PIC-Based Projects Demonstration

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1. INTRODUCTION

It is often difficult to motivate students in computer hardware courses, many students appearing to find the subject rather dry and technical, and hence boring. Sarkar and Craig (2004) have developed a series of PIC-based projects that can be used to enhance teaching and learning computer hardware. This presentation demonstrates the usefulness of PIC projects in teaching and learning contexts.

2. PIC ENVIRONMENT

Microcontrollers contain on a single silicon chip the essential features of a computer. They are frequently found in roles befitting their name viz. controlling other devices such as VCR or DVD players. They are also used extensively in motor vehicles, trains and planes, where the tasks at hand require computer control, but do not require an extensive memory capacity. The electrically erasable programmable read only memory (EEPROM) built into the PIC16F84 is particularly useful in the classroom as it enables the PIC to be reprogrammed many times over as students develop new programs. The computer-in-miniature aspect of microcontrollers makes them an ideal aid for teaching and learning about computer hardware and software principles.

Once a program has been written for a microcontroller, the program has to be entered into the memory of the microcontroller. With the PIC16F84 this can be achieved using a programmer module. Details on the availability of this module and the associated software can be found in (Iovine, 2000). The software supplied with the programmer module enables programs written in BASIC on a PC (personal computer) to be quickly transferred to the PIC microcontroller. The short turn-around time between program writing, installing the program in the EEPROM and testing the PIC in the circuitry developed on the breadboard makes this amalgam of hardware and software particularly effective as a learning tool.

3. PIC PROJECTS DEMONSTRATION

At the conference, the research team will demonstrate the PIC-based projects, which can be used in the classroom to enhance the teaching of basic concepts of bits, bytes, binary numbers and their use in digital equipment. In lectures, the basic concepts of number systems are introduced and students are shown how to convert from binary-to-hex and vice-versa. The teacher then demonstrates the PIC-projects to the class to reinforce the theoretical concepts covered in the lecture. Through active participation in the demonstration and hands-on learning activities, students developed a better understanding of the binary number system and digital hardware.

4. DISCUSSION AND CONCLUSION

In this poster presentation we have outlined how PIC-based projects can be used in the classroom for class demonstrations, to enhance the traditional lecture environment. Student responses to the project demonstrations were mostly favourable. The students indicated that they had found the PIC-based projects easy to use and helpful in gaining an understanding of a number of computer hardware concepts. Our materials, including the source code for all PIC applications are freely available to faculty interested in using them to supplement teaching computer hardware courses or as the basis for more complex projects. More information about PIC-based projects and demonstration materials can be obtained by contacting the first author.

5. REFERENCES

Iovine, J. (2000). *PIC Microcontroller Project Book*: McGraw-Hill Companies, Inc.

Sarkar, N. I., & Craig, T. M. (2004, March 3-7). *Illustrating Computer Hardware Concepts using PIC-based Projects.* Paper presented at the thirty-fifth SIGCSE Technical Symposium on Computer Science Education, Norfolk, Virginia, USA.