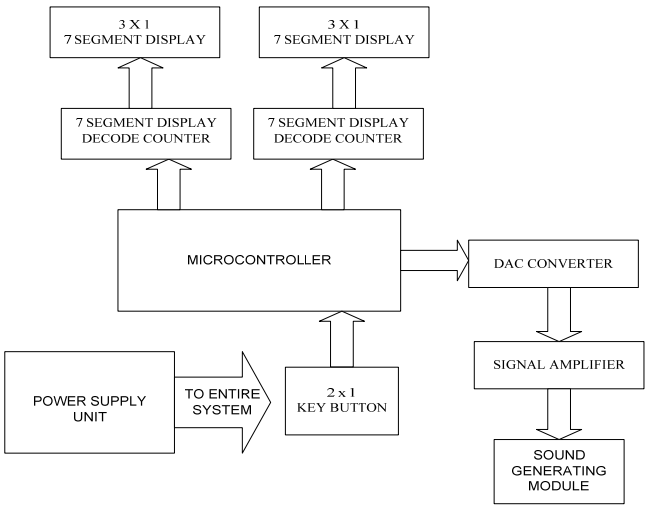


Fig.1. Block diagram of the proposed device.

Two 8-bit Timer/Counters with Separate Prescalers and Compare Modes

*2) Two Expanded 16-bit Timer/Counters with Separate Prescaler, Compare Mode and*

Capture Mode

*3) Real Time Counter with Separate Oscillator*

*4) Two 8-bit PWM Channels*

I/O and Packages

*5) 53 Programmable I/O Lines*

64-lead TQFP and 64-pad QFN/MLF

*6) Reliability Qualification results show that the projected data retention failure rate is much less than 1 PPM over 20 years at 85°C or 100 years at 25°C.*

### *B. Key button*

We have only used two key buttons. The first button increases the display number and the second button reset the program. The first button is connected to pin number PD2 of the microcontroller and the second button is connected to pin number PD3 of the same microcontroller. To prevent the debouncing and to balance the current we have used 320 resistors microcontroller pin to ground.

### *C. Display unit*

In our project we used seven segment displays. We have used two set of seven segment display. Operator display and customer display. There are three seven segment in each set. Seven segment displays contains seven LED bars. Seven segment display are available in two types, called, 'common cathode' and 'common anode'. In our project we used 'common cathode 'type display. We used CMOS 4026B to control the seven segment display this system uses just two pins to control the display. The reset is used to reset the display to 0. The clock pin is then used to increment the digit up from 0. This means to display the digit '3' it is necessary to reset and then pulse the clock line 4 times in reality this means that the display shows the digits 0-1-2-3, but as they are clocked extremely rapidly, the human eye cannot see changes and the number '3' seems to appear immediately. This system can be expanded to three digits by adding a three 4026B IC and a three seven segment display.

### *D. Sound module*

Sound module basically consists of a speaker. We used speaker for token number announcement. The IC LM741 filters and amplifies the analog signal.

### *E. Power supply*

For the proper working of the circuit a 5v DC supply is all that required. The microcontroller requires 5v for working. The display also requires 5v for working precisely. A microcontroller based system demands a power supply which provides a constant DC power. A transient on the power supply could result in system failure. The power supply unit designed in this system is 5v DC and not affected by variation in the AC serving as input to the transformer. A 230v transformer is used with output voltage of 9v.Four IN4007diodes formed a bridge rectifier, which converts the AC to DC and satisfies the charging current demands of the filter capacitor. The DC voltage varies above and below an average value. This variation is called ripple voltage which is reduced to a minimum value by filter capacitors. Capacitors of capacitance 1000microfarads were chosen to reduce the ripple voltage and achieve a filtered voltage which resembles a smooth DC voltage as much as possible (fig.1).

## IV. METHODOLOGY

We have chosen the basic language, to work out in microcontroller programming .We have done it in avr bascom compiler. We have already shown the input pin settings. We had to declare and initialize some variables (K,D,L,M,N,T)to control the program. The variable 'K' represents the value of counter. Variable K will be incremented if pin PD2 is high. we have given a pulse in the pin number PD6-which is connected to the clock pin of 4026.For each pulse the IC will increase a decimal number in display. After every increment, the value of K will be checked. If it goes to one thousand then it will be assigned to 0. For any digit (less than 1000)it will make a number of three digit. (for example if K=9,the number will be 009).The first, second and third digit will be kept in variable M,N,L respectively. We have initialized D=1, at first the value of M will be moved to T. Then the number in T will be checked. The numbers (which is found from T) respective data has been moved to the data array of the port A. After every increment it will wait for a little while. Then every time the value of D will be checked whether it is 3 or not.

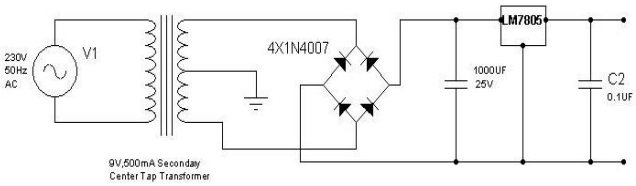


Fig. 2 .Circuit diagram of 5V power supply

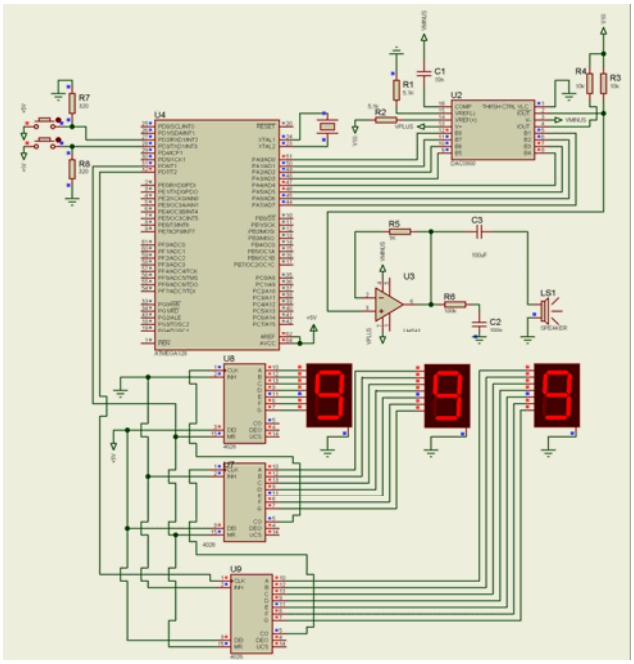

Fig . 3 . Proteus Simulation output

For the value of D (accept D=3), we will increase it by 1.

It will do the same taking the next digits. If D=3 then our program will regard D=1 and wait for input. Then for next every input, it will do the same, increasing the value of K. The whole program is shown in the flowchart (fig.4) and the circuit diagram of our proposed device is shown in (fig.3).

## V.MAKING THE DATA FILE FROM SOUND FILE

For collecting data from voice signal we first recorded the distinct voice signals for every digit and then a matlab code is

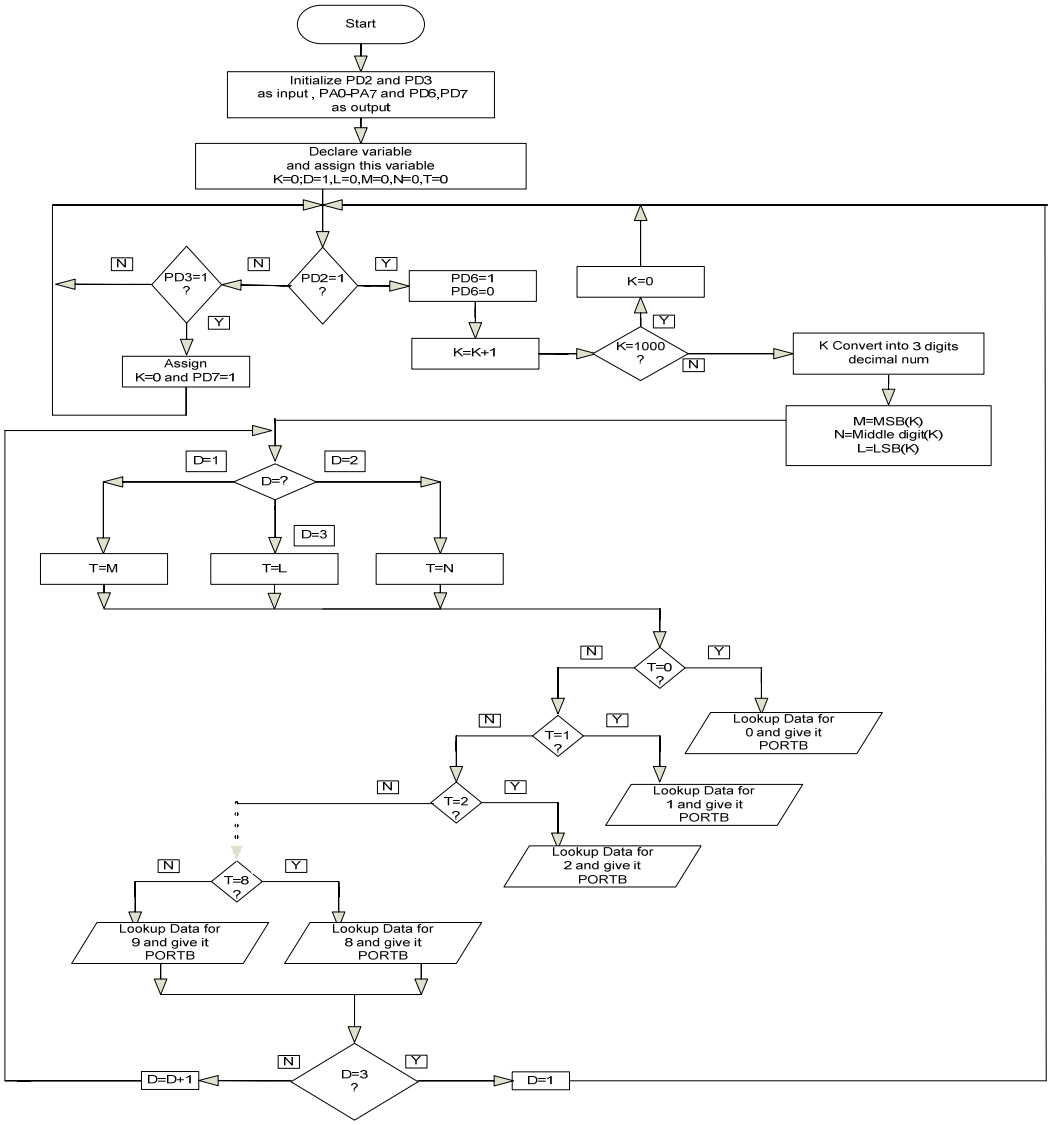


Fig . 4. Software block diagram.

used to generate 8-bit PCM wave. This code is converted by MATLAB to some AVR Bascom-compatible code that can be readily pasted into the main coding part as a data array. in figure(5) we showed the respective voice signal for digit '1' and portion of data file is given in figure (6). In the same way we converted all (0 to 9 ) voice signal to data.

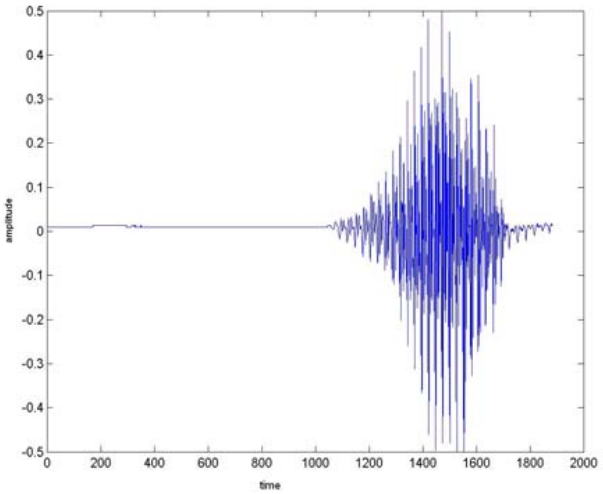


Fig. 5. Voice signal in MATLAB.

## VI. Our Practical Experience

Often we see that there are more than 99 people in the queue of our canteen. Using our device it has become simpler to serve this huge number of people. Everyone liked our number announcing system with voice.

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Data 136, 110, 88, 118, 173, 178, 126, 93, 116, 150,
Data 154, 131, 108, 105, 112, 90, 74, 152, 220, 157,
Data 48, 51, 142, 177, 143, 126, 131, 105, 83, 128,
Data 184, 172, 112, 91, 124, 157, 153, 124, 104, 107,
Data 115, 87, 56, 144, 234, 168, 34, 38, 148, 188,
Data 142, 123, 128, 96, 80, 144, 197, 158, 97, 100,...
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Fig . 6.Data file from MATLAB output.

## VII. Conclusion

We have designed a unique microcontroller based intelligent token number speaker and display system successfully. In many places we have noted that, a person is sitting with a microphone to announce the number of the display .But using our proposed device it can be done without a person to speak in the token number. Another specialty of our proposed device is that, it is possible to announce the token number in any language changing the voice file to the

required language of the world without changing any hardware. Our proposed device is cheaper and its required power is very less. To make it user friendly we have kept only two buttons (reset, next) to operate the device .Overall we are very hopeful about our proposed device.

## ACKNOWLEDGMENT

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## REFERENCES

[1] R, K, Megalingam, Sreenath PS," Low Power Microcontroller Based Simple Smart Token Number Display System", 2009 Fifth International Conference on MEMS NANO, and Smart Systems

[2] Ms. Seint Seint Htwe " Remote Token Display and Sound System", World academy of science, engineering and technology.

[3] atmega128 Microcontroller datasheet, Microchip Technologies Inc.http://www.atmel.com/dyn/resources/prod_documents/doc2467.pdf

[4] MICROCONTROLLER INTERFACING CIRCUITS http://www.rev-ed.co.uk/docs/picaxe_manual3.pdf

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