

# CRC Program

## Tracing

data bits  $\rightarrow$   <sup>int</sup> • divisor bits  $\rightarrow$   <sup>int</sup> total length  $\rightarrow$   <sup>int</sup>

data  $\rightarrow$   <sup>array of int</sup> div  $\rightarrow$   <sup>array of int</sup> divisor  rem   
 or

Enter number of data bits

$\Rightarrow$  data bits = 6

Enter data bits

1  
1  
0  
0  
1  
1

$\Rightarrow$  data [6] = 

1	1	0	0	1	1
---	---	---	---	---	---

Enter number of bits in divisor

$\Rightarrow$  divisor bits = 4

Enter Divisor bits

1  
0  
1  
1

$\Rightarrow$  divisor [4] = 

1	0	1	1
---	---	---	---

total length = 6 + 4 + 1 =  9

div[9] = 

--	--	--	--	--	--	--	--	--

rem[9] = 

--	--	--	--	--	--	--	--	--

or [9] = 

--	--	--	--	--	--	--	--	--

for i = 0 to data.length - 6;

div[i] = data[i] = 110011

After appending 0's :- div[9] = 110011000

rem = divisor (divisor)

$$\text{rem}[ ] = \text{div}[ ] = 110011000$$

$\text{rem} = \text{divide}(\text{divisor}, \text{rem})$

$\text{divide}(1011, 110011000)$

## Divide function

$\text{while}(\text{true})$

{

for  $i = 0$  to  $\text{divisor.length} // 4$ :

$i = 0 \rightarrow \text{rem}[0] = \text{rem}[0] \wedge \text{divisor}[0]$

$\text{rem}[0] = 1 \wedge 1 \Rightarrow 0$

$i = 1 \rightarrow \text{rem}[1] = 1 \wedge 0 \Rightarrow 1$

$i = 2 \rightarrow \text{rem}[2] = 0 \wedge 1 \Rightarrow 1$

$i = 3 \rightarrow \text{rem}[3] = 0 \wedge 1 \Rightarrow 1$

$\Rightarrow \text{rem}[ ] = 0111$

$\text{while}(\text{rem}[\text{cur}] == 0 \ \&\& \ \text{cur} != \text{rem.length} - 1)$

$\text{rem}[0] = 0 \ \&\& \ 0 != 8 \quad \text{T}$

$\boxed{\text{cur} = 1}$

$\text{rem}[1] == 0 \quad \text{F}$

for  $i = 0$  to  $4$ :

$\text{rem}[1] = \text{rem}[1] \wedge \text{divisor}[0]$

$1 \wedge 1 \Rightarrow 0$

$\text{rem}[2] = 1 \wedge 0 \Rightarrow 1$

$\text{rem}[3] = 1 \wedge 1 \Rightarrow 0$

$\text{rem}[4] = 1 \wedge 1 \Rightarrow 0$

$\Rightarrow \text{rem}[ ] = 00100$

$\text{while}(\text{rem}[\text{cur}] == 0 \ \&\& \ \text{cur} != \text{rem.length} - 1) \quad \text{T}$

$\boxed{\text{cur} = 2}$

for  $i = 0$  to  $4$ :

$\text{rem}[2] = 1 \wedge 1 \Rightarrow 0$

$\text{rem}[3] = 0 \wedge 0 \Rightarrow 0$

$\text{rem}[4] = 0 \wedge 1 \Rightarrow 1$

$\text{rem}[5] = 1 \wedge 1 \Rightarrow 0$

$\text{rem}[ ] = 000010$

$\text{while}(\text{rem}[\text{cur}] == 0 \ \&\& \ \text{cur} != \text{rem.length} - 1)$

$0 \quad 2 != 8$

$\text{T} \quad \boxed{\text{cur} = 3}$

$\text{rem}[3] == 0 \quad \text{T}$

$\text{rem}[4] == 0 \quad \text{F} \quad \text{rem}$

$\boxed{\text{cur} = 4}$

for  $i = 0$  to 4:

$$\text{rem}[4] = \text{rem}[4] \wedge \text{divisor}[0]$$
$$\text{rank}[S] = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 1 & 0 \end{pmatrix} \Rightarrow 0$$

Wenn  $\Gamma \vdash \perp$

$$\begin{aligned} \text{rem } [5] &= 0 \wedge 1 \Rightarrow 1 \\ \text{rem } [7] &= 0 \wedge 1 \Rightarrow 1 \end{aligned} \quad \text{rem} = 00000011$$

while (rem[4] == 044  $\text{arr}[\text{rem.length} - 1]$   
 $0 == 044 \rightarrow 4! = 8$  ) T  
arr = 5

from  $[5] \Rightarrow 0 T$

$|\psi\rangle = 6$

if  $\text{rem. length} - \text{divisor length} \geq 0$

return 00000011 to rem. in CNC generator

## CNC Generator

for  $i = 0$  to  $9$ :

$$\text{curl } \mathbf{E} = \text{div} \mathbf{E} \wedge \text{rem} \mathbf{E}$$
$$\text{we } \begin{bmatrix} 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 1 & 0 \end{bmatrix} \Rightarrow 1$$
$$[2] = \begin{pmatrix} 1 & 1 & 0 \\ 0 & 1 & 0 \end{pmatrix} \Rightarrow 1$$
$$[3] = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 0 \end{pmatrix} \Rightarrow 0$$
$$\begin{bmatrix} 4 \\ 1 \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} \Rightarrow 0$$
$$\begin{bmatrix} 5 \\ 6 \end{bmatrix} = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix} \Rightarrow \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$
$$\begin{bmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 \end{bmatrix} \Rightarrow \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$
$$[8] = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 1 & 0 \end{pmatrix} \Rightarrow 1$$

10/27

CRC Code: 110011110

### Error Detection.

Entire CRC code of 9 bits :  $\frac{1}{1}$

1  
1  
0  
6  
1  
1  
1  
1  
1

$CRC[9] = 110011111$

$rem[9] = CNLC[9] = 110011111$

$rem = divide(divisor, rem)$  // 1011, 110011111  
// Perform division calling divide func.

if returned  $rem \neq 0$   
then "Error detected"

if  $i == 8$ :  
then "No error"

Here  $rem = 1$  for 110011111  
Hence "Error is detected"



## CNC Generator.

$$\begin{array}{r}
 111010 \\
 \hline
 1011 \overline{) 110011000} \\
 \underline{1011} \phantom{0} \downarrow \\
 \phantom{1}0111 \\
 \underline{1011} \phantom{0} \downarrow \\
 \phantom{1}01001 \\
 \underline{1011} \phantom{0} \downarrow \\
 \phantom{1}00100 \\
 \phantom{1}0000 \downarrow \\
 \phantom{1}01000 \\
 \underline{1011} \phantom{0} \downarrow \\
 \phantom{1}00110 \\
 \phantom{1}0000 \\
 \hline
 \phantom{1}0110
 \end{array}$$

Message to be transmitted 110011110

## Error Detection

$$\begin{array}{r}
 1011 \overline{) 11001111} \\
 \underline{1011} \phantom{1} \downarrow \\
 01111 \\
 \underline{1011} \phantom{1} \downarrow \\
 01001 \\
 \underline{1011} \phantom{1} \downarrow \\
 00101 \\
 \underline{0000} \phantom{1} \downarrow \\
 01011 \\
 \underline{1011} \phantom{1} \downarrow \\
 00001 \\
 \underline{0000} \phantom{1} \downarrow \\
 1
 \end{array}$$

Here reminder 1 is returned

Cross Check of Inventory