Suggested Projects for the PIC Microcontrollers Lab

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Some PIC project ideas
The PIC range of microcontrollers are high performance, low cost devices that are so easy to use that the applications they can be used for is limited only by the designers imagination. Here is a short list of some ideas:

1. Square or rectangular waveform generators. Use the instructions bsf followed by bcf in an iterative fashion with a delay in between, to produce waveforms on a port pin with various periods and duty cycles. A square wave of period $2t_i$ will be produced on pin RA0 if the sequence bsf PORTA,RA0: bcf PORTA,RA0: bsf PORTA,RA0: ... is used with no other instructions in between.

2. A programmable delay can be produced by reading a byte from a port and then using the value to set the delay time.

3. A model train controller or digital event sequencer for toys.

4. A controller for an elevator of a building.

5. A sequencer to switch appliances and lights on or off in a random sequence at different times to give the impression that a home is occupied.

6. An automatic security gate controller to open and close gates.

7. An irrigation controller to water the garden under computer control. Temperature and humidity sensors can be used to trigger a PIC-based circuit to control the opening and closing of valves in the water line.

8. A frequency counter. Count pulses on a pin using either the timer/counter module or via the interrupt pin RB0/INT

9. A simple musical instrument. Use resistors and keyboard switches on a port to set the value of a byte read into the port to change the frequency of the note produced by a waveform generator.

10. A sinusoidal and triangular wave signal generator can be constructed by writing the binary value of the waveform at each sample to a digital to analogue converter. For slow waveforms, these values can be calculated as described in the application notes [4]. Walsh functions can also be used to create waveforms.

11. A burglar alarm can be developed that reads the status of sensors and activates an alarm. Time delays and other intelligence can be incorporated.

12. A servo motor or stepper motor controller using a PIC and power driver ICs can be use to produce quarter, half and full step drive waveform configurations for stepper motors or pulse width modulated signals for DC servo motors.

13. A digitally controlled power supply unit (PSU). Thumbwheel switches can be used to set up the binary value of the required power supply voltage which the PIC can then use to produce a PWM signal for a switched mode PSU, or a processed binary value for a digital to analogue converter for a linear PSU. Interrupt and pin polling can be used to perform sensing and supervisory functions.

14. A digital filter can be built using a PIC16C71 or similar PIC device that has an analogue to digital converter. See the application notes [4] for design details and program listings on FFT (fast Fourier transform) analysis and discrete filtering applications.

15. An access control system using the PORTB interrupt on change facility with a keypad code can be developed.
16. A digital thermometer with LCD display for use in fishtanks, rooms, brewing, photography etc. can be produced. A DS1820 from Dallas Semiconductor Corp. or similar digital temperature transducer and a Microchip AY0438 CMOS LCD display driver can be used. Alternatively, the PIC16C923 or PIC16C924 microcontroller can be used to perform all the functions required to process the transducer signal and produce the LCD driver signals.

17. A pulse width modulator to control power delivered to a load via thyristors. Typical applications are light dimmers and motors.

18. A digital phase locked loop (PLL) can be developed along the lines of a 4046 CMOS PLL.

19. A programmable battery management system.

20. A programmable timer with timing intervals from seconds to hours. The PIC16F84 has many registers enabling long time delays to be implemented.

21. A Flash/PROM or EEPROM programmer for PIC and other microcontrollers.

22. An electronic guitar tuner.

23. A serial port controller for PCs.


25. A heart rate monitor.

26. A radio controlled vehicle controller.

27. An infra red telemetry system which sends and receives bit streams via an infra red beam.