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Paraunitary Asymmetric Cryptosystem (PAC)

Multivariate paraunitary asymmetric cryptographic systems and methods based on paraunitary matrices

Georgia Tech inventors have created multivariate paraunitary asymmetric cryptographic systems and methods based on paraunitary matrices. The cryptographic systems and methods are based on formulating a system of multivariate polynomial equations by paraunitary matrices. These matrices are a family of invertible polynomial matrices that can be completely parameterized and efficiently generated by primitive building blocks. Using a general formulation involving paraunitary matrices, a one-way function is designed that operates over the fields of characteristic two. Approximations made to a paraunitary matrix result in a trapdoor one-way function that is efficient to evaluate, but hard to invert without secret information about the trapdoor.

Summary Bullets

- Short key size
- Short key-setup time
- Low complexity

Solution Advantages

- Short key size
- Short key-setup time
- Low complexity
- Fast encryption and decryption
- Maintained security
- Flexible design

Potential Commercial Applications

- Exchanging keys
- Digital signatures
- Data authentication schemes

Background and More Information

The principal of public-key cryptography involves exchanging information between parties without requiring a secure channel. In a public-key system, each party has a pair of secret and public keys. Everyone can send

encrypted messages to a designated party using its public key. However, only the designated party can decrypt using his corresponding secret key. Public-key systems are used for the exchange or the distribution of secret keys that are used in symmetric cryptosystems. A well-known public-key cryptosystem, RSA, uses a univariate monomial over a very large ring. Although RSA has not been broken yet, there are some practical problems in its implementation. The first problem is the key-setup time is too long for computationally-limited processors used in some applications such as pervasive computing. A second problem is the size of the key, which is too long in applications where bandwidth is limited.

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IP Status

: US8019079

Publications

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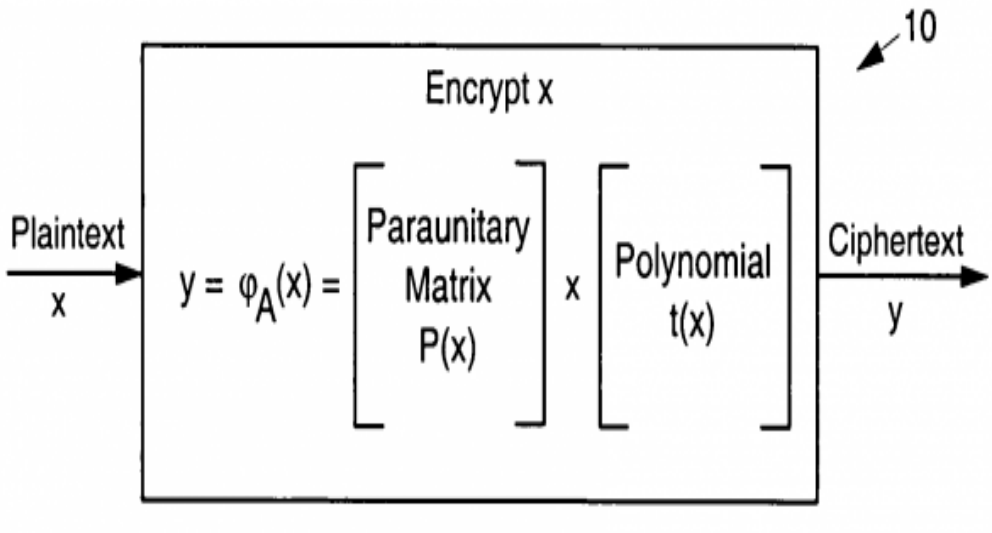
Images



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