~~Another approach to burst correction is to use a code~~ ~~specifically~~

Fire codes are very efficient burst-correcting codes but the operation of the decoder isn't quite as obvious as the Meggitt decoder. and the theory goes just a bit beyond the scope of this course. Some other burst correcting codes which can be corrected with our Meggitt decoder are as follows. These codes were discovered by Peterson & Weldon (1968) by computer search

(n, k)	b	$g(D)$
7, 3	2	$1+D^2+D^3+D^4$
15, 10	2	$1+D^2+D^4+D^5$
15, 9	3	$1+D^3+D^4+D^5+D^6$
31, 25	2	$1+D^4+D^5+D^6$
63, 56	2	$1+D^2+D^3+D^5+D^6+D^7$
63, 55	3	$1+D^3+D^6+D^7+D^8$
511, 499	4	$1+D^3+D^5+D^8+D^{12}$
1023, 1010	4	$1+D^2+D^4+D^5+D^6+D^7+D^{10}+D^{13}$

Example

$$e(D) = 1 + D^6 \quad \Rightarrow \quad S(0) = 1 + D^2$$

shift index	error pattern	$S_1(x)$ $s_0\ s_1\ s_2\ s_3$	$S_2(x)$
0	1 0 0 0 0 0 1	1 0 1 0	—
1	1 1 0 0 0 0 0	0 1 0 1	—
2	0 1 1 0 0 0 0	1 0 0 1	—
3	0 0 1 1 0 0 0	1 1 1 1	—
4	0 0 0 1 1 0 0	1 1 0 0	—
5	0 0 0 0 1 1 0	0 1 1 0	—
6	$\boxed{0\ 0\ 0\ 0\ 0\ 1\ 1}$	0 0 1 1	—
7	$\boxed{0\ 0\ 0\ 0\ 0\ 0\ 1}$	—	0 0 0 1
8	0 0 0 0 0 0 0	—	0 0 0 0
⋮	⋮		⋮

cyclically

$$S(t+1) = \begin{bmatrix} 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \end{bmatrix} S(t) \qquad r = 4$$

$e_1(D) = D^6$ $\qquad D^r e_1(D)$: $\quad D^4+D^3+D^2+1 \overline{\big) D^{10}}$, quotient $D^6+D^5+D^3$

$D^{10}+D^9+D^8+D^6$

9 8 6

9 8 7 5

7 6 5

7 6 5 3

D^3

$S_1 = D^3$ ✓

$e_2(D) = D^5 \Rightarrow S_2 = D^2$

proof $\begin{bmatrix} 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} 0 \\ 1 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \end{bmatrix}$ ✓

$\therefore \quad e(D) = D^5 + D^6 \Rightarrow S(D) = D^2 + D^3$

$e_3(D) = 1 \Rightarrow D^4 / (D^4+D^3+D^2+1) = D^3+D^2+1$

$\therefore \quad e(D) = 1 + D^6 \Rightarrow S(D) = D^2 + 1$

check: $\quad D^4+D^3+D^2+1 \overline{\big) D^{10} + D^4}$, quotient $D^6+D^5+D^2+1$

$D^{10}+D^9+D^8+D^6$

9 8 6 4

9 8 7 5

7 6 5 4

7 6 5 3

4 3

4 3 2 0

2 0 $\Rightarrow D^2+1$ ✓

syndrome table

$e(D)$	$S(D)$
D^6	D^3
D^5+D^6	D^2+D^3
$1+D^6$	$1+D^2$