Lab No. 3. Multiple access techniques

3.1.TDMA systems. Generation.

Implement the model from figure 1

Set the configuration parameters:

- maximum step size:0.01
- minimum step size:0.001
- simulation time: 20

The first signal generator gives a sine wave signal with amplitude 1 and frequency 0.25 Hz. The second signal generator gives a swantooth wave signal with the same parameters.

The timing pulse generators give a rectangular pulse amplitude 1, peroid 0.2s. and filling factor 50%. The pulse generator on the lower channel is time shifted with a transport delay block with delay cu 0.1s, buffer size 1024. The data are added on the common channel.Analyse and sketch the signals on the common channel (after the adder in Scope1) . Comment the results.

3.2. TDMA data recovery

For data recovery we use two timing pluse generators, identically with the ones used at the transmitter part. The Low Pass Filters have the cut-off frequency at least three time the fundamental frequency of the information bearing signals. Analyse and sketch the signals after the low-pass filters and compare them with the original ones. Comment the results.

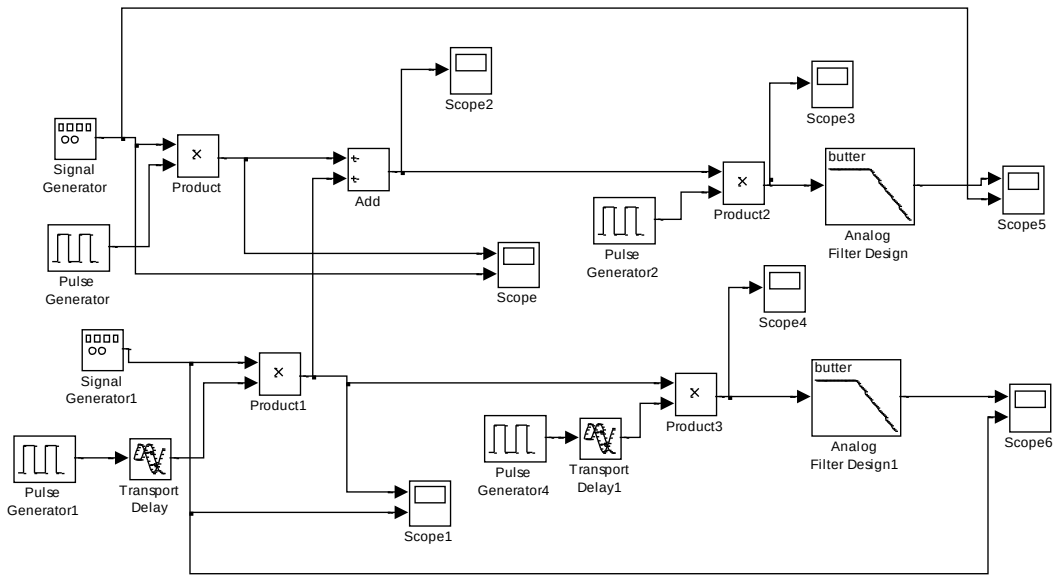

Fig. 1

3.3. FDMA systems. Generation

Implement the model from figure 2.

The simulation parameters are the same as the ones set at 3.1.

The first signal generator gives a sine wave signal with amplitude 1 and frequency 0.25 Hz. The second signal generator gives a swantooth wave signal with the same parameters.

The sine-wave carrier signals have amplitude 1 and frequencies 10 Hz and 20 Hz respectively. The Zero order hold blocks have the sample time equal with the minimum step size. Analyze the signals on the common channel (after the adder) and the recovered signals of the two users (in Scope 1 and Scope 2). Comment the results.

3.4. Data recovery from FDMA signal

The signal on the common channel is multiplied with the same carriers used at the transmitter and then low-pass filters. The Low Pass Filters have the cut-off frequency at least three time the fundamental frequency of the information bearing signals. Analyze and sketch the signals after the low-pass filters and compare them with the original ones. Comment the results.

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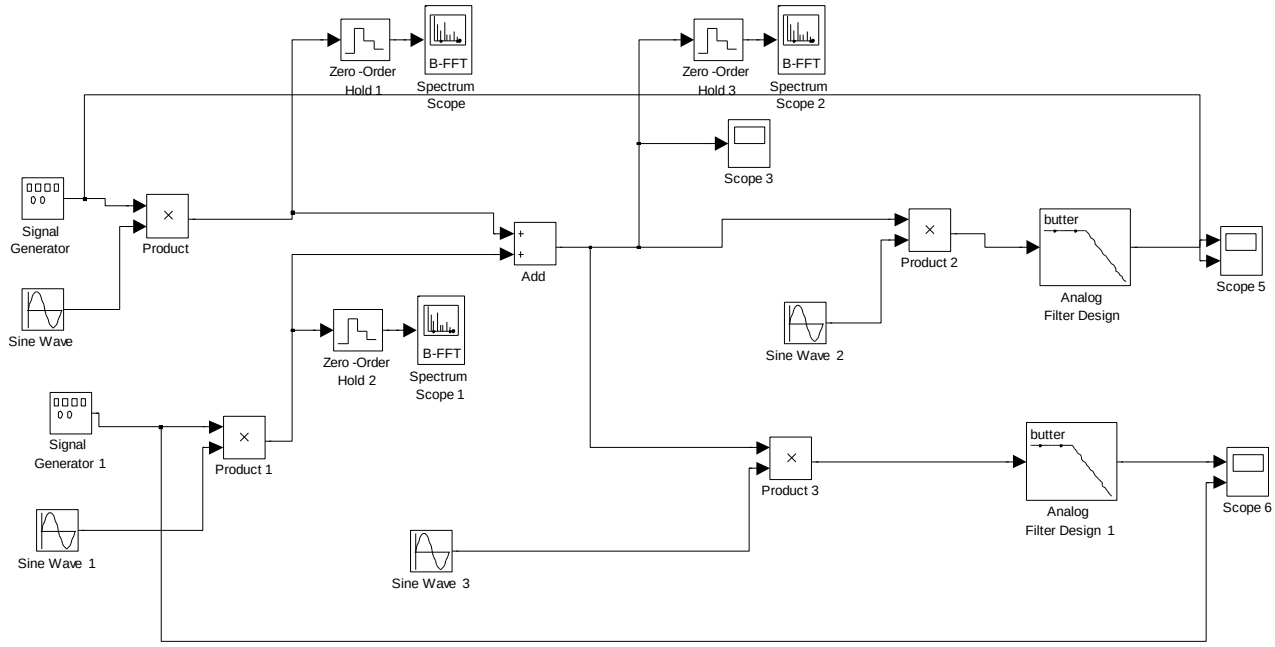

Fig.2.

3.5. CDMA systems. Generation.

Implement the model from figure 3.

The simulation parameters are the same as the ones set at 3.1.

The first signal generator gives a sine wave signal with amplitude 1 and frequency 0.25 Hz. The second signal generator gives a swantooth wave signal with the same parameters.

The first Walsh code generator have the length 64, index 2 and the sampling period 1/64. The second one have the same parameters but index 32. Analyze the signals on the common channel (after the adder). Comment the results.

3.6. Data recovery from the CDMA signal

The Wals code generators at the receiver end are identically with the ones used at the transmitter and the low pass filters have the cut off frequencies of 5 Hz.

a- Analyse and sketch the signals after the low-pass filters and compare them with the original ones. Comment the results.

b- Change the sape of the upper signal generator from sine wave to rectangular. What you observe? Comment the results.

c-Change the indexes of the Walsh code used for the lower channel to 32, then to 12 and to 2. What do you observe?

d-. Change the length of the two codes from 64 to 32 (with sampel time 1/32), next to 16 (with sample time 1/16), next to 128 (with sample time 1/128). Comment the results.

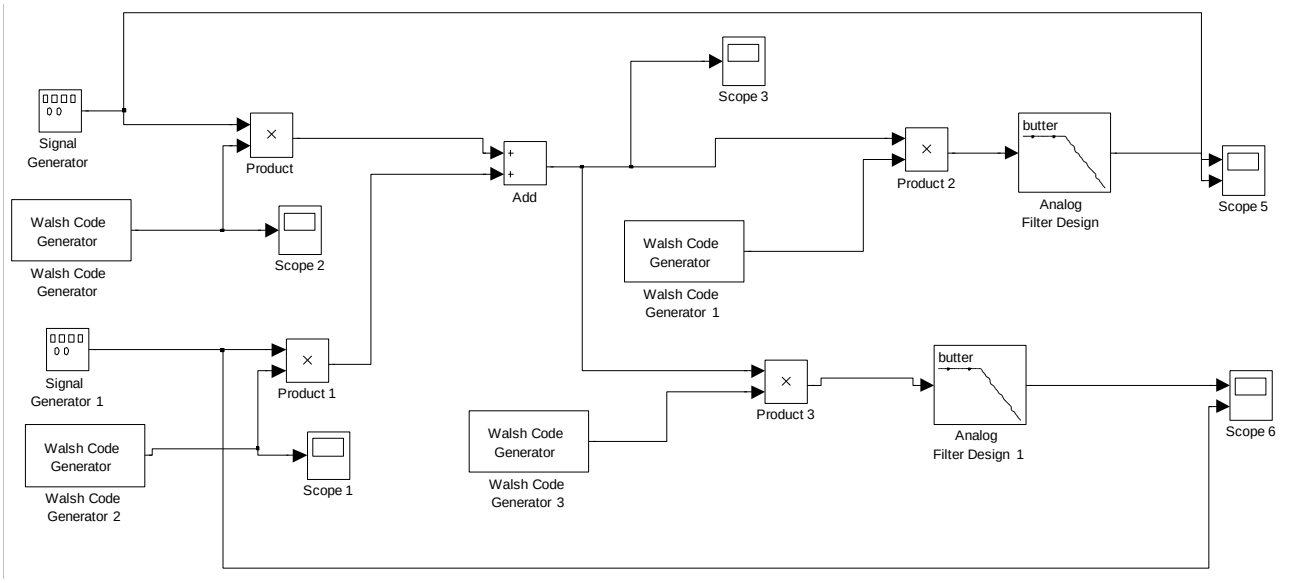

Fig. 3