Termin2 (1)

Montag, 3. Februar 2025 09:08

Termin2 (1)

RECHNERARCHITEKTUR

Termin 2

Umgang Befehlssatz eines MU1 Prozessors

Vorbereitung

Bereiten Sie die Lösungen daheim so vor, dass Sie die Ergebnisse zum Praktikumstermin präsentieren können.

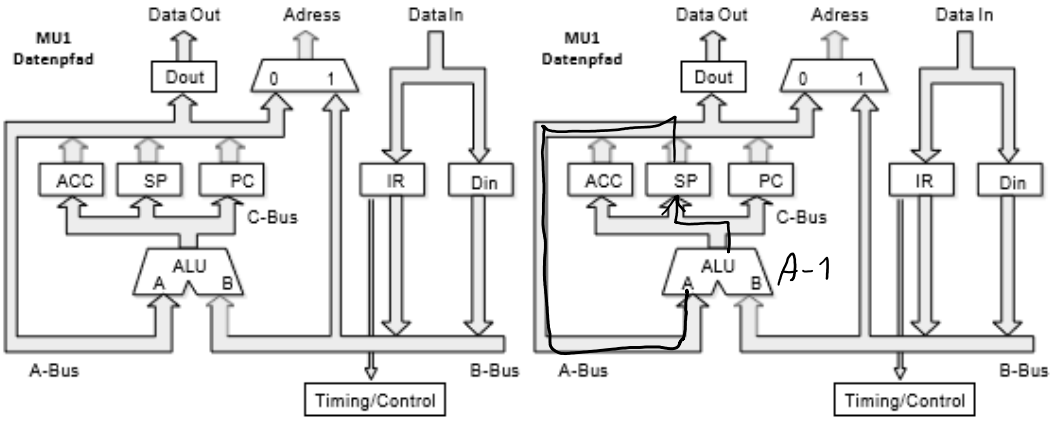
Aufgabe1:

Zeichnen Sie für die untenstehenden Befehle den jeweiligen Datenfluss und füllen Sie die Steuerungstabelle aus.

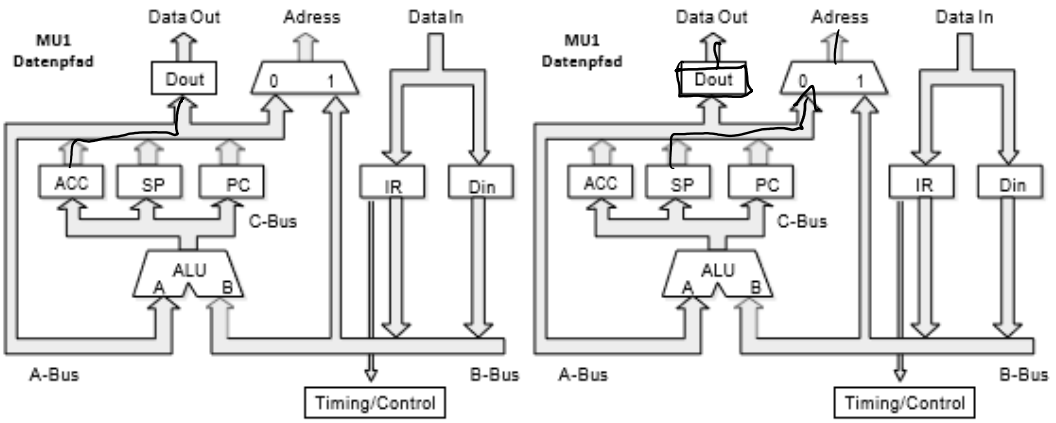
Befehlstabelle für MU1

Instruction	*Effekt*
Reset	PC = 0
LDA S	ACC = [S]
STO S	[S] = ACC
ADD S	ACC = ACC + [S]
JUMP S	PC = S
JGE S	IF ACC >= 0 PC = S
JNE S	IF ACC = 0 PC = S
STOP	stop
CALL S	SP = SP-1, [SP] = PC, PC = S
RETURN	PC = [SP], SP = SP + 1
PUSH	SP = SP-1, [SP] = ACC
POP	ACC = [SP], SP = SP + 1
LDR S	ACC = [[S]]
STR S	[[S]] = ACC
MOV PC	PC = ACC
MOV SP	SP = ACC

Der Befehl Push

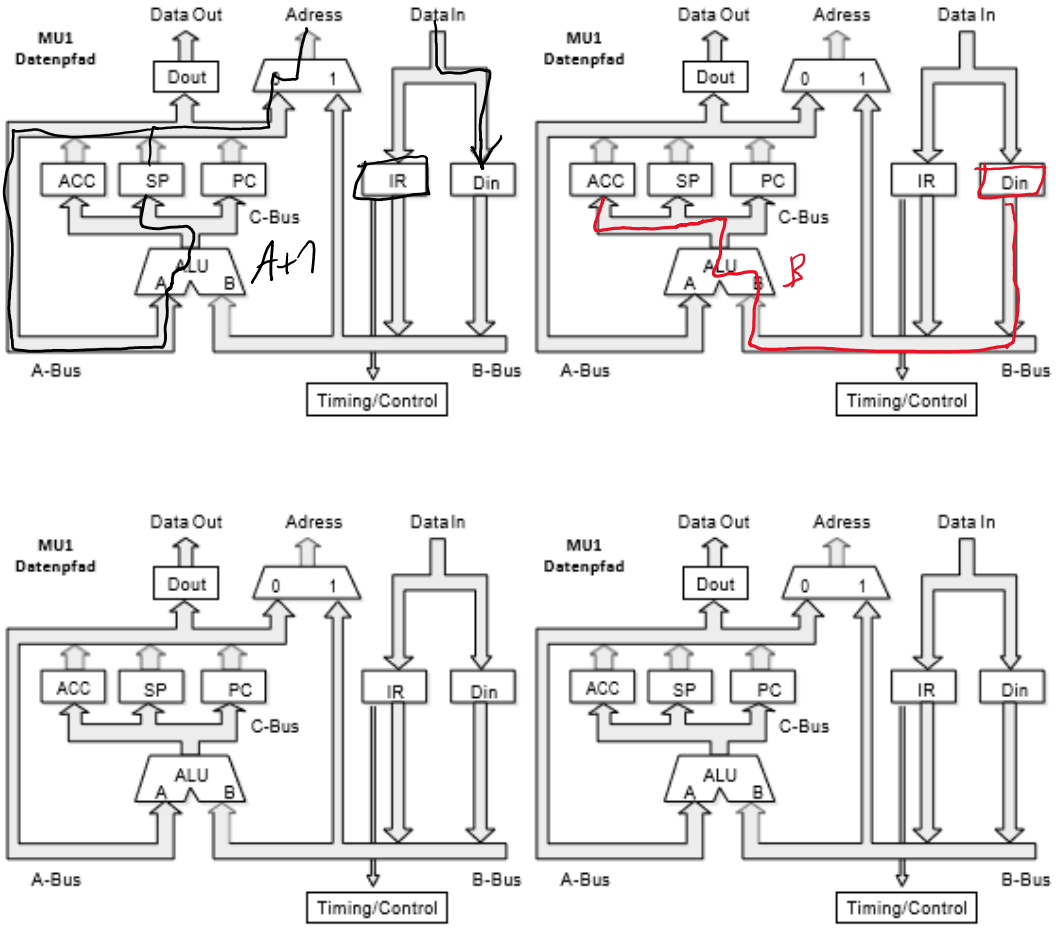


RnW=0



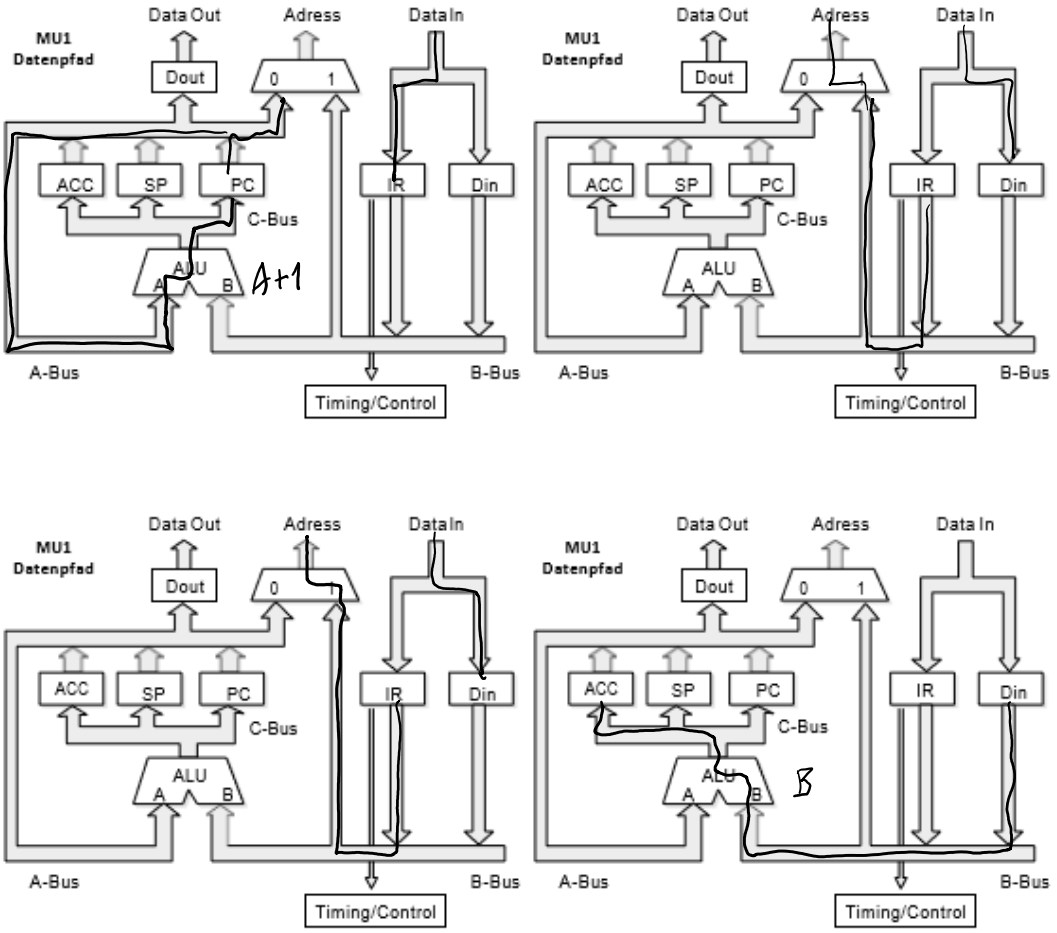
Inputs						Outputs																Description
Instruction	Opcode	/Reset	Step	ACC_Z / Zero	ACC_{15} /Negativ	Step	Adress	ACC_{oe}	ACC_{le}	PC_{oe}	PC_{le}	IR_{oe}	IR_{le}	SP_{oe}	SP_{le}	DIN_{oe}	DIN_{le}	$DOUT_{oe}$	$DOUT_{le}$	ALU Function	MEM_{rq}	RnW	
PUSH																						

Der Befehl Pop



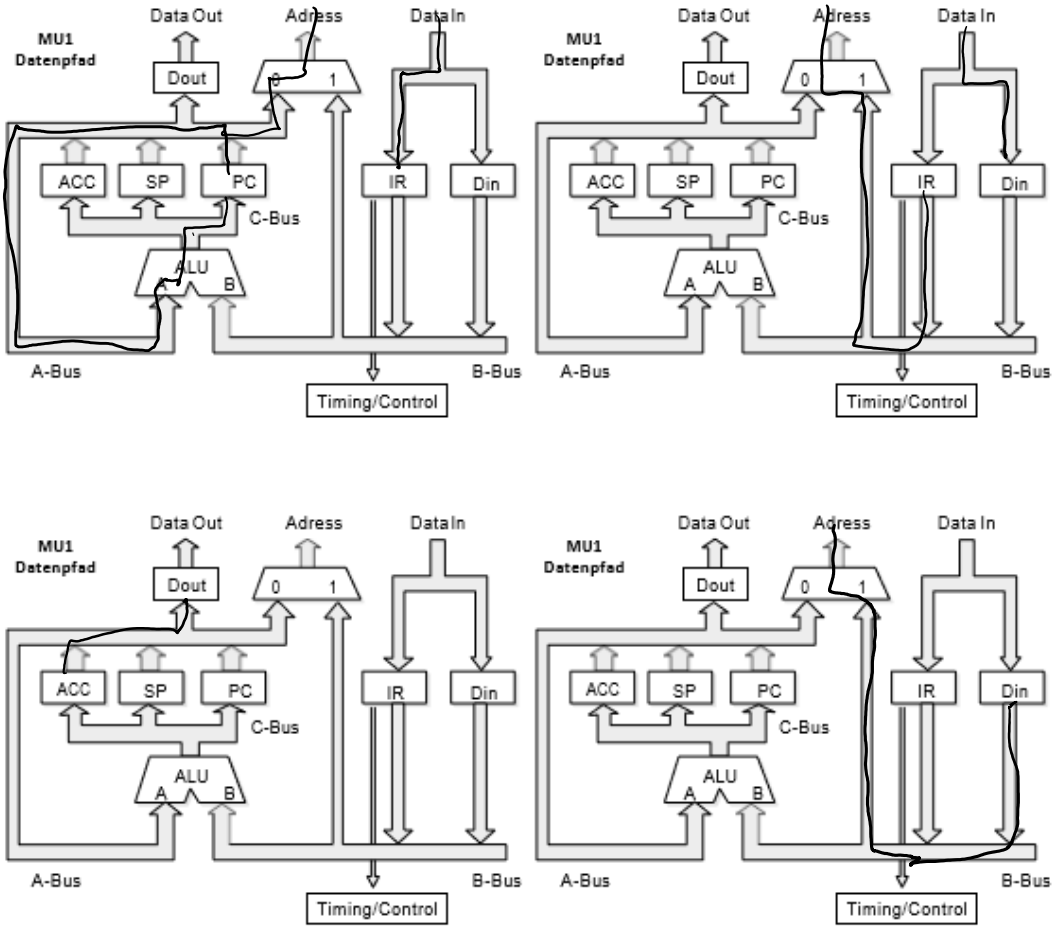
Inputs						Outputs																Description
Instruction	Opcode	/Reset	Step	ACC$_Z$/ Zero	ACC$_{15}$/Negativ	Step	Adress	ACC$_{oE}$	ACC$_{ie}$	PC$_{oe}$	PC$_{ie}$	IR$_{oe}$	IR$_{ie}$	SP$_{oe}$	SP$_{ie}$	DIN$_{oe}$	DIN$_{ie}$	DOUT$_{oe}$	DOUT$_{ie}$	ALU Function	MEM$_{rq}$	RnW	
POP		1	0			1																
		1	1	X	X	2	0	0	0	0	0	0	0	1	1	1	0	0	0	A+1	1	1	Din = [SP], SP+=1
		1	2	X	X	0	X	0	1	0	0	0	0	0	0	1	0	0	0	B	0	1	Acc = Din

Der LDR S Befehl



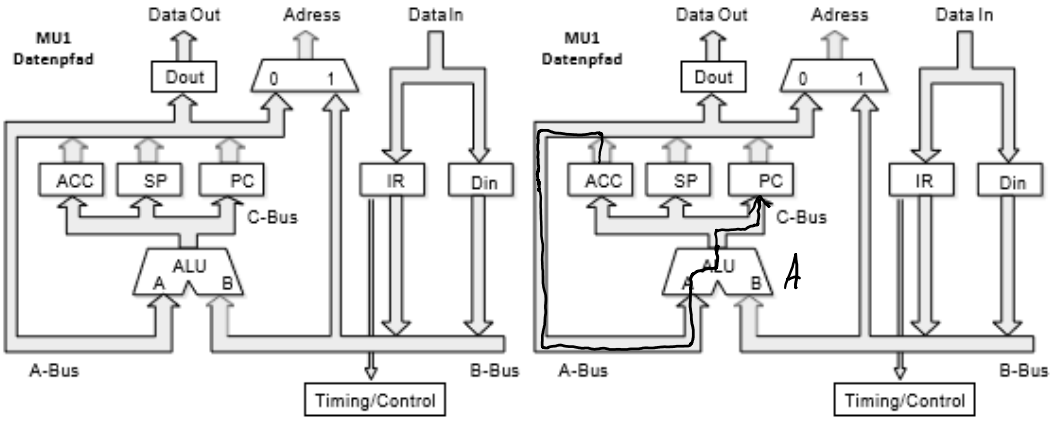
Inputs						Outputs																Description
Instruction	Opcode	/Reset	Step	ACC_Z/ Zero	ACC_{15}/Negativ	Step	Adress	ACC_{OE}	ACC_{le}	PC_{oe}	PC_{le}	IR_{oe}	IR_{le}	SP_{oe}	SP_{le}	DIN_{oe}	DIN_{le}	$DOUT_{oe}$	$DOUT_{le}$	ALU Function	MEM_{rq}	RnW	
LDR S			0	X	X	1																FETCH
			1	X	X	2	1	X	X	0	0	0	1	0	0	0	1	0	0	0	1	1	DECODE | Din = [IR]
			2	X	X	3	1	X	X	0	0	0	0	0	0	1	1	0	0	0	1	1	| Din = [Din]
			3	X	X	0	0	0	1	0	0	0	0	0	0	1	0	0	0	B	0	1	ACC = Din

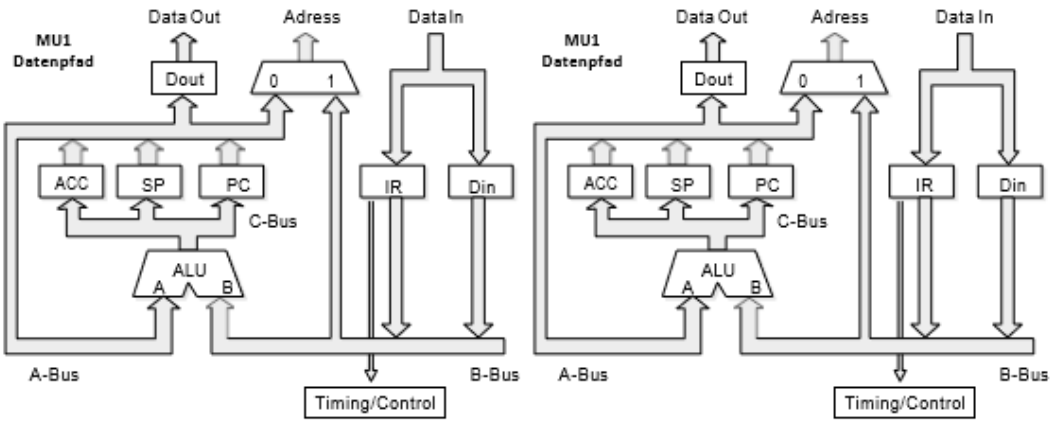
Der STR S Befehl



Inputs						Outputs																	Description
Instruction	Opcode	/Reset	Step	ACC_Z / Zero	ACC_{15}/Negativ	Step	Adress	ACC_{oE}	ACC_{le}	PC_{oe}	PC_{le}	IR_{oe}	IR_{le}	SP_{oe}	SP_{le}	DIN_{oe}	DIN_{le}	$DOUT_{oe}$	$DOUT_{le}$	ALU Function	MEM_{rq}	RnW	
STR S			0			1																	
		1	1	X	X	2	1	0	0	0	0	1	0	0	0	0	1	0	0	X	1	1	Din = [S]
		1	2	X	X	3	0	1	0	0	0	0	0	0	0	0	1	0	0	X	0	1	Dout = ACC
		1	3	X	X	0	1	0	0	0	0	0	0	0	0	0	1	0	0	X	1	0	[Din] = Dout

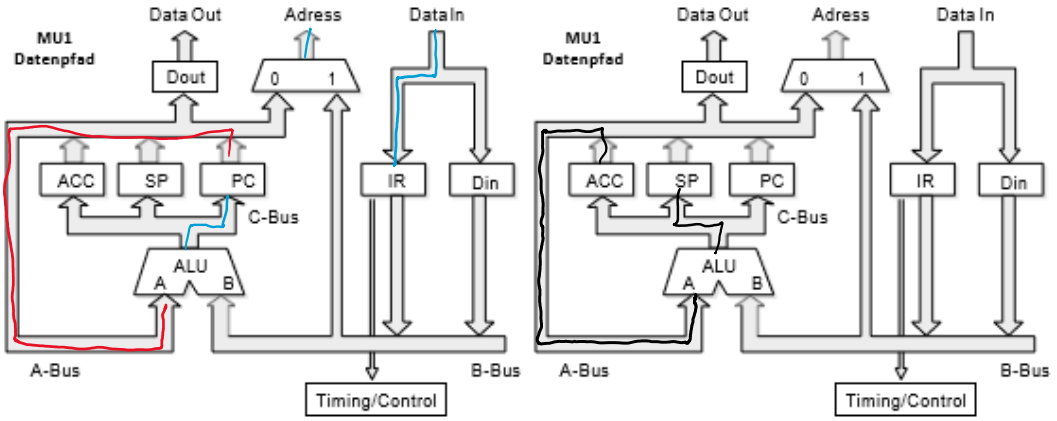
Der MOV PC Befehl

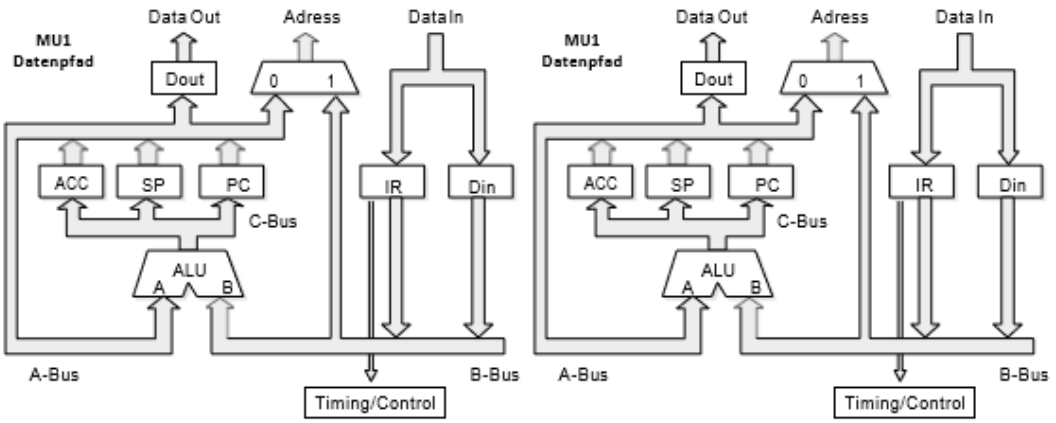




Inputs						Outputs																Description
Instruction	Opcode	/Reset	Step	ACC_Z / Zero	ACC_{15} / Negativ	Step	Adress	ACC_{oe}	ACC_{le}	PC_{oe}	PC_{le}	IR_{oe}	IR_{le}	SP_{oe}	SP_{le}	DIN_{oe}	DIN_{le}	$DOUT_{oe}$	$DOUT_{le}$	ALU Function	MEM_{rq}	RnW	
MOV PC		1	1	X	X	0	X	1	0	0	1	0	0	0	0	0	0	0	0	A	0	1	Mov PC

Der MOV SP Befehl





Inputs						Outputs																Description
Instruction	Opcode	/Reset	Step	ACC_Z/ Zero	ACC_{15}/Negativ	Step	Adress	ACC_{oE}	ACC_{ie}	PC_{oe}	PC_{ie}	IR_{oe}	IR_{ie}	SP_{oe}	SP_{ie}	DIN_{oe}	DIN_{ie}	$DOUT_{oe}$	$DOUT_{ie}$	ALU Function	MEM_{rq}	RnW	
MOV SP								1							1					A			

Aufgabe2:

Versuchen Sie, das Beispielprogramm aus der Vorlesung mit den neuen Befehlen LDR S und STR S so umzuschreiben, dass sie keinen selbst modifizierenden Code mehr benötigen.

```
Loop:       LDA   Total      ; Accumulate total
Add_instr:  ADD   Table      ; Begin at head of table
            STO   Total      ;
            LDA   Add_instr  ; Change address ...
            ADD   One        ; by modifying instruction!
            STO   Add_instr  ;
            LDA   Count      ; Count iterations
            SUB   One        ; Count down to zero
            STO   Count      ;
            JGE   Loop       ; If >= 0 repeat
            STP              ; Halt execution


; Data definitions
Total       DEFW 0       ; Total - initially zero
One         DEFW 1       ; The number one
Count  DEFW 4            ; Loop counter (loop 5x)
Table       DEFW 39      ; The numbers to total...
            DEFW 25      ;
            DEFW 4       ;
            DEFW 98      ;
            DEFW 17      ;
```