A Programmable Timing System for Debating Training and Competitions

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***Abstract* – A piece of equipment designed under a multi-disciplinary project in Shandong University of Science and Technology is described. The purpose is to indicate speech-time status to speakers in debates by presenting a three-light output. The speech length may be programmed by the user with a combination of buttons and LCD display. The system is portable and microcontroller-based, using on-chip timers for accurate measurement of durations.**

Keywords* – *oral, linguistic, debating, microcontroller, timing.

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1. INTRODUCTION

The great advantage of the university environment over the industrial is that projects of an interdisciplinary nature can be undertaken without an eye to immediate profits. There exist several opportunities in terms of teaching and research where one academic branch of an institution can cooperate with another in a symbiotic relationship of mutual benefit.

The project described herein lies at the union of several independent disciplines, as shown in Figure 1. The origin was an educational one, arising from a request from staff in the College of Foreign Languages, which provides courses for English major students as well as College English for first and second year students of all other colleges. The enterprise was rooted in the training of students in oral English presentations mainly for the purpose of debating. Implementation was carried out in the College of Information and Electrical Engineering,

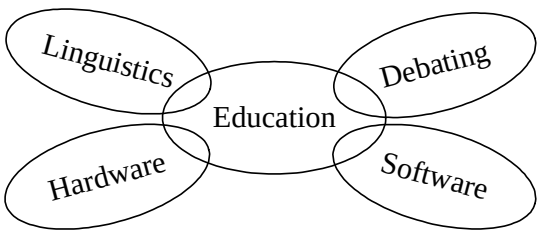

Fig. 1 The overlapping disciplines of the project involving the design of suitable hardware and software to meet the required functionality.

2. THE REQUIREMENTS OF DEBATING

The practice of debate is now a worldwide activity seen in government, legal and academic circles. Training of young people in the necessary oral techniques has a high priority in the curriculum of many schools and colleges. The styles are broadly similar, comprising two or more contesting parties, which present arguments either to propose or oppose a motion. However, there is a wide variation in the number of speakers and the times allowed.

Some of the more common debating styles are known as: Parliamentary, Policy, Lincoln-Douglas, Public Forum, World Schools and Karl Popper, but there is a host of others [1]. The Asian University Debating Championship also has its own style [2].

The common feature is that speakers are strictly limited in presentation time.

The basic debate speech can be divided into three sections as shown in Figure 2.

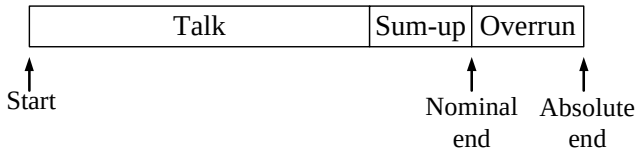

Fig. 2 The time format of a standard debate speech

It is obviously advantageous for the timing to be controlled electronically, thereby freeing the chairman of the debate from a needless responsibility. This is now almost universal in competitive debating.

The goal of the project presented here was to produce a suitable electronic timing system to aid in the training of students in the preparation of debate speeches which adhere to the time requirements of competitive debating.

Owing to the nature of teaching in the college, it was felt to be important that the equipment should be portable, and capable of operation without connection

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to electric power or computer facilities.

3. THE FUNCTIONAL SPECIFICATION OF THE SYSTEM

3.1 Choice of output display

The target audience would in most cases be students, either in the classroom situation or in a more formal competitive debating environment. Thus, a portable piece of equipment was needed, incorporating a user interface which could be programmed to indicate to speakers the current time status of their presentations.

Several products are available on the market, but none fit the exact requirements of this project. Some are software packages which require the presence of a computer in the auditorium and do not indicate readily to the speaker his timing status [3]. Others are portable, but use very small LED indicators, and usually carry high prices [4,5,6,7].

One obvious approach would be to provide an electronic clock indicating the remaining time before the prescribed termination of the speech. However, experience has shown that this is very distracting for speakers.

The standard philosophy now is to use a three-light system, where the accepted format for the three lights is as follows:-

Green light = Talk (Speaker may continue)

Yellow light = Sum up (Commence summing-up))

Red light = Overrun (Nominal end reached))

Red light flashing = Stop now! (Absolute end)

3.2 Range of speech lengths

The designed system is user programmable for a number of different speech durations, each with appropriate sum-up and overrun times, as shown in Table 1.

TABLE 1 OPTIONS FOR SPEECH TIMING

Speech Length	Sum-up time	Overrun time
1 minute	10 seconds	10 seconds
2 minutes	10 seconds	10 seconds
3 minutes	15 seconds	15 seconds
5 minutes	30 seconds	20 seconds
10 minutes	2 minutes	30 seconds
15 minutes	5 minutes	1 minute
20 minutes	5 minutes	1 minute
30 minutes	5 minutes	1 minute
45 minutes	5 minutes	1 minute

4. HARDWARE DESIGN

The intelligence of the equipment is provided by a Cygnal C8051F206 microcontroller, in which all three of the programmable timers are utilised to fulfill the functions required of the machine.

The basic configuration is shown in Figure 3, where the user-programming is achieved by means of two control buttons and a reset. The light outputs take the form of three clusters of high-intensity LEDs, one for each colour. In fact these are split into two banks between the front and back faces of the housing, so that both the speaker and chairman of a debate can observe the progress of time.

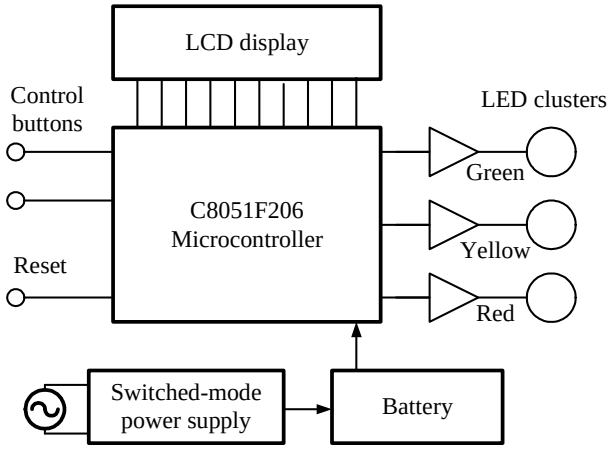

Fig. 3 Schematic of the complete system

The microcontroller is powered by a 9 volt rechargeable battery, through a regulator. A 32-character alphanumeric LCD display is interfaced to the microcontroller for the purpose of selecting time and running the machine.

The mounted system is shown in Figure 4, which is the view from the operator's point of view.

Fig. 4 The timing system mounted in its housing

5. SOFTWARE DEVELOPMENT

Apart from the menu logic and the LCD interface driver, the main activity of the software is the precise calculation and display of time values.

The three timers on the C8051F chip use the system

clock divided by 12 to give a timing frequency of 1.33 MHz. Each timer is preloaded to give an overflow after 40 ms, and this is converted to an integer variable representing time in seconds, which forms the basis of the timing algorithms.
The three timers are utilised as follows

1. Timer 0 is used to derive the timing in seconds
2. Timer 1 controls the short test sequence.
3. Timer 2 switches the red light during the overrun interval, and then implements the flashing function.

6. The Man-Machine Interface

It should be borne in mind that the operation of this unit is usually undertaken by teachers of English in an atmosphere of activity and competition. It is therefore considered important that the control functions should be as simple as possible, commensurate with the required functionality. The final design uses a 32-character LCD display, together with three control buttons.
These buttons function as follows:

1. Menu Button. This is actually the Reset connection of the microcontroller, and causes a restart of the program. Since the menu is displayed first, the reset is a convenient way of returning to the menu, thereby clearing the SFR registers of the chip.
2. Arrow Button. This button causes the cursor on the LCD screen to loop through all the menu items currently displayed.
3. Select Button. Choice of a particular menu item is achieved with this button.

The hierarchy of menus and options is shown in Figure 5:

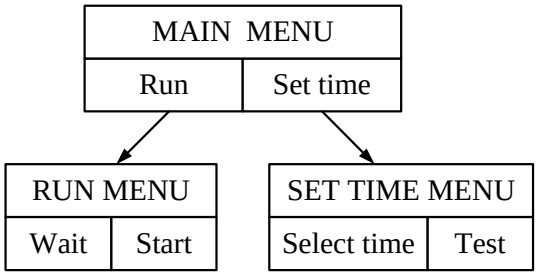

Fig. 5 The menu tree structure

The photos in Figures 6 and 7 show two of the menu displays on the LCD screen.

Fig. 6 The Main menu

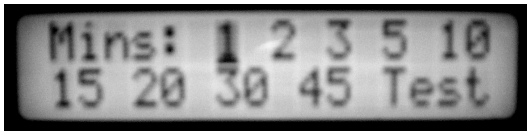

Fig. 7 The Speech Time Selection menu

7. Engineering Aspects

The power supply for the equipment comprises a set of rechargeable batteries, which are charged from a switched-mode power supply. This provides the alternatives of running the machine from the mains supply, or using it in a portable mode after a charging period.
A self-test and demonstration function is incorporated, which switches through the complete light sequence in about 15 seconds. This can be used to evaluate the functioning of the system. Additionally, this feature is used to familiarise the participants with the operation of the timing system before the commencement of a debate.
In order to achieve sufficient luminance for use in daylight conditions, the coloured light display comprises clusters of five 12 mm LEDs for each colour.
The whole system is housed in a metal cabinet to give physical and electromagnetic protection to the circuitry.

8. Testing and User Feedback

The equipment has been tested over a long period to ensure reliability and repeatability of function. Comments from the teaching staff of the College of Foreign Languages have also been solicited. The features which appear to offer the most appeal to pedagogues are as follows:

1. The size and weight of the device makes it easily used in classrooms.
2. The built-in battery pack provided lightens the teachers load by not requiring access to power outlets in every situation.
3. The simple menu system with only three buttons provides an uncluttered user interface.
4. The range of times that can be selected is suitable for most debating training.

Figure 8 shows a typical application of the equipment in a debate training situation.

(Continued on P.106)

output properties of the nonlinear operation circuit consistent with the characteristics of thermocouples, we select corresponding value of parallel resistance to achieve the purpose of linearization.

4 Test results

In order to validate the compensation performance of this linear circuit, we do calibration experiment depending on the thermocouple indexing table. The Linear compensation range is 0~1000℃,the signal magnification of nonlinear compensation circuit is 100 times. We use CN65M/HD thermocouple signal generator as the input signal (V_f), This generator can generate thermocouple standard voltages signal from 0℃ to 1000℃, its accuracy can reach 0.1 level,and can meet the occasions of the standardization for the thermocouple high-accuracy signal.

From the obtained data we know that the output signal of thermocouple's temperature– millivolt has large nonlinearity. After nonlinear compensation, the nonlinear error is less than 0.4%.

5 Acknowledgments

I am very grateful to my mentor Tao anli, he told me a lot of valuable opinions about the design. I would also like to thank the students who help me.

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Fig. 8 The timing system in classroom use

9. CONCLUSION

A portable timing system for debating activities has been described, which has the advantages of portability and simplicity of operation.
Although intended initially for debating in English, the unit is obviously equally applicable to the large number of Chinese debates which are now popular on the mainland. Indeed, the equipment can be used in any situation where oral speech has a time-critical element. As such, it may be applicable to conferences, workshops and in the business environment.

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