8-BIT ARITHMETIC OPERATIONS USING 8051

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AIM:

To write assembly language programs to perform the following arithmetic operations using an 8051 microcontroller:

1. 8-bit addition
2. 8-bit subtraction
3. 8-bit multiplication
4. 8-bit division

PROGRAM – 1: 8-BIT ADDITION:

ALGORITHM:

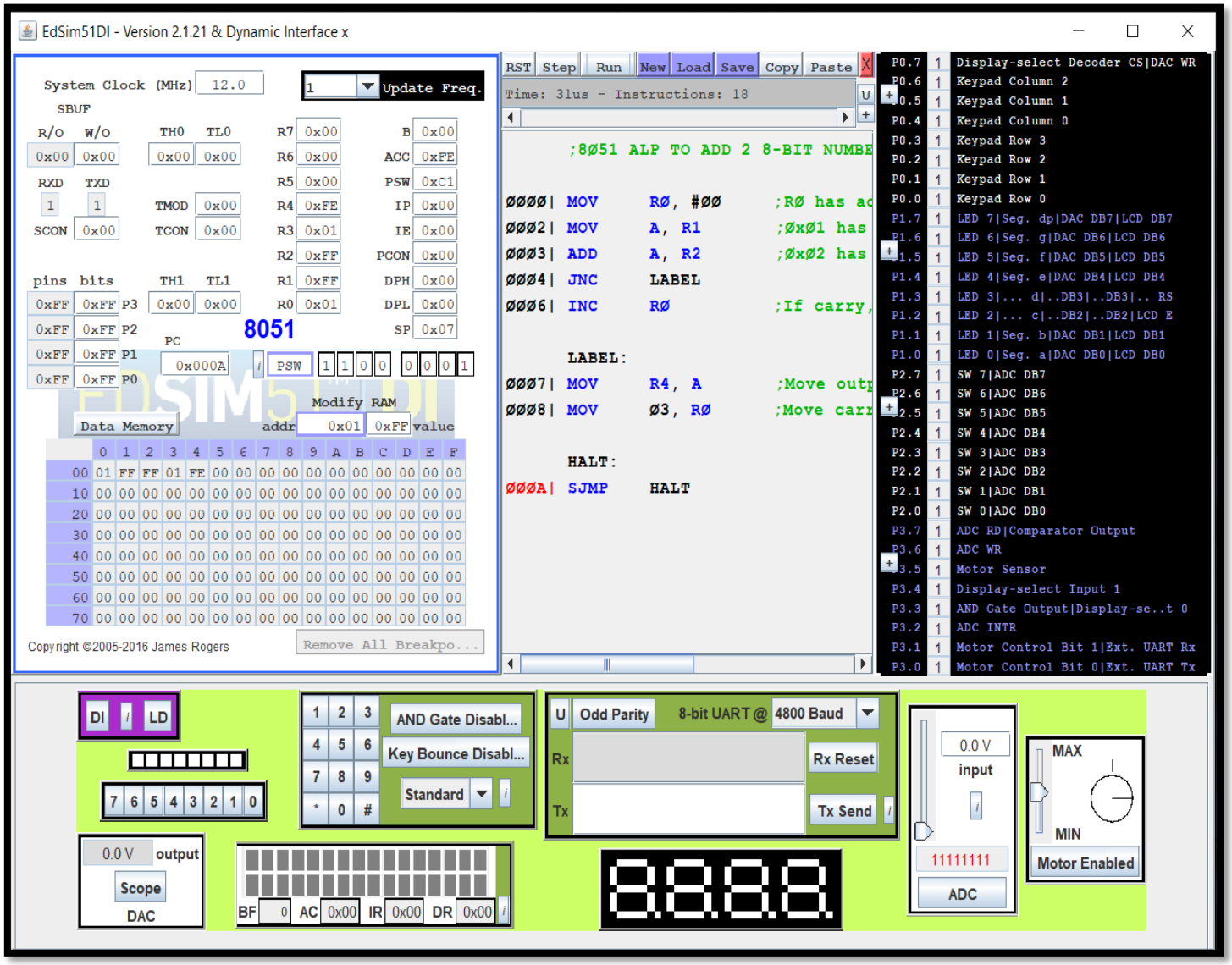
1. Begin

2. Initialize R0 with 00h.
3. Move the value in R1 to A.
4. Add the value in A to with value in R2.
5. Increment R0 if carry is produced.
6. Move R0 to R3 (carry) and A to R4 (sum).

7. End.

PROGRAM	COMMENTS
MOV R0, #00	R0 has address of 0x00
MOV A, R1	0x01 has 1st 8-bit number
ADD A, R2	0x02 has 2nd 8-bit number. Add it with A
JNC LABEL	If no carry, jump to “LABEL”.
INC R0	If carry, increment R0
LABEL:	
MOV R4, A	Move output to R4 from A
MOV 03, R0	Move carry to R3. (MOV R3, R0) is invalid
HALT:	
SJMP HALT	Halt the program with a loop.

SAMPLE I/O SNAPSHOT:



PROGRAM – 2: 8-BIT SUBTRACTION:

ALGORITHM:

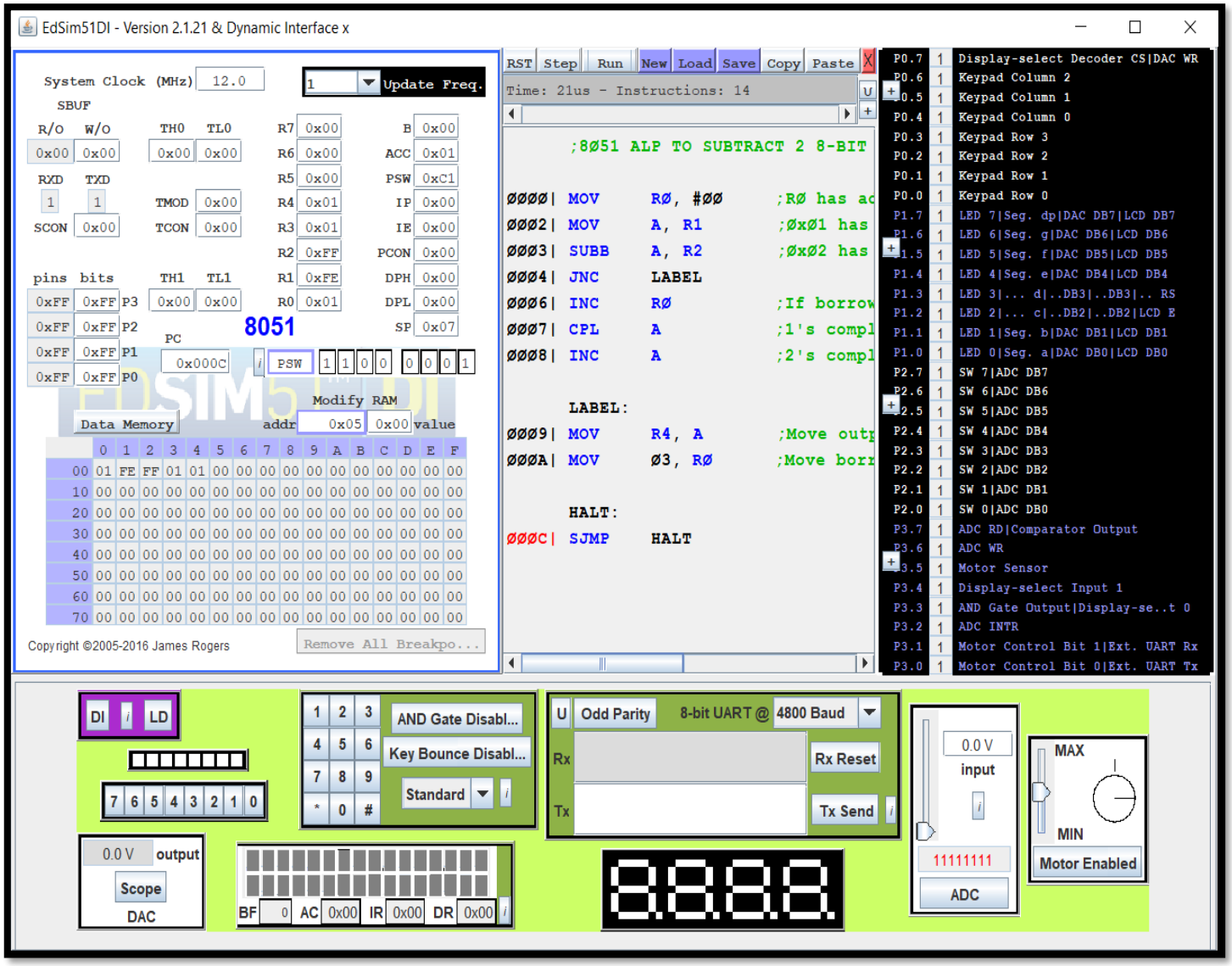
1. Begin.

2. Initialize R0 with 00h
3. Move the value in R1 to A.
4. Subtract the value in A to with value in R2.
5. Increment R0 if carry is produced and take 2's complement of A.
6. Move R0 to R3 (borrow) and A to R4 (difference)

7. End.

PROGRAM	COMMENTS
MOV R0, #00	R0 has address of 0x00
MOV A, R1	0x01 has 1st 8-bit number
SUBB A, R2	;0x02 has 2nd 8-bit number. Subtract it from A.
JNC LABEL	If no carry, jump to “LABEL”.
INC R0	If carry, increment R0
CPL A	1's complement the difference
INC A	2's complement the difference
LABEL:	
MOV R4, A	Move output to R4 from A
MOV 03, R0	Move carry to R3. (MOV R3, R0) is invalid
HALT:	
SJMP HALT	Halt the program with a loop.

SAMPLE I/O SNAPSHOT:



PROGRAM – 3: 8-BIT MULTIPLICATION:

ALGORITHM:

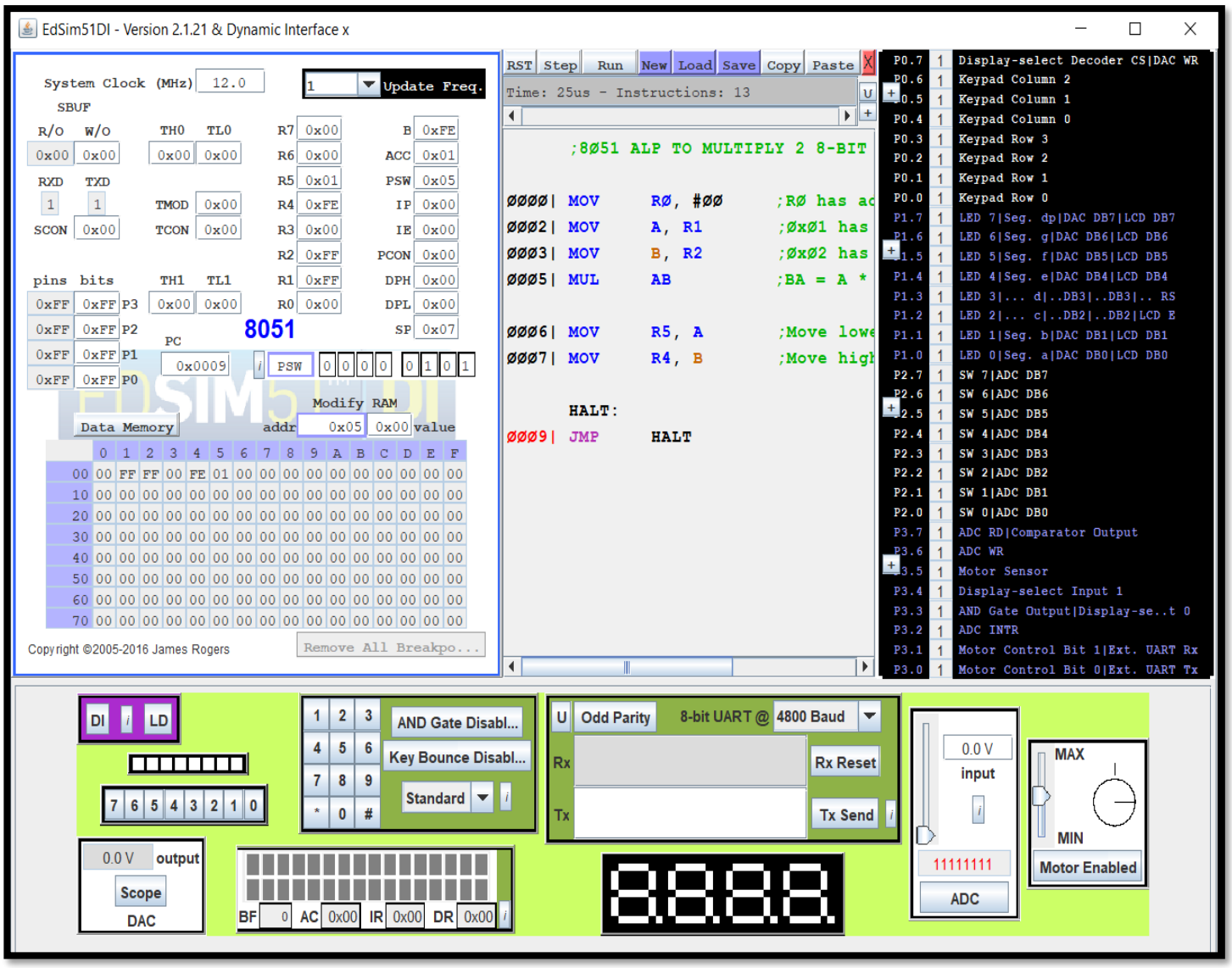
1. Begin.

2. Initialize R0 with 00h
3. Move the value in R1 to A.
4. Move the value in R2 to B.
5. Multiply A and B.
6. Move B to R4 (MSB of product) and A to R5 (LSB of product)

7. End.

PROGRAM	COMMENTS
MOV R0, #00	R0 has address of 0x00
MOV A, R1	0x01 has 1st 8-bit number
MOV B, R2	0x02 has 2nd 8-bit number
MUL AB	BA = A * B
MOV R5, A	Move lower byte to R5 from A
MOV R4, B	Move higher byte to R4 from B
HALT:	
SJMP HALT	Halt the program with a loop.

SAMPLE I/O SNAPSHOT:



PROGRAM – 4: 8-BIT DIVISION:

ALGORITHM:

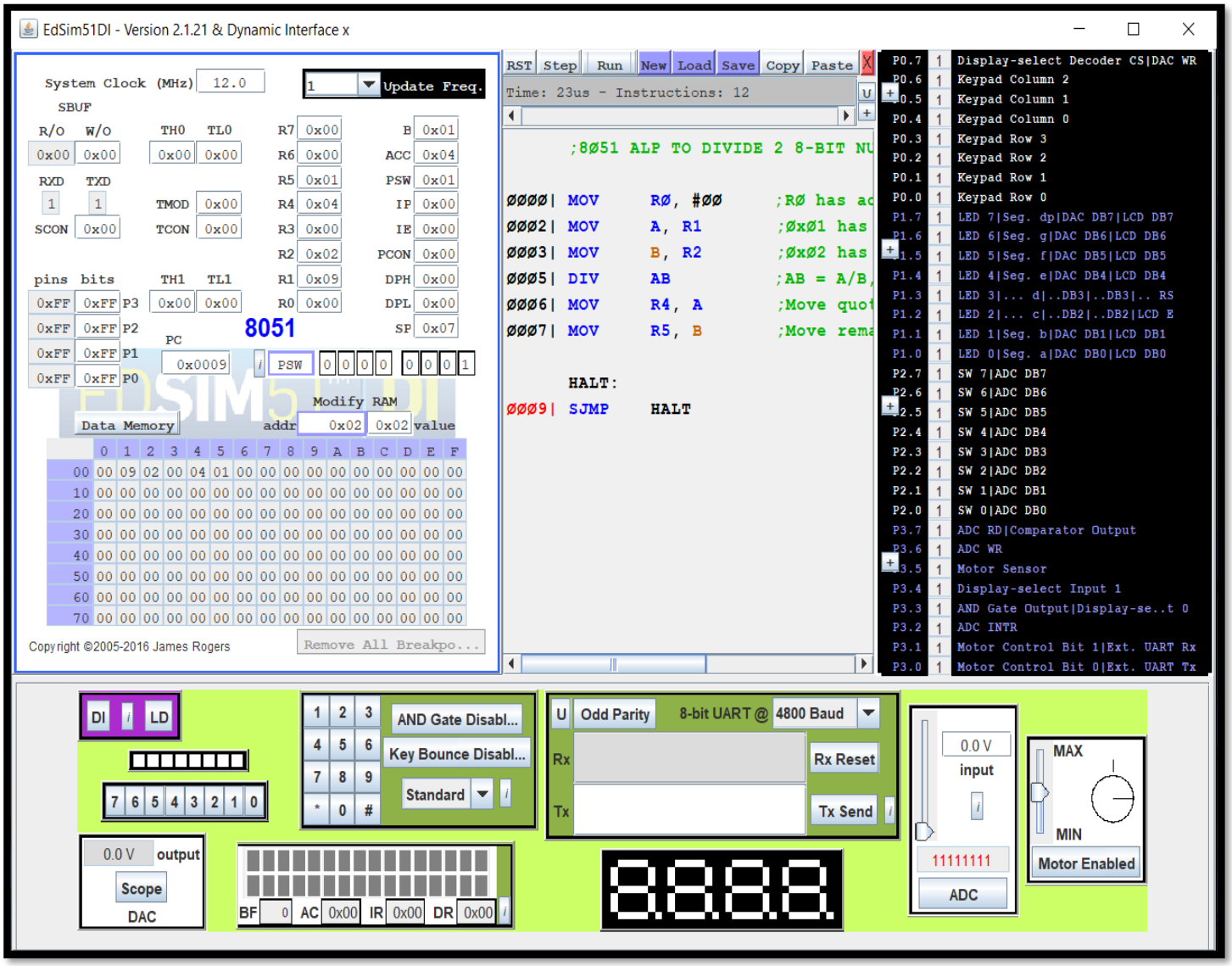
1. Begin.

2. Initialize R0 with 00h.
3. Move the value in R1 to A.
4. Move the value in R2 to B.
5. Divide A by B.
6. Move A to R4 (quotient) and B to R5 (remainder)

7. End.

PROGRAM	COMMENTS
MOV R0, #00	R0 has address of 0x00
MOV A, R1	0x01 has 1st 8-bit number
MOV B, R2	0x02 has 2nd 8-bit number
DIV AB	BA = A / B, A: Quotient, B: Remainder
MOV R5, A	Move quotient to R4 from A
MOV R4, B	Move remainder to R5 from B
HALT:	
SJMP HALT	Halt the program with a loop.

SAMPLE I/O SNAPSHOT:



RESULT:

The assembly level programs were written to perform the above specified 8-bit arithmetic operations using an 8051 microcontroller and the outputs were verified.