York Electronics Centre
"Industrial Excellence"

Signal Processing

DCD Algorithm

THE UNIVERSITY of York

- A novel and extremely efficient calculation method
- Very powerful new algorithm for solving linear equations
- Very low comput-ational load suits hardware and fixed point software implementation

Applications include:

- 3G / CDMA
- Tomography
- Smart Antennas
- Echo cancellation and adaptive equalisation
- Speech processing
- Radar, Sonar

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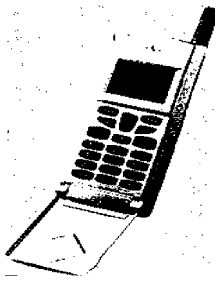
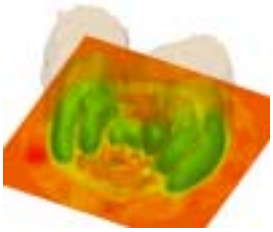
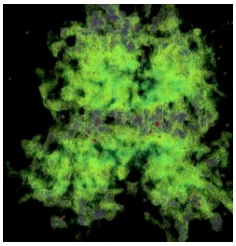
The Communications Research Group in the Department of Electronics has invented a novel and extremely efficient calculation method, called the Dichotomous Co-ordinate Descent (DCD) algorithm. This is a method for easily determining solutions of systems of linear equations, which may be extremely large. This method enables solutions in real time to be realistically achieved.



Although this method was initially developed for communications applications, which exhibit considerable demand for such techniques, it has large potential for many other applications including tomograpy, medical imaging, video processing, acoustics etc.





The DCD algorithm allows real-time solution of systems whose solution even on professional computers by traditional methods has been impractical. This method does not involve multiplication or division; accordingly it is not only very fast, but does not accumulate significant errors of computation. It also exploits any sparseness of the system matrix and/or the solution vector, yielding additional performance benefits. It is extremely well suited for hardware implementation and implementation on simple and cheap fixed point DSP devices.

In communications and signal processing, the potential field of its applications is comparable to that of the well known LMS algorithm.

YEC operates commercially, delivering solutions to industry from

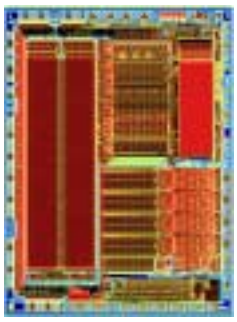
THE UNIVERSITY of York

Signal processing

DCD Algorithm

Technique	Convergence Speed	Operations	Hardware
RLS	Fast	+,-,x,÷	No
LMS	Slow	+,-,x	Not easy
DCD	Fastest	+,-	Easy

DCD has been shown to outperform RLS and LMS techniques



The DCD algorithm has been mathematically rigorously tested and several applications have been developed to expose advantages and disadvantages. The results of the work are the subject of a patent application, and therefore have not been released into the public domain. There are considerable technical and business benefits offered by the invention.

Many problems whose solution is currently considered to be beyond the capabilities of real-time hardware can be readily solved by this method. Possible applications include (but are not restricted to) such fields of electronics as communications, signal processing, computers, acoustics, radars, sonars. Other fields are geophysics, speech, tomography in medicine, ocean tomography, etc.

Investigations into mobile phone applications have shown that this technique allows:

- Multi-user receivers (Multi User Detection – MUD) and smart antennas to be implemented in real-time increasing system capacity and performance.
- Link capacity to achieve the limit defined by the 3G standard, while being capable of implementation on today's mobile phone platforms.
- Fast and accurate, low cost echo cancellation for hands free operation without the need for a double talk detector.

Potential activities include:

- Design and production of an electronic chip or a set of chips (specific hardware) implementing this technique (e.g. FPGA or ASIC cores)
- Development of a co-processor for digital signal processors (DSP)
- Development of audio systems exploiting new acoustic echo cancellers
- Development of new types of speech coders
- Radar and sonar applications
- Systems for medicine tomography
- Low power video processing

The Communications Group of the University of York is renowned for its leading edge work in pursuing new capabilities for the communication and related markets. York Electronics Centre complements the research activity by providing industrial development capabilities to implement real world solutions for specific application.

If you have an interest in finding out more about how The University of York can apply research and development capabilities to support your business needs please contact us, we will be happy to discuss your needs.

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