EE-712 Embedded system design
Lab2 - Parallel IO and basic operations

Aim: To interface switches and LEDs to the parallel ports of the TivaC board and to perform some basic operations on the inputs and give proper output.

Problem Definition: Interface keys to parallel input pins for receiving operation code and operands. Interface LEDs to parallel output pins. Program is a loop for reading the inputs and displaying the resulting outputs.

For example, let there be 8 input pins X0, X1, .. X7 and 8 output pins Y0, Y1, .. Y7. Operation code is given by X7 X6 and it is copied to Y7 Y6. Operand-1 is given by X3 X2 X1 and Operand-2 is given by X6 X5 X4. Output is displayed as Y6 Y5 Y4 Y3 Y2 Y1 Y0.

Operations:

1. X7 X6 = 00. Copy. Y7 Y6 = X7 X6, Y5 Y4 Y3 = X5 X4 X3, Y2 Y1 Y0 = X2 X1 X0.
2. X7 X6 = 01. Add. Y7 Y6 = X7 X6, Y5 Y4 Y3 Y2 Y1 Y0 = X2 X1 X0 + X5 X4 X3.
3. X7 X6 = 10. Subtract. Y7 Y6 = X7 X6, Y5 Y4 Y3 Y2 Y1 Y0 = X2 X1 X0 - X5 X4X3.
4. X7 X6 = 11. Multiply. Y7 Y6 = X7 X6, Y5 Y4 Y3 Y2 Y1 Y0 = X2 X1 X0 x X5 X4X3.

Devise an appropriate observation table for verifying the operations.

Pins to be used:

X7X6X5X4X3X2X10 = PA7 PA6 PA5 PA4 PA3 PB5 PB4 PB3
Y7Y6Y5Y4Y3Y2Y1Y0 = PE4 PE3 PD2 PD1 PD0 PE2 PE1 PE0

NOTE:

1. Include following header files in your main.c
   #include "inc/hw_memmap.h" //Macros defining memory map of the device
   #include "driverlib/sysctl.h" //Prototypes for the system control driver
   #include "driverlib/gpio.h" //GPIO API

2. GPIOs on TM4C123 can be configured for 2mA, 4mA, 8mA drive strength. On reset, GPIOs are default to 2mA drive strength. While interfacing LEDs, if the LED current is more than 8mA then we cannot connect it

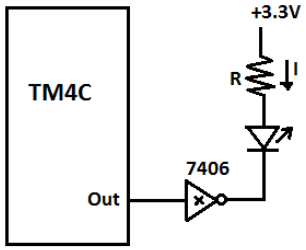

Fig 1: Interfacing of 7406 buffer with TM4C

directly to the microcontroller pin. It might damage the chip due to high current.

3. Use 7406 buffer to avoid accidental damage to microcontroller pins.
4. 7406 requires Vcc = 5V which can be provided by VBUS pin on TM4C123.

References:

1. *http://users.ece.utexas.edu/ valvano/Volume1/EBook/ C8_SwitchLED.htm*
2. *http://processors.wiki.ti.com/index.php/Introduction_to_the_TI-RTOS_Kernel_Workshop*