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Linear Algebra Applications Using MatLab Software

The paper presents two ways of special matrix generating using some functions included in the MatLab software package. The MatLab software package contains a set of functions that generate special matrixes used in the linear algebra applications and the signal processing from different activity fields. The paper presents two tipes of special matrixes that can be generated using written sintaxes in the dialog window of the MatLab software and for the command validity we need to press the Enter task. The applications presented in the paper represent eamples of numerical calculus using the MatLab software and belong to the scientific field „Computer Assisted Mathematics" thus creating the symbiosis between mathematics and informatics.

1. Introduction. The Hadamard Matrix

The Hadamard matrix is a square matrix with all elements 1 or -1 placed in such a position that line j become identical with column j.

The Hadamard function is called with the sintax:

H_n = hadamard(n), (1)

when the rang n of the matrix must be chosen in such a way that n, n/2 or n/20 is a exponent of 2.

This matrix isn't orthogonal (motivation that the notation H_n was used), that it can be orthogonalized by multiplying by a scalar, according to the relation:

$$\left[H_{orth,n}\right] = \frac{1}{\sqrt{n}}\left[H_n\right] \quad (2)$$

where $n = 2^k$, k being a natural number.

2. Analysis.

There is numerical example presented.

Example.
We intend to traced the level lines for Hadamard matrix for n =12 and n = 20.

We use the following MatLab sequences:

```
n = 12; contour(hadamard(n))
n = 20; contour(hadamard(n))
n = 40; contour(hadamard(n))
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The level lines can be followed in the graphic windows represented in figures 1, 2 and 3.

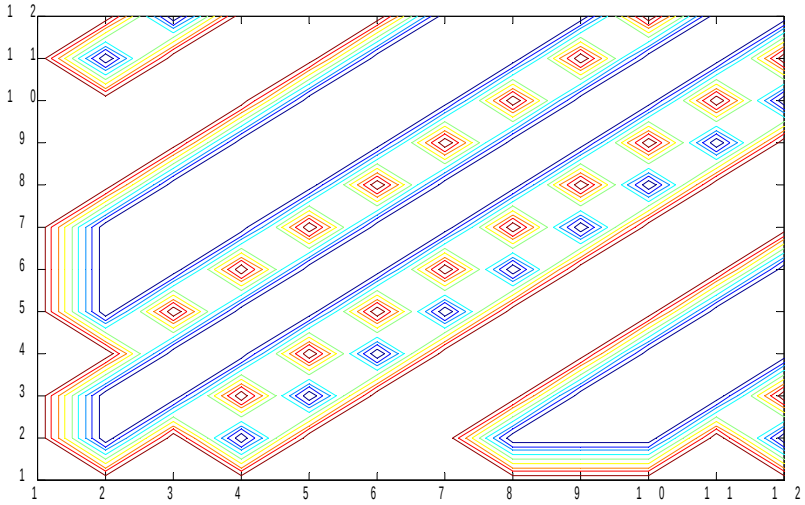

Figure 1. The level lines corresponding to the Hadamard matrix for n = 12.

For n=20 we obtain the graphical window such in figure 2.

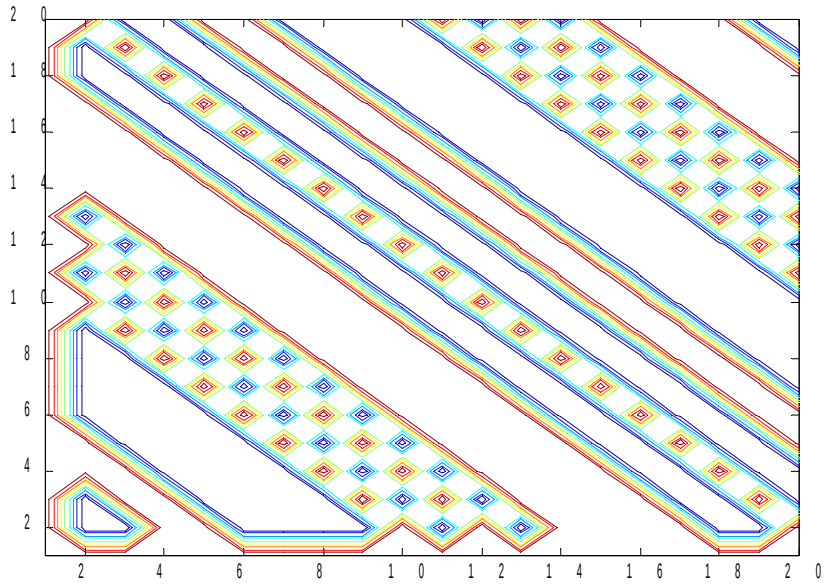

Figure 2. The level lines corresponding to the Hadamard matrix for n = 20.

For n = 40 we obtain the graphic window like in figure 3.

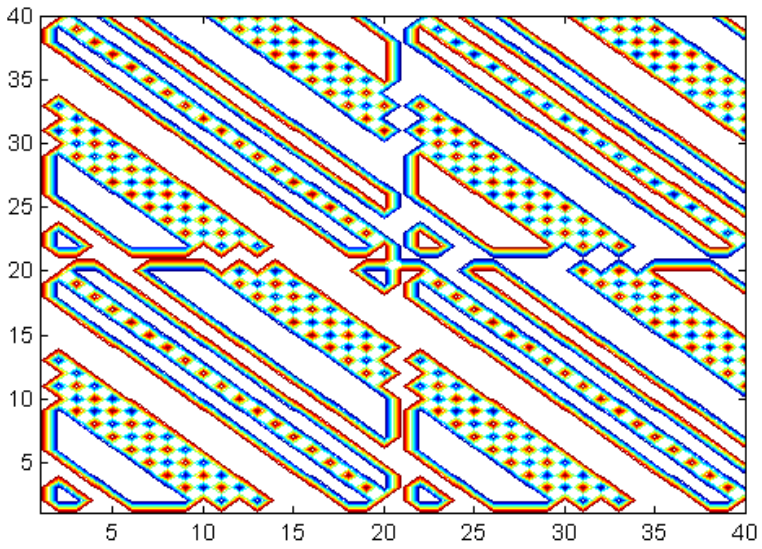

Figure 3. The level lines corresponding to the Hadamard matrix for n = 40.

4. Conclusion

In conclusion the result is that the applications presented in the paper represent examples of numerical calculus using the MatLab software and belong to the scientific field "Computer assisted mathematics", thus creating a symbiosis between mathematics and informatics.

References

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