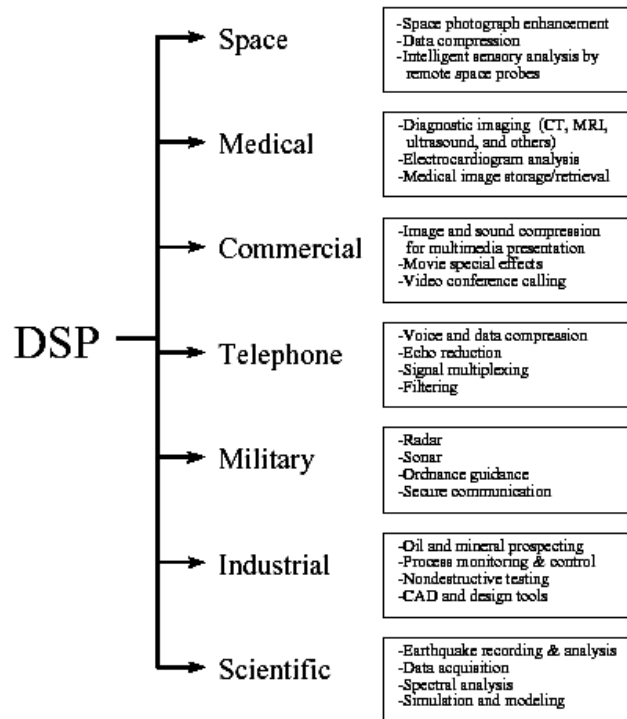


16. DSP - ПРОЦЕСОРИ

16.1. ПРЕДНАЗНАЧЕНИЕ И НЕОБХОДИМОСТ ОТ ПРИЛАГАНЕТО ИМ

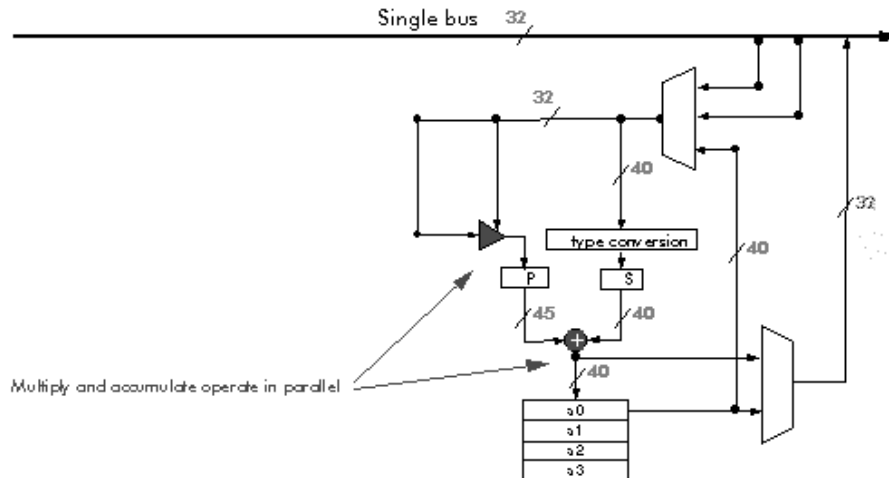


Фиг. 16-1. Области на приложение на DSP – технологията.

Professional Audio Products <ul style="list-style-type: none"> • Electronic Music Keyboards • Digital Audio Effects Processors (Reverb, Chorus, Flanging, Vibrato, Pitch Shifting, D yn Ran, Compression, ...) • Vocal "Harmonizers" / Formant-Corrected Pitch Shifters • Graphic and Parametric Equalizers • Digital Mixing Consoles • Digital Recording Studios (DAT) / Multichannel Digital Audio Recorders • Speaker Equalization • Room Equalization 	Algorithms Used Wavetable/FM synthesis, Sample Playback, Physical Modeling, Delay-Line Modulation/Interpolation, Digital Filtering (Comb, FIR, ...) STFT (Phase Vocoder), additive synthesis, frequency-domain interpolation/Lent's Alg), windowing, Digital FIR/IIR Filters Filtering, Digital Amplitude Panning, Level Detection, Volume Control Compression techniques: MPEG, ADPCM, AC-3 Filtering Filtering
Consumer Audio Products Karaoke Digital Graphic Equalizers Digital Amplifiers/Speakers Home Theater Systems (Surround-Sound Receivers/Tuners) Digital Versatile Disk (DVD) Players Digital Audio Broadcasting Equip. CD Players and Recorders CD-I Satellite (DBS) Broadcasting Satellite Receiver Systems Digital Camcorders Digital Car Audio Systems (Digital Speakers, Amps, Equalizers, Surround-Sound Systems)	Algorithms Used MPEG, audio effects algorithms Digital Filtering Digital Filtering AC-3, Dolby Prologic, THX DTS, MPEG, Hall/Auditorium Effects AC-3, MPEG... AC-3, MPEG... PCM ADPCM, AC-3, MPEG AC-3, MPEG AC-3, Ex. Circle Surround (RSP Tech.) Digital Filtering...
Computer Audio Multimedia Systems	3D Positioning (HRTFs), ADPCM, MPEG, AC-3

Фиг. 16-2. Приложение на DSP-процесорите в звукотехниката.

16.2. УСТРОЙСТВО НА DSP.



Фиг. 16-3. Типична структура на DSP.

integer

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

$$= 2^6 + 2^4 + 2^1 + 2^0 = 64 + 16 + 2 + 1 = 83$$

$- 2^7 \quad 2^6 \quad 2^5 \quad 2^4 \quad 2^3 \quad 2^2 \quad 2^1 \quad 2^0$

fixed point

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

$$= 2^{-1} + 2^{-3} = 0.5 + 0.125 = 0.625$$

$- 2^0 \quad 2^{-1} \quad 2^{-2} \quad 2^{-3} \quad 2^{-4} \quad 2^{-5} \quad 2^{-6} \quad 2^{-7}$

Radix point is assumed in fixed point format

Фиг. 16-4. Формати на данните на DSP-процесор – цяло число и с фиксирана точка.

implied mantissa bit

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

mantissa

$- 2^{-1} \quad 2^0 \cdot 2^{-1} \quad 2^{-2} \quad 2^{-3} \quad 2^{-4} \quad 2^{-5} \quad 2^{-6} \quad 2^{-7}$

$\text{mantissa} = 2^0 + 2^1 + 2^{-3} = 1 + 0.5 + 0.125 = 1.625$

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

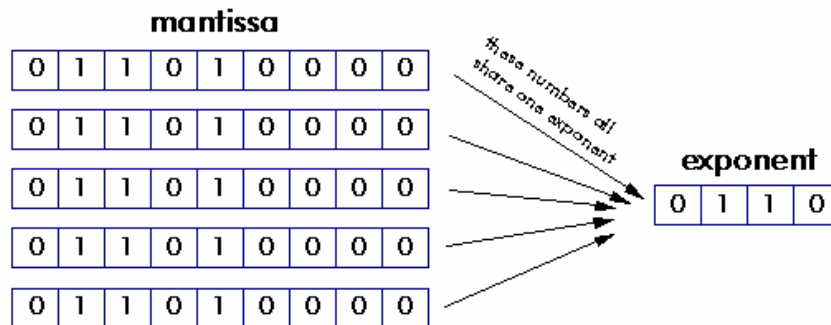
exponent

$- 2^3 \quad 2^2 \quad 2^1 \quad 2^0$

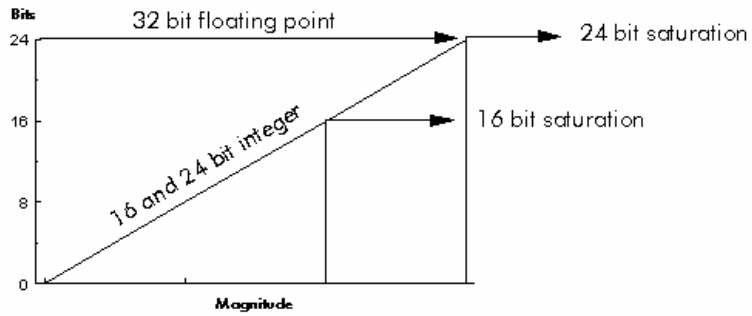
$\text{exponent} = 2^2 + 2^1 = 4 + 2 = 6$

$\text{decimal value} = 1.625 \times 2^6 = 104.0$

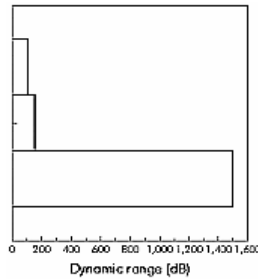
Фиг.16-5. Формат на данни с плаваща запетая.



Фиг.16-6. Формат на данни с блокова плаваща запетая.



Фиг. 16-7. Връзка между формата данни и динамичния обхват.



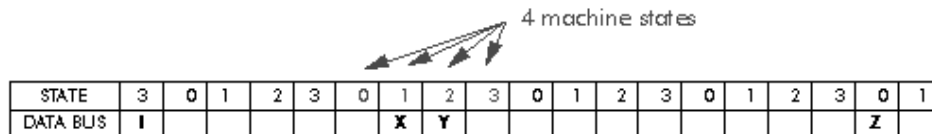
Фиг.16-8. Разлика между динамичния обхват на данни с фиксирана и плаваща



Фиг.16-9. Типична Харвард-архитектура на DSP-процесор.

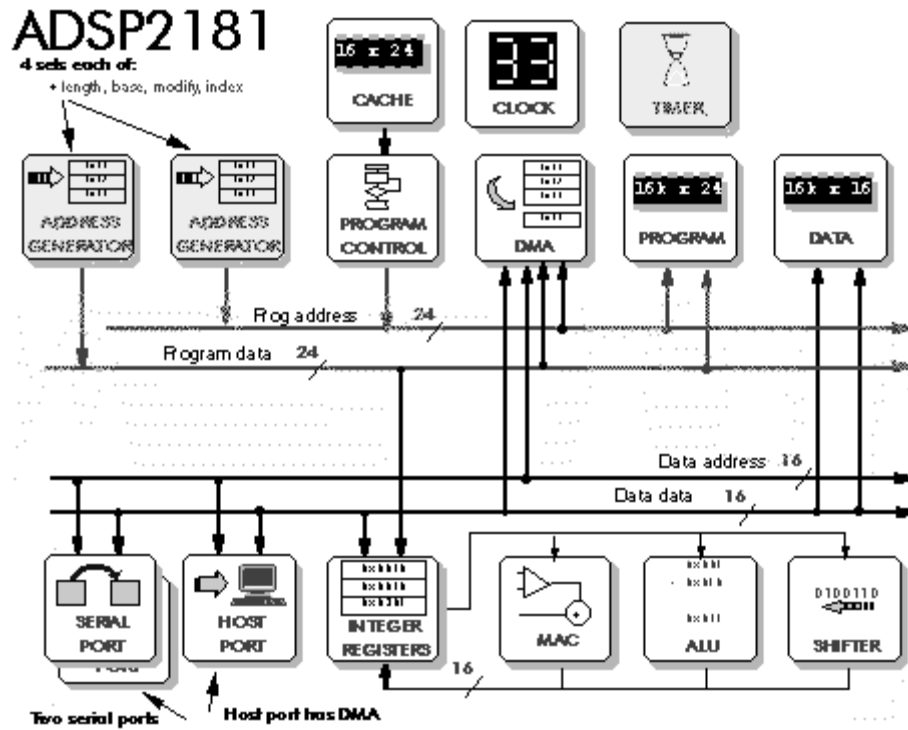


Фиг. 16-10. Архитектура на фон Нойман.



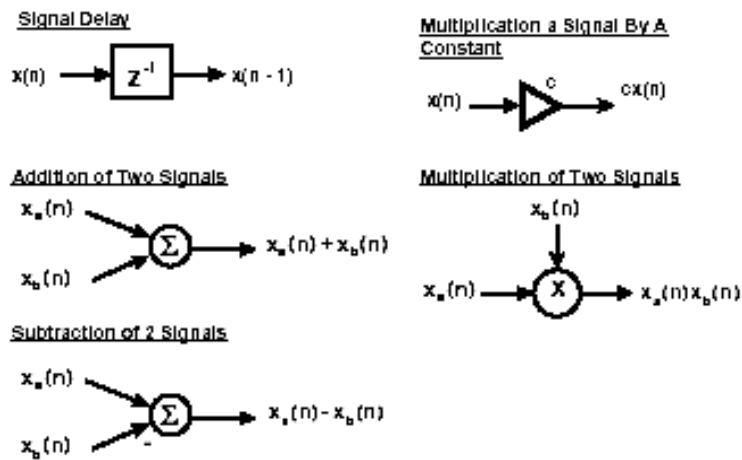
← in each instruction cycle

Фиг.16-11. Модифициран цикъл на фон Нойманова архитектура.



Фиг.16-12. Блокова схема на DSP.

16.3. ПРИЛОЖЕНИЕ НА DSP



Фиг. 16-13. Основни операции, изпълнявани от DSP –процесор.