Note that page numbering is turned on in this template.

$$I_r(z)/H(z) = \mathcal{Q}^{(r)}(z) + R^{(r)}(z)/H(z) \quad . \qquad (1.3.18)$$

$$I_r(z) = \mathcal{Q}^{(r)}(z)H(z) + R^{(r)}(z)$$

$$i_n = \Sigma_j \, q_{n-j} h_j + r_n$$

$$r_n = i_n - \Sigma_j \, q_{n-j} h_j$$

**********8

We know that the contents of the k registers are the *next* k output symbols, so

$$q_0 = o_{r+1}$$
$$q_1 = o_{r+2}$$
$$\ldots$$
$$q_{k-1} = o_{r+k}$$

Meanwhile,

$$R(z) = H(z)\, z^r \, [\, \Sigma_{i=r+1}^{\infty} o_i z^{-i} \,] = H(z) \{ z^r O_{tail}(z) \}$$

We have to group the z^r one way or the other, so do it with the tail. Then

$$O_{tail}(z) \quad \leftrightarrow \quad o_i \quad i > r$$
$$z^r O_{tail}(z) \equiv F(z) \quad \leftrightarrow \quad o_{r+i} \quad i > r \quad . \quad \text{// by (1.1.4)}$$

Now consider as a convolution

$$R(z) = [z^r O_{tail}(z)] H(z) = F(z) H(z) \quad .$$

The time domain projection of the above equation is this:

$$r_n = \Sigma_{j=0}^{k} f_{n-j} h_j \quad .$$

Now we know that

$$f_i = o_{r+i}$$

so then

$f_{n-j} = o_{r+n-j}$

and we then get

$r_n = \Sigma_{j=0}^{k} o_{r+n-j} h_j = o_{r+n} h_0 + o_{r+n-1} h_1 + \ldots\ldots o_{r+n-k} h_k$

So this gives the remainder coefficients in terms of these k+1 values

o_{r+n}
o_{r+n-1}
...
o_{r+n-k}

So in general,

$r_n = r_n(o_{r+n}, o_{r+n-1} \ldots\ldots o_{r+n-k})$

Here are special cases

$r_0 = r_0(o_r, o_{r-1} \ldots\ldots o_{r-k})$
$r_1 = r_1(o_{r+1}, o_r \ldots\ldots o_{r-k+1})$

But all these o_j have already been output ! So my conjecture is wrong! the other extreme is

$r_{k-1} = r_{k-1}(o_{r+k-1}, o_{r+k-2} \ldots\ldots o_{r-1})$

Conclusion: the remainder for Fig 1.1 is NOT a function of the k constants in the registers!!! It is a function of the outputs o_j and only some of these are in the registers when we stop.

Convolution then says

$r_n = \Sigma_{j=0}^{k} (o_{tail})_{n-j} h_j$