Technology-enhanced Learning - Activity Plan

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Grade / Course: *Embedded systems / EEX5336*
Length of Activity: *60 minutes*

Lesson Summary:
Students will gain knowledge about usage of the timers and the counters in a given embedded system application and compute the preset timer value for the given scenario using 8051 microcontroller.

Lesson Objective:
To provide students with an opportunity to use the timers and counters of 8051 microcontroller for a realtime embedded application and compute the preset timer value for the given scenario.

Resources/Technology – Teacher
Interactive Whiteboard, Multimedia Projector with screen, PC with powerpoint, internet and 8051 simulator software.
Online Resources

- http://www.slideshare.net/cjbas/8051-timers-and-counters-71747755

Other Resources

- Printed study material – Book 1 – EEX5336 Embedded systems.

Resources/Technology – Students
Computer Lab or Student Laptop setting for 8051 simulator
Worksheet, Printed Learning Materials
Online Resources

- http://www.edsim51.com/8051Notes/8051/timers.html
- http://www.8052.com/tuttimer.phtml
- https://sourceforge.net/projects/mcu8051ide/

Intended Curriculum Learning Outcomes

- Students will be able to explain the different between timers and counters according to the basic operation.
- Students will be able to compute preset value for a given delay time using timers.
- Students will be able to configure the counter for a given task.
- Students will be able to simulate the timer and counter operation for a given task.

Instructional Activities
The teacher will review and present the powerpoint materials using multimedia projector and show the simple calculation procedure of timer preset value using interactive whiteboard to the whole class. Teacher to provide instructions on how to use timers and counters and compute delay times using simulator in the web links to the resources provided to students. (20 minutes)
Students are given time to complete the lesson activities. (40 minutes)

Learner Assessment

Students completion of the worksheet.

Worksheet

1. Briefly describe the importance of the following with reference to the embedded applications.
   a. Timers.
   b. Counters.

2. Compute the register values and preset timer value to generate a digital pulse with the delay given below.
   a. Using Software Delay Loops
   b. Using 8051 Timers
   (**Note:** Assume delay time as ***First 5 digits*** of your registration number in microseconds)

3. A student is expecting to generate PWM signal to control the synchronous motor. Duty cycle of the PWM signal may vary 25% or 50% or 75%. Assume frequency of the PWM signal is 20Hz
   a. Sketch the wave form of the PWM signal for each of given duty cycles.
   b. Write an ALP to generate the PWM signal having 75% duty cycle and simulate the result using 8051 simulator.

4. Using one of the hardware counters in 8051 microcontroller, draw a diagram and show the counter configuration with relevant counter mode for the following waveform shown in Figure 1 in order to count total number of pulses when EA signal goes high. Show the input signals clearly.

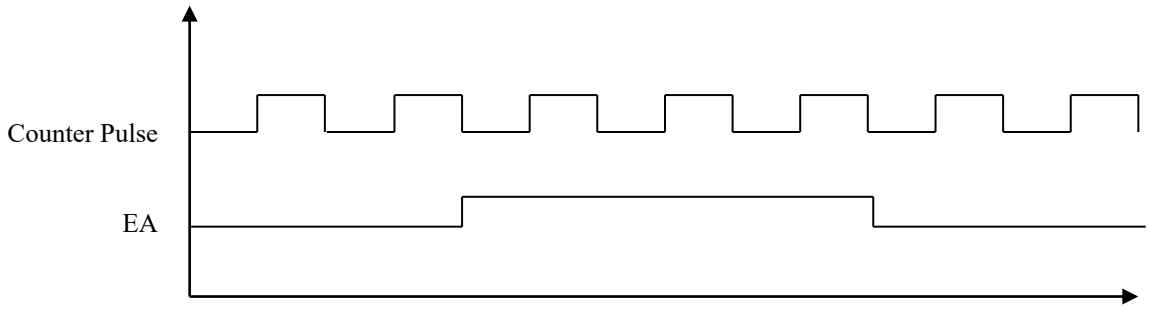

Figure 1: Waveform