Construction Of Soundlevel Meterwithits Unique Applications

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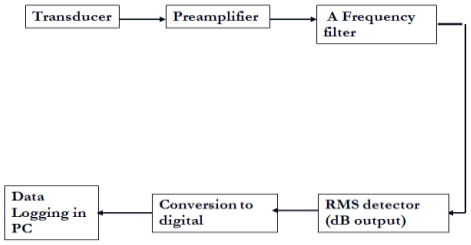
Abstract: The objective of the paper is to show people the vast application of sound level meter which could change human life for good. For this purpose we construct a sound level meter for domestic purpose which could be used to change the behavior of peoples

Introduction

Main objective of the paper is to show how to construct a sound level meter and interface it with computer by using the microcontroller. This could be used in wide range of application. The main feature of sound level meter is the flexibility due to user define threshold value and this will also show graphical representation of sound level and the main challenges in its construction was that it follow A frequency response, easy to install and be inexpensive.

Construction of Meter

Block diagram of sound level meter

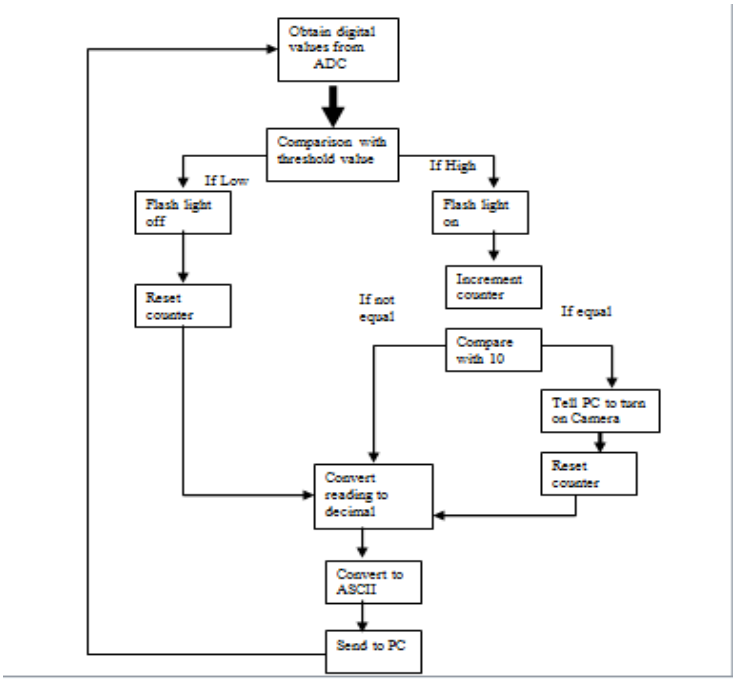


The microphone is a transducer which converts sound to voltage. Sensitivity of the meter is increased by using LM741 op amp IC as preamplifier.Sennheiser audio level meter UPM 550, has been used to achieve Aweighting filter response. LM741 op amp IC is also used as amplifier. The gain is set to 390.To convert dc toRMS we used IC AD536. The digital conversion circuit uses a combination of an ADC and Microcontroller. The ADC used is ADC0806, and the Microcontroller is AT89C51.

The Algorithm

The basic Algorithm of the program followed by the Microcontroller is shown by the block diagram below

Block diagram of algorithm followed by microcontroller



ADC would take the input, digitalize it, and provide the binary output to the controller. The microcontroller takes the readings at a rate of 1 sample/second. The ADC operation involves the CS (chip select), RD (Read), WR (write) and INTR (Interrupt)signals [1]. These pins are connected to pins of the controller. Using these four signals the microcontroller operates the ADC. [1] Most important step is comparing the threshold value. If reading is greater than the threshold value, then a light would blink under a ‘low’ sign attracts the attention of the people, so that they would automatically lower their volumes. If thenoise remains high persistently for 10 secondthe camera turn on and take a snapshot but if reading value is less than threshold value no action is taken. The readings obtained from the meter are also to be communicated serially to a PC, so that they may be stored, and plotted in a graph.In the PC, MATLAB platform is used to take in the values sent by the Microcontroller. Coding is done in MATLAB, to receive these values. The process is shown in the form of flowchart.

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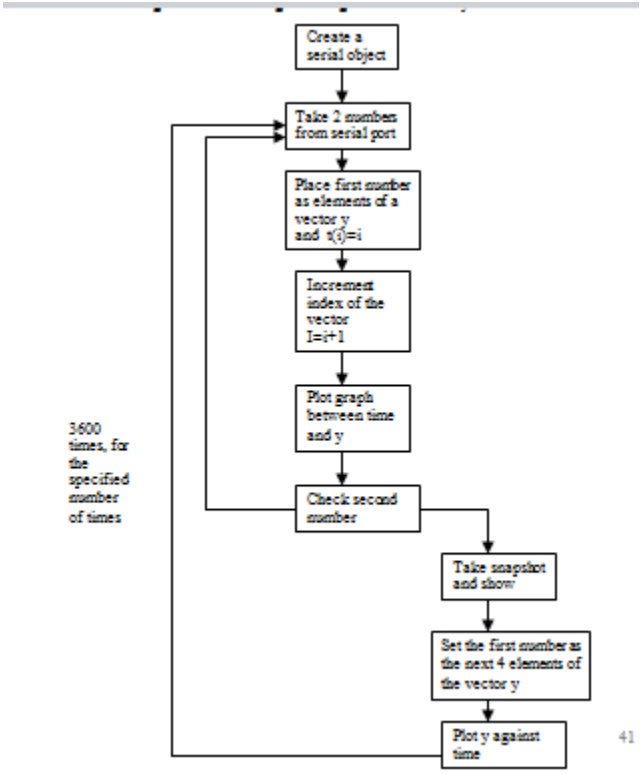
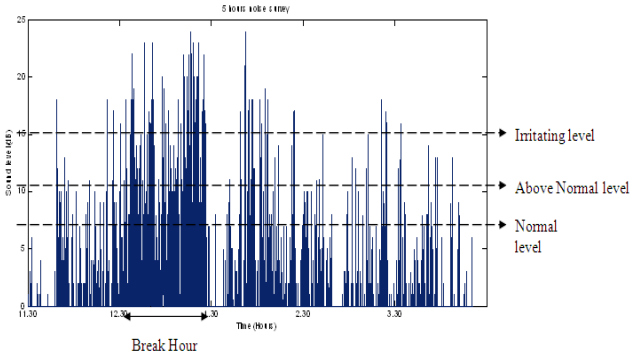
Block diagram of algorithm followed by PC



For the accurate calibration of sound level meter a visit was paid to the Environmental Protection Agency (EPA) central laboratory (CLEAN) Pakistan for the purpose of calibration.

A sound survey

A sound survey was carried out using the meter. The meter was used, to measure and record noise readings for five hours in a university corridor. The graph plotted in the end, shows the trend of noise throughout that time. The graph obtained is shown below.



DISCUSSION

Meter has been designed which detects and measures sound. The complete device made, process and analyses the measured values to determine the course of action. If the sound level is above a certain pre-determined threshold level, a light turns on to signify the excess of noise. This threshold level has been determined through practical surveys and experimentation. The device also stores the measured values in a computer, and at the end of a specified measuring time, shows the complete trend of noise in the form of a graph, which is easy to read and interpret. The device also keeps track whether ten consecutive readings are higher than the threshold. In that case a command is sent to a computer, to turn a camera on and take a snapshot of the scene of unrest.

RECOMMENDATIONS

This device if correctly implemented would be able to bring down noise levels, by warning the people of the harmful levels reached each time the noise becomes too high. Sound level meter can be used to change the habit of people and can be used to educate them .Could flexibly adjust minimum acceptance value as per requirement and help us to improve overall society behavior., particularly schools, colleges, universities, hospitals, libraries and other public places.

FUTURE ENHANCEMENTS

Sound level meter can be used to judge the machine health by measuring and monitoring of sound of the machine which could help not only per long the machine but also save the machine from damaging. For example we could use sound level meter as safety switch in transformer or in electrical motors. Sound level meter can also be used for opening of railway gates with sound level meter. The proposed model is that sound level meter measure noise level in railway trace for opening and closing of railway gates. If the noise level is higher than certain value railway gates is automatically closed. We can set the threshold value depending upon the speed of train

References

Books:

1. Mazidi, Muhammad Ali, The 8051 Microcontroller and Embedded Systems, 2nd edition, Pearson Education Inc., India, 2008