CMPE 240- Advanced Computer Design

Assignment: GPIO Interface Testing

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Team: Student_Team1 (Harish Marepalli, Debashish Panigrahi, Shahnawaz Idariya are my team members)

Professor: Harry Li

Date: 09/20/2022

Target Board: LPC1769

Given Description:

Import the sample GPIO project to your MCUXpresso IDE, build circuit and modify the C program to realize the following functions:

1. Use p0.21 (j2-23) pin as an output pin and p2.13 (j2-27) pin as an input pin.
2. Build a prototype circuit for GPIO input and output testing. Run GPP testing functions and modify this function to test GPP input and output.
    a. Your output function should be able to turn on LED when CPU sending 1 and turn it off when CPU sending 0.
    b. The input function should be able to read logic 1 when the testing circuit toggle the switch to connect to VCC (3.3v), and logic 0 when the testing circuit switch is toggled to the GND.

Components Used:

1. Prototype Board
2. LPC1769 inserted into female header pins and soldered to the board.
3. 330-ohm resistors
4. Push Button Switch
5. LED
6. USB probe to dump the program into on-chip flash memory.

Source Code:

```
/*
===============================================================================
 Name        : Assignment_GPIOTesting.c
 Author      : Tirumala Saiteja Goruganthu
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 Course   : CMPE240 - Advanced Computer Design
 Professor           : Harry Li
 Description : This program written to test the GPIO functions of LPC1769.
                        A toggle switch is used to send logic '1' or '0' to CPU where
                       the input pin (P2.13) will read this logic state and trigger the
                       output pin (P0.21) accordingly. Note that FIOSET and FIOCLR registers
                       are used to control the output pin bit and FIOPIN register is used to
```

```
                    control the input pin bit.
===============================================================================
*/

#ifdef __USE_CMSIS
#include "LPC17xx.h"
#endif

#include <cr_section_macros.h>

#include <stdio.h>

// TODO: insert other include files here

// TODO: insert other definitions and declarations here
//Initialize the port and pin as outputs.
void GPIOinitOut(uint8_t portNum, uint32_t pinNum)
{
	if (portNum == 0)
	{
		LPC_GPIO0->FIODIR |= (1 << pinNum);
	}
	else if (portNum == 1)
	{
		LPC_GPIO1->FIODIR |= (1 << pinNum);
	}
	else if (portNum == 2)
	{
		LPC_GPIO2->FIODIR |= (1 << pinNum);
	}
	else
	{
		puts("Not a valid port!\n");
	}
}

//Initialize the port and pin as inputs.
void GPIOinitIn(uint8_t portNum, uint32_t pinNum)
{
	if (portNum == 0)
	{
		LPC_GPIO0->FIODIR |= (0 << pinNum);
	}
	else if (portNum == 1)
	{
		LPC_GPIO1->FIODIR |= (0 << pinNum);
	}
	else if (portNum == 2)
	{
		LPC_GPIO2->FIODIR |= (0 << pinNum);
	}
	else
	{
		puts("Not a valid port!\n");
	}
}

//Activate the pin
```

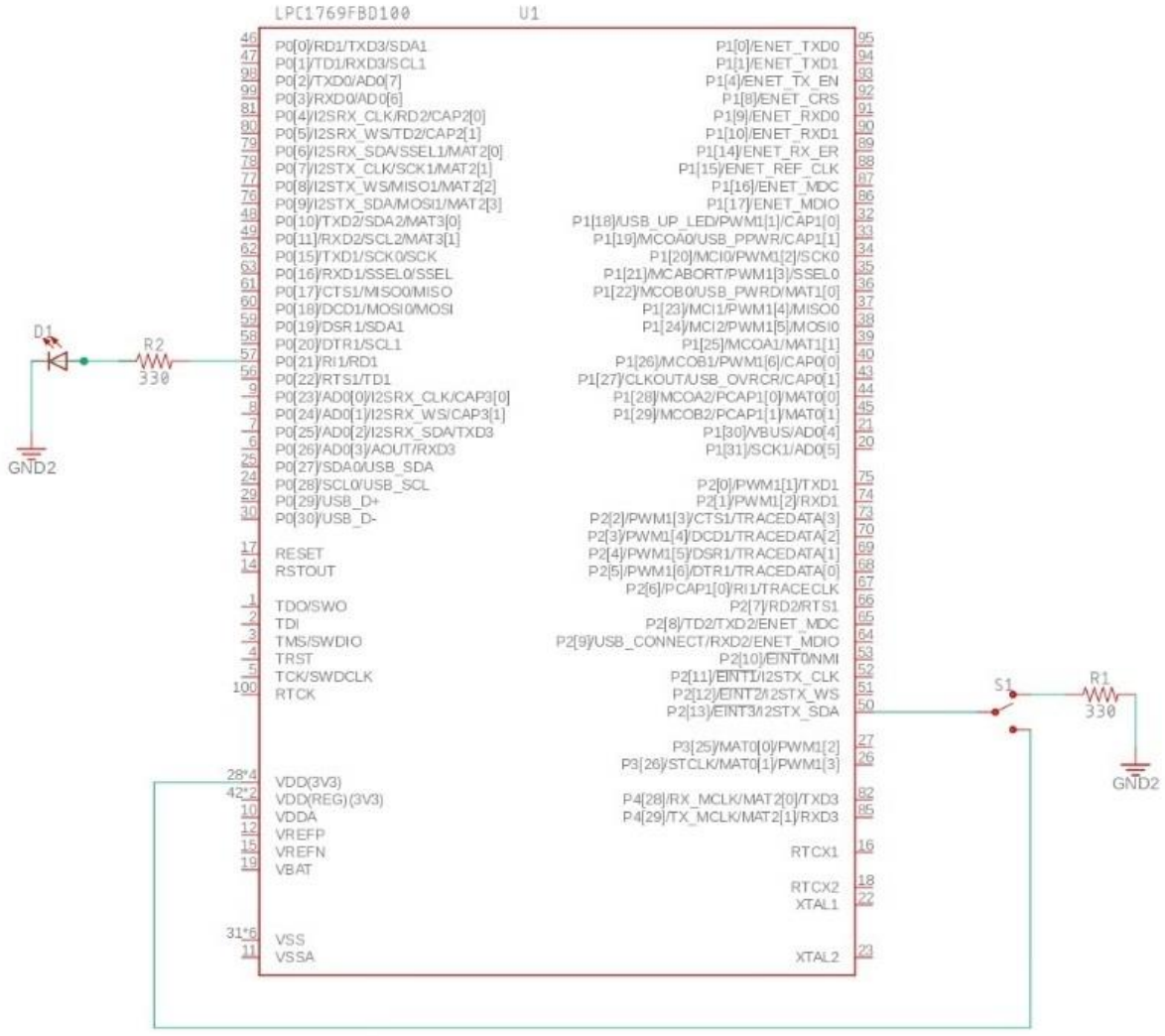
```
void setGPIO(uint8_t portNum, uint32_t pinNum)
{
	if (portNum == 0)
	{
		LPC_GPIO0->FIOSET = (1 << pinNum);
		printf("Pin 0.%d has been set.\n",pinNum);
	}
	else
	{
		puts("Only port 0 is used, try again!\n");
	}
}

//Deactivate the pin
void clearGPIO(uint8_t portNum, uint32_t pinNum)
{
	if (portNum == 0)
	{
		LPC_GPIO0->FIOCLR = (1 << pinNum);
		printf("Pin 0.%d has been cleared.\n", pinNum);
	}
	else
	{
		puts("Only port 0 is used, try again!\n");
	}
}

int main(void)
{
	//declare switch status variable and pin number
	uint32_t switchstatus;
	uint32_t switchpinnumber = 13;

	//Set pin 0.21 as output
	GPIOinitOut(0,21);

	//Set pin 2.31 as input
	GPIOinitIn(2, 13);

	while(1)
	{
		//Get the switch status using FIOPIN Register
		switchstatus = (LPC_GPIO2->FIOPIN >> switchpinnumber) & 0x01;
		//Since all pins that are configured as Input will be in high state
		//due to the internal pull-ups which is why switch status is toggled
		//using logic '0'
		if (switchstatus == 1)
		{
			//Activate pin 0.21
			setGPIO(0,21);
		}
		else
		{
			//Deactivate pin 2.13
			clearGPIO(0, 21);
		}
	}
	//0 should never be returned, due to infinite while loop
```

```
        return 0;
}
```

Connectivity Table:

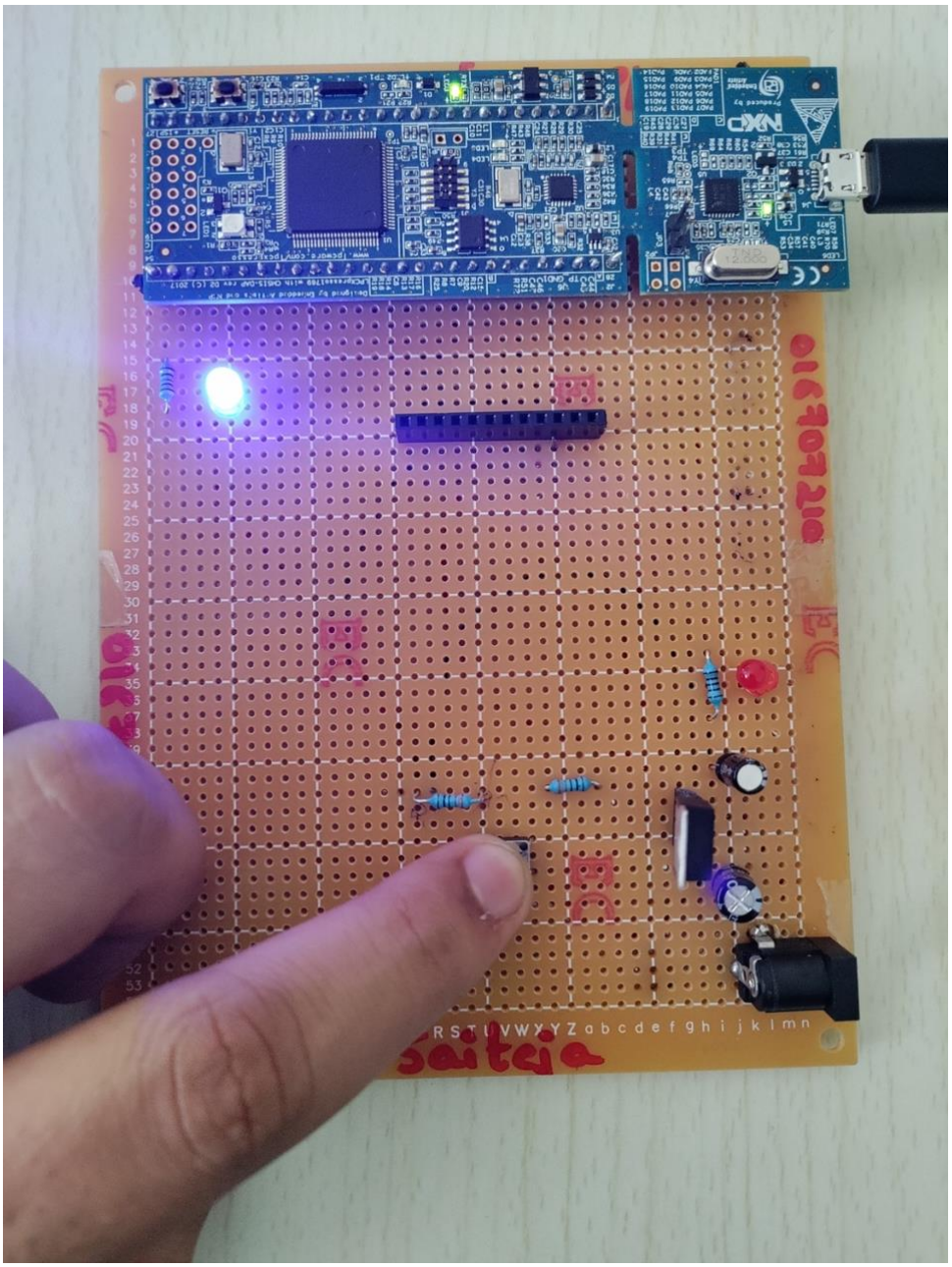
CPU PIN	J2-TAG PIN	FUNCTION
P0.21	J2-23	Output
P2.13	J2-27	Input

Schematic Diagram:



Output Snippet:

Below is the snippet of the output with LED in ON state. User will send logic-1 to the input pin of LPC1769 by pushing the button-in. This logic switch at the input pin is realized by the above code and toggles the logic value at the output port accordingly which in-turn will light the LED.



Conclusion:

Hence, modified the given C program and tested the GPIO interface in LPC1769 using the pins P0.21 for output and P2.13 for input on a prototype board by building the circuit.