

```

1  /*****
2  * \file main.c
3  * \brief ECEN 5803 Project 1, Module 1
4  *
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6  *
7  * An assembly code subroutine was written to approximate the square root of an
8  * argument using the bisection method. All math is done with integers, so the
9  * resulting square root is a truncated integer
10 *****/
11
12 #include <MKL25Z4.H>
13
14 /**
15 * @brief my_sqrt is an assembly function which approximates the square root of
16 *        an integer using the bisection method.
17 *
18 * @param[in] x is the integer you wish to find a square root for
19 *
20 * @return The function returns a truncated integer approximation of sqrt(x).
21 */
22 _asm int my_sqrt(int x)
23 {
24     MOV    r3,r0        ; x is now r3, r0 will be the return value c
25     MOVS   r2,#1        ; b is r2 initialized to 65536, the largest sqrt possible for 32 bits
26     LSLS   r2,#16       ; 65536 is 1 << 16 since the compiler wont allow more than 8 bit immediates.
27     MOVS   r1,#0        ; a is r1, initialized to 0
28     loop   ; loop starts here
29     MOV    r4,r0        ; c_old <- c
30     ADDS   r0,r1,r2     ; c <- (a+b)
31     LSRS   r0,r0,#1     ; c <- c/2
32     MOV    r5,r0        ; r5 <- c*c
33     MULS   r5,r5
34     CMP    r5,r3        ; check c*c == x
35     BEQ    end         ; exit if it is the solution
36     BLT    less        ; branch to less if c*c < x
37     MOV    r2,r0        ; if c*c > x, b <- c
38     ret
39     CMP    r0,r4        ; check c == c_old
40     BNE    loop        ; return to loop if c has changed
41     end
42     BX     lr          ; finished
43     less   ;
44     MOV    r1,r0        ; a <- c
45     B      ret         ; return
46 }
47
48 /*-----
49 MAIN function
50 *-----*/
51 /**
52 * @brief Main function
53 * The main function tests my_sqrt with four values: 2, 4, 22, and 121.
54 * once the values are computed, the program enters a while loop.
55 */
56 int main(void){
57     int r, j, k, l;
58     r = my_sqrt(2);      // should be 1
59     j = my_sqrt(4);      // should be 2
60     k = my_sqrt(22);     // should be 4
61     l = my_sqrt(121);    // should be 11
62     while(1)
63     ;
64 }
65

```