transition toward ecologically sustainable socio-economic development creating conditions for entering society of civilized countries at the equality basis.

CODING THEORY

Докл. - Мельник Ю., Ин-31

1. People all over the world have been fascinated by the pictures and scientific data being relayed from Mars by NASA's Pathfinder mission. For decades space probes have been sending back similar data from the furthest planets. How can this information be reliably transmitted across hundreds of millions of miles without being completely swamped by noise?

2. Many different disciplines come together to successfully recover these signals - electronic engineering, computing and mathematics. *Coding theory* is the branch of mathematics concerned with transmitting data across noisy channels and recovering the message.

3. The simplest method for detecting errors in binary data is the *parity* code which transmits an extra "parity" bit after every 7 bits from the source message. However, this method can only detect errors, the only way to correct them is to ask for the data to be transmitted again!

4. The disadvantage of the repetition scheme is that it multiplies the number of bits transmitted by a factor which may prove unacceptably high. In 1948, Claude Shannon, working at Bell Laboratories in the USA, inaugurated the whole subject of coding theory by showing that it was possible to encode messages in such a way that the number of extra bits transmitted was as small as possible.

5. It was two years later that Richard Hamming, also at Bell Labs, began studying explicit error-correcting codes with information transmission rates more efficient than simple repetition. It is said that Hamming invented his code after several attempts to punch out a message on paper tape using the parity code. "If it can *detect* the error," he complained, "why can't it *correct* it!".

6. While Shannon and Hamming were working on information transmission in the States, John Leech invented similar codes while

working on Group Theory at Cambridge. This research included work on the sphere packing problem (see this issue's *mathematical mystery*) and culminated in the remarkable, 24-dimensional *Leech lattice*, the study of which was a key element in the programme to understand and classify finite symmetry groups.

7. A less obvious application of error-correcting codes came with the development of the compact disc. On CDs the signal in encoded digitally. To guard against scratches, cracks and similar damage two "interleaved" codes which can correct up to 4,000 consecutive errors (about 2.5 mm of track) are used.

PIXEL ART

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Pixel Art conception. The beginning of Pixel Art as graphics.
Process of drawing pixel image. Color table and number of colors. Pixel by pixel drawing.
Must pixel   artist be an artist at all.
The age of Pixel Art.
Young age of Pixel Art in Ukraine.
Problem of disability of getting specific education.
Process organization
QPlazeRME,   NetLizard and other Ukrainian companies working with Pixel Graphics.

КАФЕДРА ФІЗИЧНОГО ВИХОВАННЯ

ОПТИМИЗАЦИЯ ТРЕНИРОВОЧНОГО ПРОЦЕССА ЮНЫХ БИАТЛОНИСТОВ

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