

CORRELATION RECEIVER

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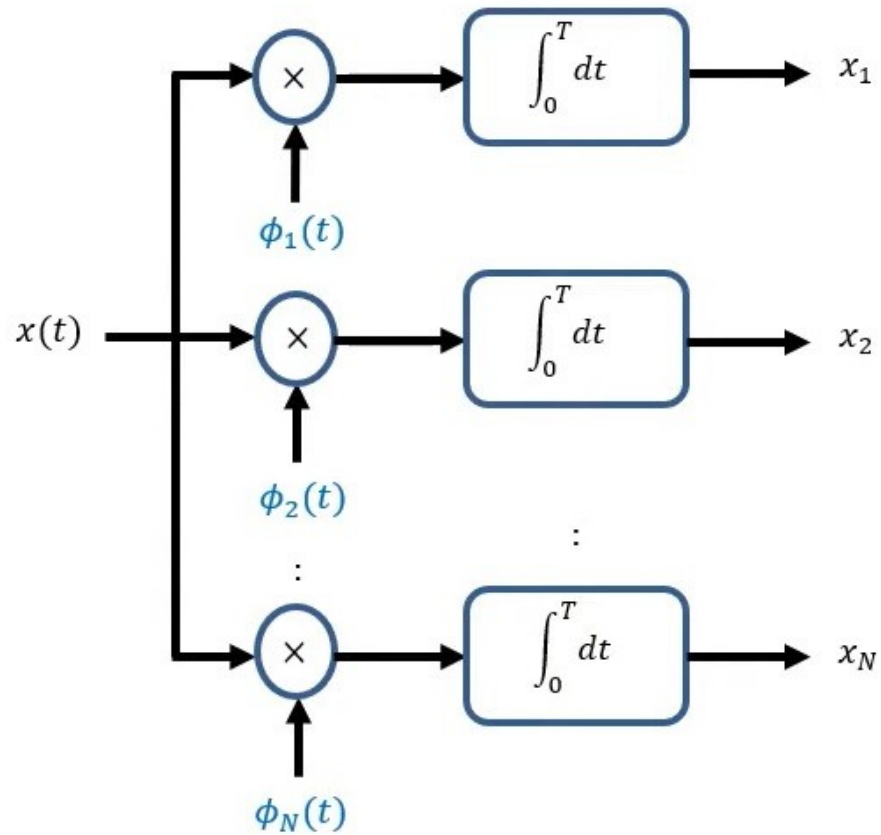
CORRELATION RECEIVER

- For equally likely tx'd s/g's $s_1(t), \dots, s_M(t)$ and in AWGN channel, optimum receiver has 2 parts :
 - a. Detector/demodulator part
 - b. Max likelihood decoder/ signal transmission decoder
- i. Detector part has a bank of **N pdt integrators / correlators** with N orthonormal basis functions $\phi_1(t), \phi_2(t), \dots, \phi_N(t)$. This bank of N correlators operates on the rx'd s/g $x(t)$ to produce the

ii. Performs max likelihood decision rule on observation vector x to obtain the estimate of transmitted symbol m_i , $i = 1, \dots, M$ such that avg prob of error is minimized. N elements of obs vector x are first multiplied by corresponding N elements of each of the M s/g vectors s_1, \dots, s_M .

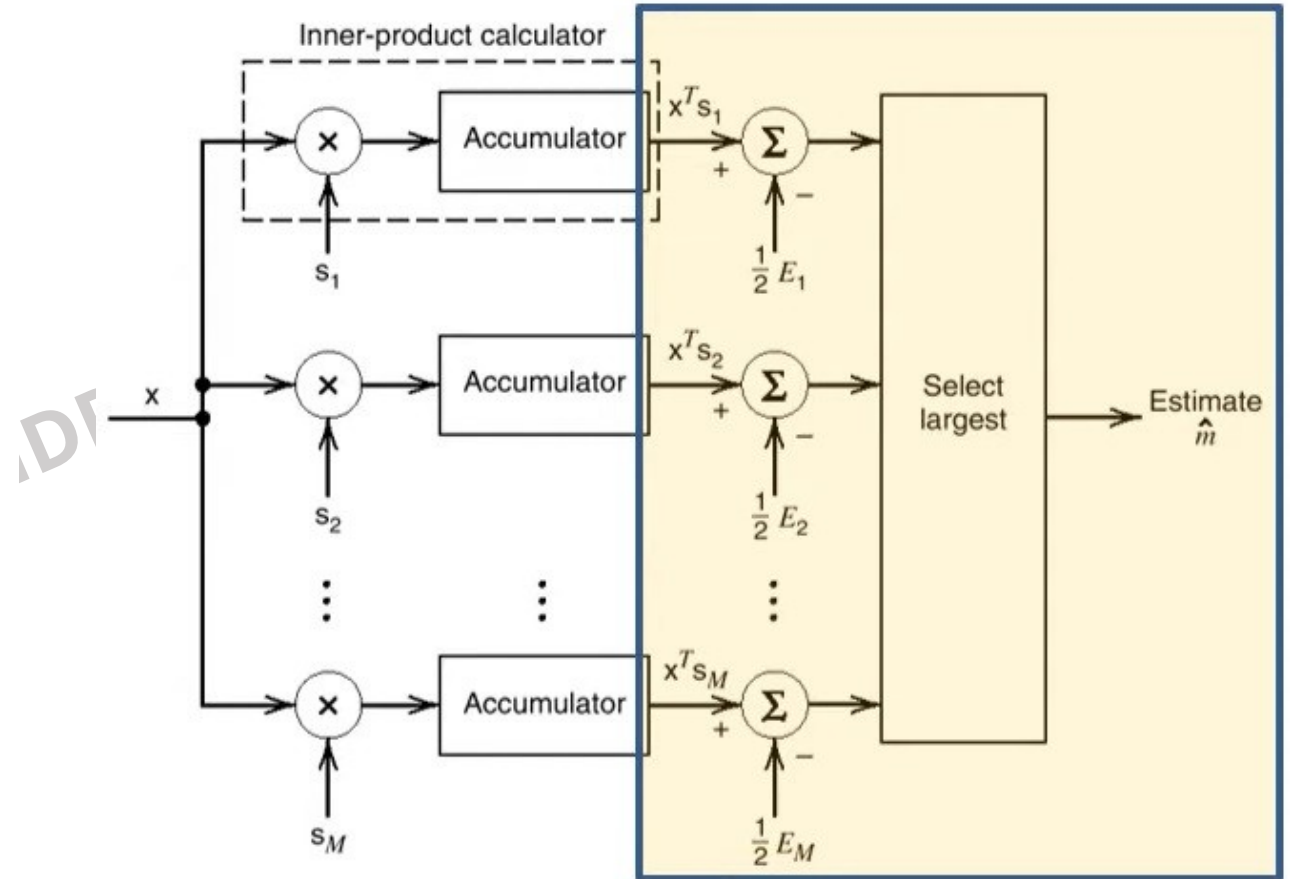
Resulting pdts are successively summed in accumulators to form the corresponding set of inner pdts $\{x^T s_k, k=1, 2, \dots, M\}$. Next the inner pdts are corrected for the fact that tx'd s/g energies may be unequal. Finally the largest in the resulting set of no.s is selected and an

a) Detector/demodulator part



Observation vector \mathbf{x}

b) Signal transmission decoder



- Optimum receiver of above fig. is called as **correlation rxr**.
- Part b) uses ML rule for decoding. Hence the name.

**Observation vector x lies in region Z_i
for $k=i$. -----(10)**

- This rule is used to implement part b).

is the inner product of obs vector x and s/g vector .

- $=$ $S_k =$

$$x^T S_k = [\dots] = + + \dots + =$$