transfer rate of the DDR2 computer RW memory makes 667 Mbps, i.e. 10 times less, and GDDR4 – about twice as less. The new graphic memory chip of the fifth series with data interchange dual-speed (Graphics Double Data Rate 5, GDDR5) is meant for powerful personal computers, workstations and electronic gaming machines of the new generation. The new 512 Mb capacity microchip (16 Mb X 32) is able to broadcast a mobile picture and the information attached to it at the rate up to 24 Gbps or process up to 16 video DVD-quality signals simultaneously. The microchip functions from the voltage of 1,5V and consumes the electric energy almost by 20% less than todays popular chips of video memory, GDDR3. A mass production of Samsung GDDR5 memory on the basis of 60 nm technology started in 2007. The GDDR5 chips had become a standard in the segment of high-performance decisions. Using DirectX9.0 it is possible to create high-quality three-dimensional scenes with a high degree on-line detailing. One of the main possibilities of this set of functions is the one to program graphics using shaders. Shaders use special programmable display card registers to create various graphic effects. The Shader Model 2.0 support begins with the DirectX9.0; earlier DirectX versions have no such a support; then more advanced kinds of shaders Shader Model 2.0b were developed, wherein the instruction length was extended and some advanced features were added. For this model of shaders a refreshed package DirectX9.0b was released. Then Shader Model 3.0 was elaborated, which considerably extended the graphics programmability, with this shader model there appeared a possibility of dynamic branching and the instruction length was extended essentially. For this programmable graphics model support an update version of the DirectX9.0c. In the DirectX10 there appeared an update shader model, Geometry Shader. For the tridimensionality effect creation on a plane surface two textures are necessary, the surface normal map and the normal map properly, i.e. the normal texture. One of the most virtual effects in terms of rendering is the Parallax Occlusion Mapping; its meaning is the same as in Bump Mapping, i.e. to create a fine surface with many small details on a multipolygonal model. The main difference of this effect from the Bump Mapping lies in the presence of the parallax effect. To create such an effect, three textures, the normal map, the map of normals and the height map, which creates a more real three-dimensional surface, are needed. For the efficient use of this effect it is necessary to combine the Bump Mapping and Parallax Occlusion Mapping. The DirectX10 is supported only by the operating system Windows Vista. In the DirectX10 there appeared a new conveyor (pipeline), which includes: an orthographic frame buffer; geometry shader; stream out.

Various kinds render possible to plug-in resources to various parts of the conveyor. They enable recirculating data; perform the access to the textures VS, GS and PS. The constant buffer makes possible to store more data, performs a quicker updating of constants; there appeared an opportunity to group constants into various buffers for more efficient servicing, thus, the DirectX9.0 restrictions vanish. The new possibilities involve a more efficient multipass delineation, for example, the animation computation is performed once, and the delineation on these data is performed a required quantity of times, that enables to reduce the load on the graph and data processors greatly as the calculations are performed only once. Also a so-called displacement mapping, which renders possible to create non-recurrent objects in the game; also this possibility enables creating vast landscapes and realize some other solutions. One more interesting feature is an alternative interpretation data. And, finally, a possibility to create effects on the basis of GPGPU methods, which allows performing simple physical calculations, has been added. It makes possible to retain the results of the GS (geometry shader) output operation, works with a variable quantity of entities. At the output operation all topologies are converted into primitive lists, into so-called “triangle list” entity and other lists. An alternative method of output into the structure/VB besides the delineation. The calculation of implications for entities is referred to new interesting possibilities in this area; for example, the triangles’ normals. The extrusion of shades’ sizes enables the animation on the GPU with stream out (impossible in the DirectX9), the extrusion is performed in the GS – generation of sides of shades’ sizes, the extrusion in the DirectX10 works by 20% quicker than in DirectX9.0.

The work is submitted to III International Scientific Conference “Problems of International Integration of National Educational Standards”, April, 23-27, 2008, Czechia (Prague) – Luxembourg – France (Paris), came to the editorial office on 10.02.2008.

THE INVESTIGATION OF NEGATIVE CONSEQUENCES INDUCED BY ELECTRIC SYSTEM FLOWS OF REACTIVE POWER

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Reactive power must be generated immediately near its consumers, i.e. it is necessary to install compensating devices step-up a power factor of loads. An electric system elements transfer of reactive power is accompanied by watt losses, cause inadmissible supply voltage derating or supply voltage rise, account for reduce of electric system capacity.

In order that make sure that a setting of compensating devices is necessary negative consequences induced by electric system transfer of reactive power must be estimated.

Electric system element watt losses are found by the expression:

$$\Delta P = \frac{P^2 + Q^2}{U^2} \cdot R = \frac{P^2}{U^2} \cdot R + \frac{Q^2}{U^2} \cdot R = \Delta P_a + \Delta P_r , \quad (1)$$

Where U – the voltage of transmission network; R – the resistive impedance of the transmission network element; ΔP_a and ΔP_r - respectively losses specified by the active P and the reactive Q power.

Watt losses are directly proportional to the resistive impedance of the transmission network element. That means that watt losses depend on the transfer length. In addition, these losses are in inverse proportion to square of mains voltage. Therefore the long transmission of electric power at a high voltage.

Relative watt losses can be judged by the expression:

$$\Delta P_r\,\% = \frac{\Delta P_r}{\Delta P} \cdot 100\% = \frac{tg^2\varphi}{1 + tg^2\varphi} \cdot 100\% . \quad (2)$$

For example, the natural weight-average power factor of industrial consumers is $\cos\varphi = 0.7 \div 0.75$ ($tg\varphi = 0.88 \div 1.02$) [1], therefore relative watt losses are equal to $\Delta P_r\,\% = 44 \div 51\%$. Whereas the economic value of power factor is equal to $\cos\varphi = 0.93 \div 0.94$ ($tg\varphi = 0.35 \div 0.4$) and corresponding relative losses of it is equal to $\Delta P_r\,\% = 11 \div 14\%$.

Reactive power flows are the complementary load of electric system elements. Therefore when reactive power is transmitted quantity of electrical energy transmitted to consumers must be restricted. That opposes to the connection of new consumers and may result in serious power failures.

The complementary load of electric system elements ΔS induced by reactive power transfer is can be judged by the expression:

$$\Delta S = S_n - S_e = P\left(\frac{1}{\cos\varphi_n} - \frac{1}{\cos\varphi_e}\right) \quad (3)$$

Where $\cos\varphi_n$ and $\cos\varphi_e$ are natural and economic values of the power factor.

I.e. the complementary load of electric system elements vary depending on the relation of natural and economic power factor values. Analysis shows that power factor of industrial consumers much less then the economic value of it [1].

The relative complementary load of electric system is:

$$\Delta S\,\% = \frac{\Delta S}{S_e} \cdot 100\% = \left(\frac{\cos\varphi_e}{\cos\varphi_n} - 1\right) \cdot 100\% . \quad (4)$$

Electric system load was increased by 24-35% when the transmitted reactive power is more then its economic value.

One of electric system reliability criterions is the voltage of network nodes. Inadmissible supply voltage derating is produced by considerable consumption of reactive power during hours of the peak electrical demand. And vice versa reactive power generation during hours of the small load results in a considerable supply voltage rise. That decreases the work reliability of electric system and the quality of electrical energy.

Thus reactive power compensation is necessary in electric systems. That permitted to reduce relative watt losses ΔP by 33-37%, to increase the network throughput by 20-25%.

References:

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The work was submitted to III international scientific conference «Actual problems of science and education», Cuba, March, 19-29, 2008, came to the editorial office 21.04.2008.

RANGE EXTENSION OF LOADS FOR HALF-BRIDGE THYRISTOR INVERTERS

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Circuits with half-bridge thyristor inverters are well known and used in different secondary power supplies with the transformer load power to 3 – 4 kilowatts [1].

Range extension of powers to hundreds of kilowatts is urgent proposition. It enables to use such inverters to supply of energy-intensive customers. For example, such inverters are used to supply of electric-arc furnaces, plasmatrons, high-power welding sets and other devices demanding a stabilization of load power.