

ENEL 323 : Computer Software Engineering 1
Assignment #2
Display Control Library for AVR Butterfly

Part One

By
Jack Farley (jfa31) and Adrian Gin (amg94)

LCD Control Library Files

Our goal is to write a set of C functions which can control the LCD on the AVR Butterfly. It will support operations on the 6 alphanumeric characters only. These operations can be found on page 1, ENEL 323 Assignment #2 description hand-out.

Our LCD Control library will consist of two files.

- LCDcontrol.c
- LCDcontrol.h

Function Prototypes and Descriptions

Below are the function prototypes to be implemented in our LCD control library. The function abstract is found in comments above each prototype.

```
/* A device specific macro (for the ATmega169) to set contrast of the LCD screen
 * on a scale from 0 to 15, where 15 is the highest level of contrast.
 * Macro copied from LCD_Driver.h Created by AMTEL Norway.
 */
#define LCD_CONTRAST_LEVEL(level) LCDCCR=(0x0F & level)
```

```
/* void lcd_init(void)
 * Sets up the LCD display for use and clears the 6 alphanumeric characters
 * on the LCD display.
 * The function also initialises the display strings as null pointers.
 * This function must be called before any other function in the library
 * is used.
 */
void lcd_init(void);
```

```
/* void lcd_clear(void)
 * Clears the 6 alphanumeric characters on the LCD screen so that they are
 * all blank.
 */
void lcd_clear(void);
```

```
/* void lcd_dislay_char(char c, uint8_t position)
 * Displays the character given in 'c' at the position given by 'position' (for 2 <
 * 'position' < 7) on the LCD screen.
 */
void lcd_dislay_char(char c, uint8_t position);
```

```
/* void lcd_display_string(char *str)
 * Loads the passed string into temporary memory and displays the first 6
 * characters of the string on the LCD.
 */
void lcd_display_string(char *str);
```

```

/* uint8_t lcd_load_strings(char *string1, char *string2)
 * Makes a copy of the two strings pointed to by 'string1' and 'string2' into
 * memory and then displays the first 6 characters of the string pointed to
 * by 'string1' on the LCD.
 * A one (1) is returned if both strings are successfully copied. Otherwise
 * a zero (0) will be returned to indicate an unsuccessful copy.
 */

```

```

uint8_t lcd_load_strings(char *string1, char *string2)

```

```

/* uint8_t lcd_toggle_string(void)
 * Toggles between the two stored strings initialised by lcd_load_strings.
 * If both the loaded strings are null pointers, lcd_toggle_string() will have
 * no effect. If only one string has been loaded, lcd_toggle_string will
 * display the loaded string. lcd_toggle_string always resets the string offset
 * (first 6 characters visible).
 * The index of the displayed string after the toggle is returned.
 */

```

```

uint8_t lcd_toggle_string(void);

```

```

/* uint8_t lcd_toggle_position(uint8_t position)
 * Toggles (between on and off) the alphanumeric LCD character at
 * the position given by 'position' (2 < 'position' < 7).
 * The new state of the toggled LCD character is returned,
 * (0 = off, 1 = on).
 */

```

```

uint8_t lcd_toggle_position(uint8_t position);

```

```

/* uint8_t lcd_scroll(uint8_t direction)
 * Scrolls the current string being displayed on LCD one position left or right
 * Set 'direction' to zero (0) to scroll left one position, and
 * Set 'direction' to one (1) to scroll right one position.
 * The offset of the displayed string is returned.
 */

```

```

uint8_t lcd_scroll(uint8_t direction);

```

The Test Application

To demonstrate the functionality of our LCD control library, we will transform the AVR Butterfly unit to an electronic name tag. This electronic name tag could be used to show the names of waiters or waitresses in restaurants.

The application will utilise a menu system which allows the user to navigate through the application's functions using the joystick. The application will have three core functions, it will allow the user to:

- Input their first and last name using the Joystick.
- Display their name on the LCD in two following ways:
 - Flashing mode and,
 - Scrolling mode.
- Adjust the level of contrast on the LCD.

In flashing mode, the LCD will display the first name (and scroll to the end of the name if it is longer than six characters) and then display the last name (and scroll to the end if it is longer than six characters). The rate at which the sequence runs at can be controlled by the user.

In scrolling mode, the first name is scrolled across the LCD screen followed by the last name (separated by a single space) scrolling across the LCD screen. The direction and the speed of the scrolling name maybe controlled by the user.