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TITLED

DISPENSING MACHINE

BY

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Problem Statement

At a shopping mart ,it is required to dispense the products in the bags after billing ,device an approach to implement such a system .

Problem Analysis

- For the dispensing machine ,there would be a display on the LCD regarding the items which are available in the store along with their price ,the user should his/her choice through the UART.
- The input consists of the item along with quantity.
- Specific task is done by the DC motor according to the input:-

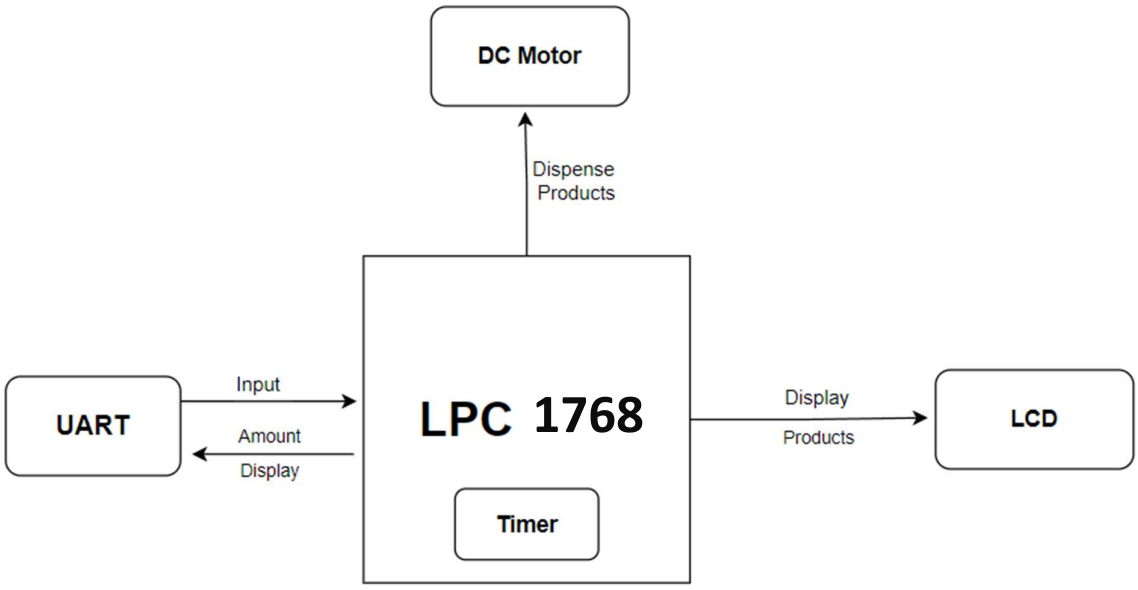
1. For product A, DC motor A is assigned to rotate clockwise for 5 sec.
2. For product B, DC motor B is assigned to rotate clockwise for 5 sec.
3. For product C, DC motor C is assigned to rotate clockwise for 5 sec.

CALCULATIONS

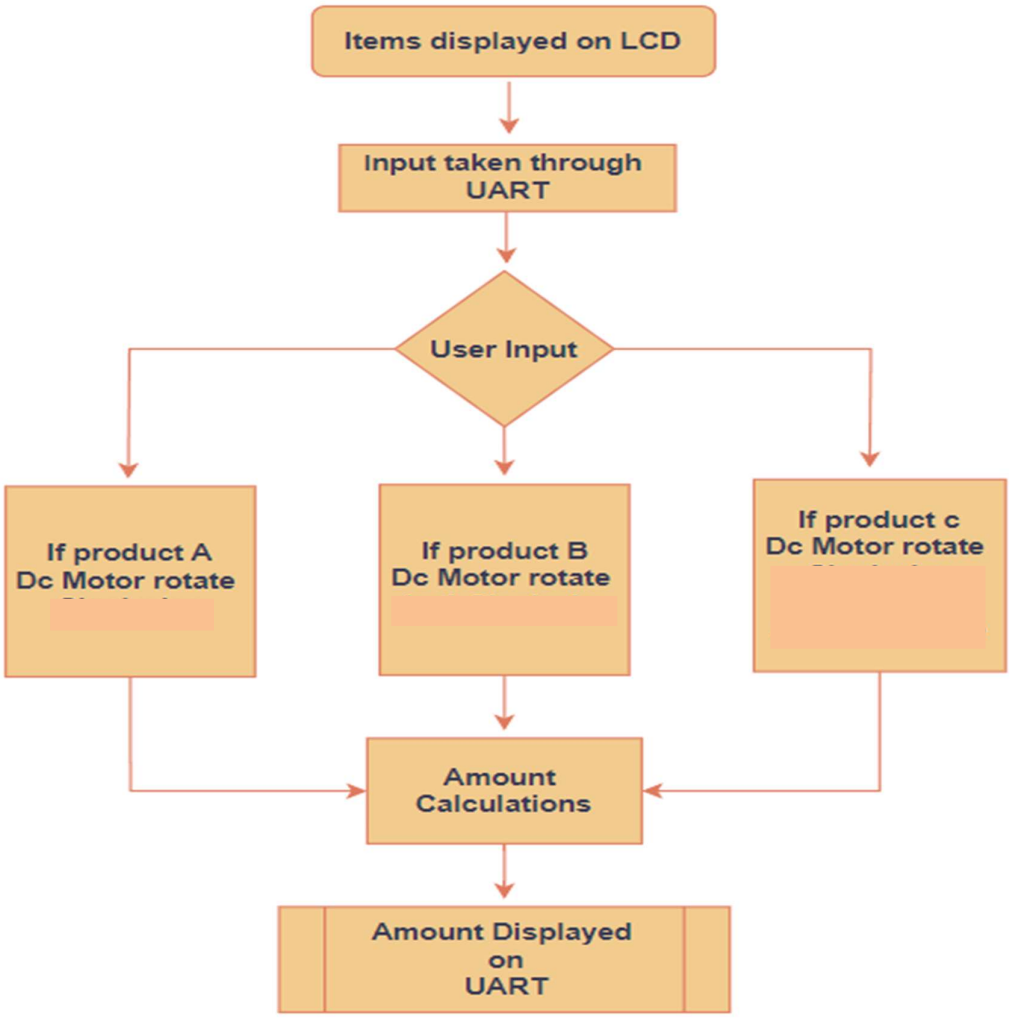
- The total amount is calculated accordingly and displayed on the UART.

Amount = Price * quantity

BLOCK DIAGRAM



Flowchart


Items displayed on LCD
Input taken through UART
User Input
If product A Dc Motor rotate
If product B Dc Motor rotate
If product c Dc Motor rotate
Amount Calculations
Amount Displayed on UART

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Objects

1. Message Queue

   It develops a synchronization between user input and the amount calculated.

ON Chip Peripherals

1. UART0
2. Timer

OFF Chip Peripherals

1. LCD
2. DC Motor

Specifications of peripherals used

1. LCD

- 16x2 display can be used in 8-bit Or 4-bit mode.
- 8 data pins
- 3 control pins (RS, RW, EN)

- RS- Data mode(1) /Command mode(0)
- RW- Read /Write.
- Enable - Latch the data.

2. DC Motor

- Typical working voltage – 3.3V
- Free run current - @3.3V 25mA
- Stall current - @3.3V 650mA

- Functionalities

- Clockwise
- Anti-Clockwise
- Stop

3.UART

- Four UART's
- 16 byte Receive and Transmit FIFOs
- Built-in fractional baud rate generator with auto bauding capabilities
- Software flow control through TXEN bit in Transmit Enable Register
- UART0 Registers

- U0RBR(UART0 Receive Buffer Register)
- U0THR (UART0 Transmit Holding Register)
- U0DLL and U0DLM (UART0 Divisor Latch Registers)
- U0IER (UART0 Interrupt Enable Register)

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Code

```
#include <LPC17xx.h>
#include <rtl.h>
#include "Lcd.h"
#include "uart.h"

unsigned char receive();
void delay_ms(unsigned int ms);
void transmit(unsigned char ch);
void delay(unsigned int x);
void complete(unsigned char mg,unsigned char C);

unsigned char mg,C;
unsigned long int temp1=0, temp2=0 ;
unsigned char Msg1[14] = {"A    B    C"};
unsigned char Msg2[15] = {"100   40   10"};


os_mbx_declare(MsgBox, 1);          // Declare an RTX mailbox
_declare_box(mpool, 20, 1);         // Dynamic memory pool
os_mbx_declare(MsgBox2, 1);         // Declare an RTX mailbox
_declare_box(mpool2, 20, 1);        // Dynamic memory pool
```

```
__task void lcd(void);
__task void dispense(void);
__task void order(void);



__task void order(void)
{

        U32 *rptr,*mptr2;
        os_mbx_init(MsgBox2, sizeof(MsgBox2));    // initialize the mailbox
 mptr2 = _alloc_box(mpool2);             // Allocate memory for the message
        while(1)
        {
                os_dly_wait(5);
         os_mbx_wait(MsgBox, (void **)&rptr, 0xffff); // wait for the
message
         mg=receive();
   transmit(mg);
         C=receive();
   transmit(C);
         _free_box(mpool, rptr); // free memory allocated for message
   mptr2[0]=0;
   os_mbx_send(MsgBox2, mptr2, 0xffff); // Send the message to the
mailbox
        }
```

```
}

__task void dispense(void)
{
        unsigned char success[]="Please enter the name of item and no.of items here---->";
        unsigned char fail[]="No such products available";
 unsigned int i;
        U32 *mptr,*rptr2;


 while(1)
 {
          os_mbx_init(MsgBox, sizeof(MsgBox));    // initialize the mailbox
  mptr = _alloc_box(mpool);             // Allocate memory for the message
  for(i=0;success[i]!='\0';i++)
   {
    transmit(success[i]);
   }
 i=0;
 mptr[0]=i;
 os_mbx_send(MsgBox, mptr, 0xffff); // Send the message to the mailbox
 os_dly_wait(5);
 os_mbx_wait(MsgBox2, (void **)&rptr2, 0xffff); // wait for the message
```

```
if(mg=='A')
{
 LPC_GPIO1->FIOSET = 0x00000200;
 LPC_GPIO1->FIOCLR = 0x00000100;
 delay_ms(50);
 LPC_GPIO1->FIOCLR = 0x00000300;
 complete(mg,C);
}
else if(mg=='B')
{
 LPC_GPIO1->FIOSET = 0x00000100;
 LPC_GPIO1->FIOCLR = 0x00000200;
 delay_ms(50);
 LPC_GPIO1->FIOCLR = 0x00000300;
 complete(mg,C);
}
else if(mg=='C')
{
 LPC_GPIO1->FIOSET = 0x00000200;
 LPC_GPIO1->FIOCLR = 0x00000100;
 delay_ms(50);
 LPC_GPIO1->FIOSET = 0x00000100;
 LPC_GPIO1->FIOCLR = 0x00000200;
 delay_ms(50);
 LPC_GPIO1->FIOCLR = 0x00000300;
```

```
 complete(mg,C);
 }
 else
 {
        transmit(0X0D);
  transmit(0x0A);
       for(i=0;fail[i]!='\0';i++)
   {
     transmit(fail[i]);
   }
                transmit(0X0D);
   transmit(0x0A);
 }
_free_box(mpool2, rptr2); // free memory allocated for message
 }

}

void complete(unsigned char mg,unsigned char C)
{
 int i,k,l=0;
 unsigned char a[5];
 unsigned char cmp[]="Amount---->";

 transmit(0X0D);
```

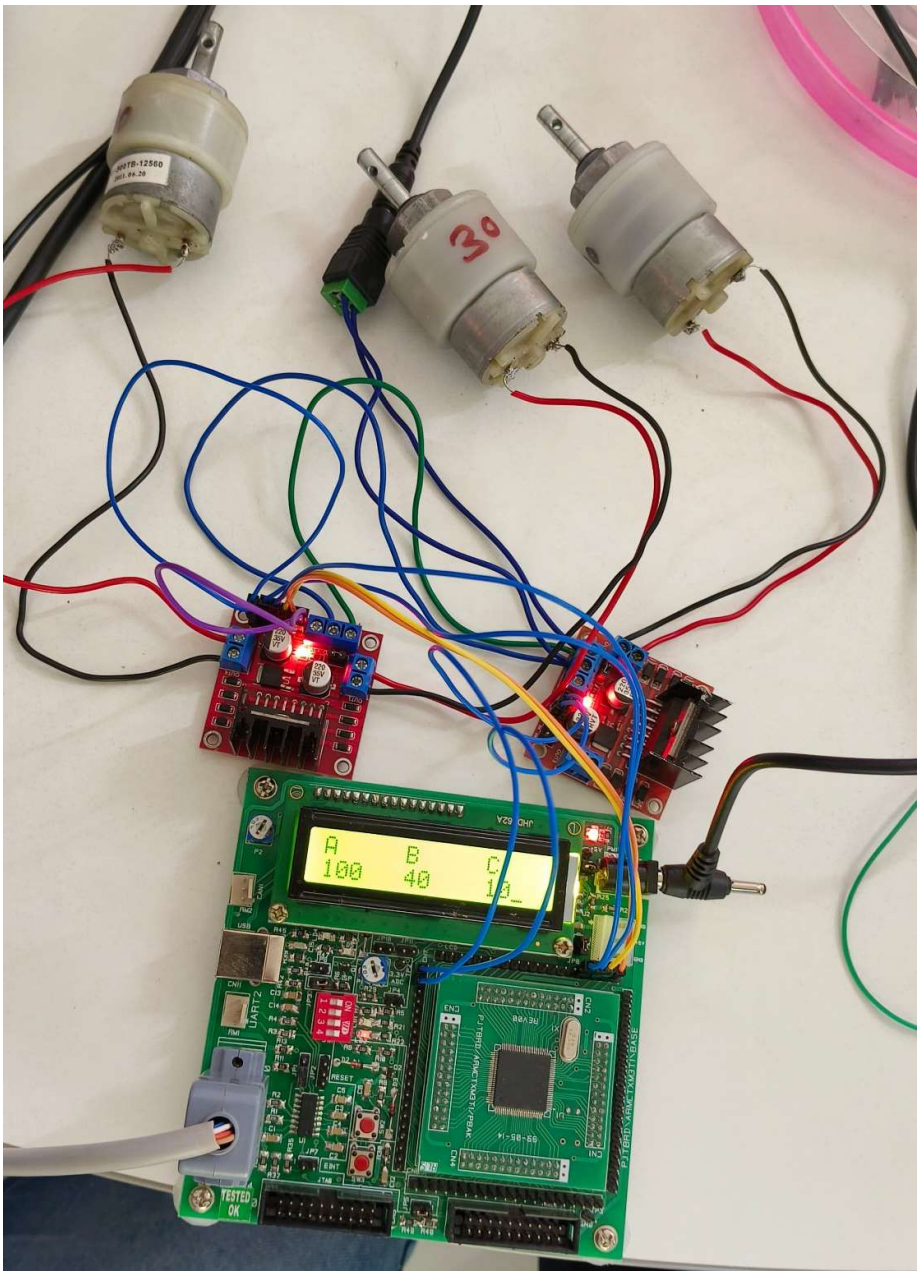
```
 transmit(0x0A);
for(i=0;cmp[i]!='\0';i++)
 {
  transmit(cmp[i]);
 }

k=(C-'0'); // total amount multiplication
if(mg=='A')
k=k*100;
if(mg=='B')
k=k*40;
if(mg=='C')
k=k*10;
i=0;

 while(k)
 {
  a[i]=((k%10)+'0');
  k=k/10;
  i++;
        l++;
 }
 for(i=l-1;i>=0;i--)
 {
   transmit(a[i]);
```

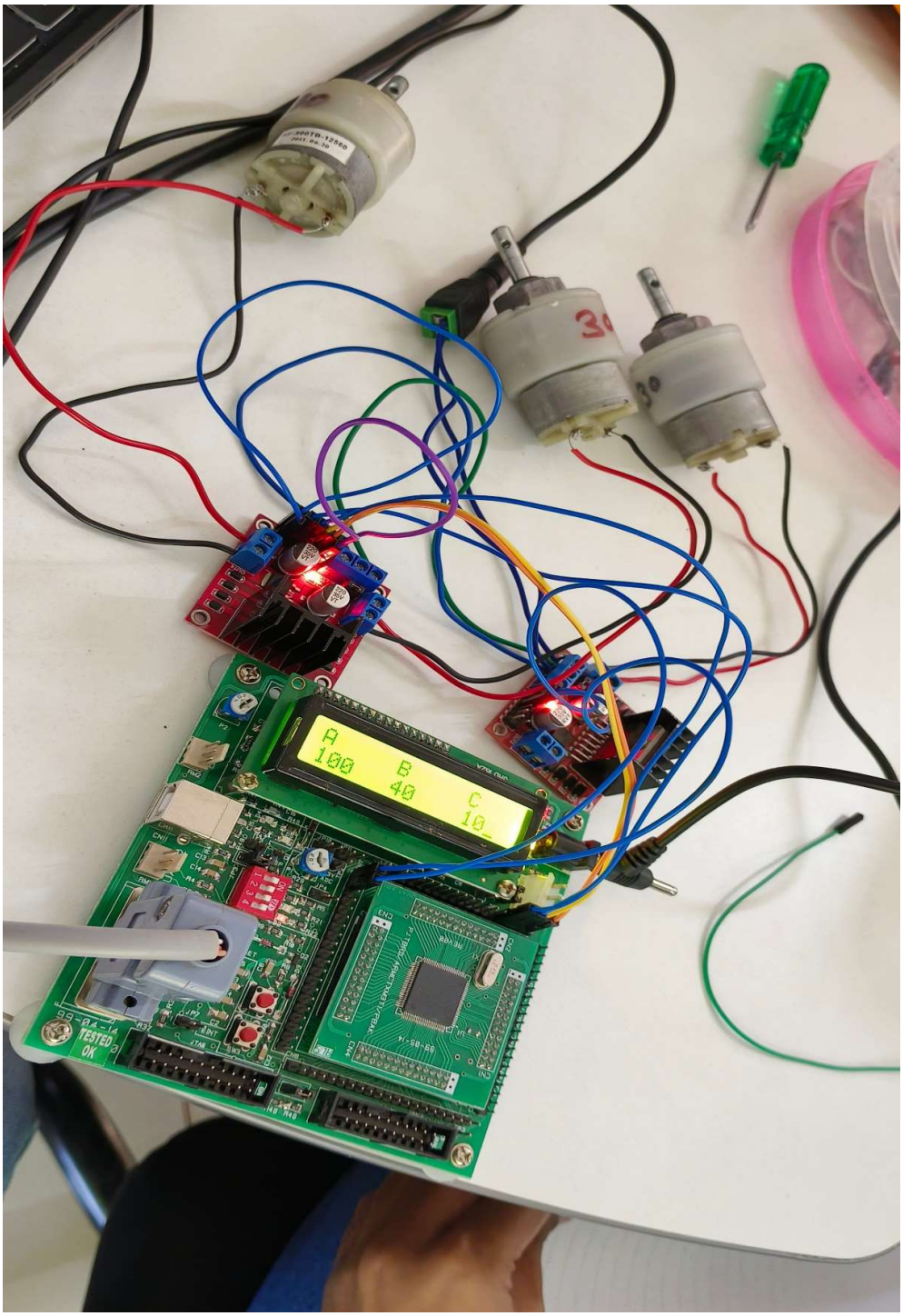
```
 }
   transmit(0X0D);
   transmit(0x0A);
}

unsigned char receive()
{
 while(!(LPC_UART0->LSR & 0x01));
 return(LPC_UART0->RBR);
}
void transmit(unsigned char ch)
{
 while(!(LPC_UART0->LSR & 0x20));
 LPC_UART0->THR = ch;
}

__task void lcd(void)
{
          delay_lcd(800);
                temp1 = 0x80;                    //1st message on LCD 1st line
        lcd_com();
                delay_lcd(800);
          lcd_puts(Msg1);

          temp1 = 0xc0;                    //2nd message on LCD 2nd line
```

```
        lcd_com();
        delay_lcd(800);
        lcd_puts(Msg2);

        os_tsk_create(dispense,10);
        os_tsk_create(order,10);
        os_tsk_delete_self();
}

void delay_ms(uint32_t ms) {
   LPC_TIM0->TCR = 0x02;  // Reset Timer
   LPC_TIM0->PR  = 0x00;  // Set prescaler to 0
   LPC_TIM0->MR0 = ms * (12000000 / 1000);  // Set match value for the
desired delay
   LPC_TIM0->TCR = 0x01;  // Enable Timer
   while (LPC_TIM0->TC < LPC_TIM0->MR0);
   LPC_TIM0->TCR = 0x00;  // Disable Timer
}

int main(void)
{
        SystemInit();
        SystemCoreClockUpdate();
  _init_box(mpool, sizeof(mpool), sizeof(U32)); // initialize the 'mpool'
memory for the membox dynamic allocation
```

```
 _init_box(mpool2, sizeof(mpool2), sizeof(U32)); // initialize the 'mpool'
memory for the membox dynamic allocation
        lcd_init();
        UART0_Init();
 os_sys_init(lcd);
 return 0;
}
```

HARDWARE IMPLEMENTATION




A
100
B
40
C
10
TESTED
OK

CONCLUSION

In conclusion, our dispensing machine, powered by a DC motor, featuring an LCD display, and utilizing UART communication in LPC1768, represents a successful integration of hardware components. The efficient design ensures precise dispensing, user-friendly interaction through the LCD, and seamless communication via UART. This project exemplifies a reliable and versatile automated system with potential applications across various industries.