

Adaptive QR Algorithm Masterclass

SYLLABUS

In this masterclass we will present the QR algorithm and explicitly look at why and where it is now extensively used in DSP and Digital Communications in applications such as MIMO, equalisers, and beamformers. The QR algorithm is widely known and used in linear and matrix algebra to decompose a matrix into an orthogonal matrix, Q , and upper triangular matrix R . As such the algorithm is used for finding the solution of a linear set of equations, or expressed in matrix algebra, for implicitly solving for a vector, $w = R^{-1}p$, without explicitly forming a matrix inverse, which in fixed point arithmetic may be an ill-conditioned problem, and suffer from overflow/underflow: In this course we will review algorithm, applications and real FPGA implementations.

The course will include:

- Matrix Algebra Review
- QR History - Classical Linear Algebra
- Householder and Givens transforms
- Least Squares DSP Implementations
- Fixed point implementations
- Parallel and Serial FPGA Implementations
- Backsubstitution versus Downdating Arrays
- CORDIC and Arithmetic Requirements
- Singular Value Decomposition (SVD)
- Beamforming and Beamsteering
- MIMO System Implementation
- Fixed point implementations

