ARM

Anas Shrinah

December 2, 2022

The goal of this worksheet

This workshop aims to help you write simple ARM assembly programs.

1 Typical programing blocks in Assembly

1.1 If statement

Write an ARM assembly code to compare the values of two variables x and y; if x is equal to y, increase x by the value of y. Use r0 for x and r1 for y. Do not use any other registers.

```
if(x == y){x += y;}
```

1.2 If...else statement

Write an ARM assembly code to compare the values of two variables x and y; if x is not equal to y, assing 3y to x or else assign 15x to y. Use r0 for x and r1 for y. Do not use any other registers.

```
if( x != y )
    {
      x = 3 * y;
    }
   else
   {
     y = 15 * x;
   }
```

1.3 For loop

Write an ARM assembly code to impliment the below C++ statments. Assume r0 is c, r1 is a, r2 is b and r3 is i.

```
int c =0;
for( int i = a; i < b; i++ ){
      c++;
   }
```

1.4 Do while loop

Write an ARM assembly code to impliment the below C++ statments. Assume r0 is a, r1 is b.

```
  do {
     a = a + 1;
   }while( a < b );
```

2 Representation of characters

Write an ARM assembly program that loads registers r0,r1, and r2 with the ASCII codes of the letters in the word "fun". Then, convert these codes to the ASCII codes of the upper case English letters of the same word by:

- Adding a constant.
- subtracting a constant.

3 Calculate the inverse of a matrix

Write an ARM assembly program that finds the inverse of 2×2 matrix. Load the registers r0,r1,r2, and r3 with the values of a, b, c and d. then calcuate the inverse of the martix and store its elements in r7, r8, r9 and r10.

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \rightarrow A^{-1} = \frac{1}{Det(A)} \times \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

Assume that we will be working with small enough values that there will be no integer overflow.
Hints:

1. Note the division might result in numbers with decimal points.
2. Reuse your code for calculating the determinant of 2×2 matrices from the lab..