

THE UNIVERSITY OF MANCHESTER
PARTICULARS OF APPOINTMENT
FACULTY OF SCIENCE & ENGINEERING
SCHOOL OF MATHEMATICS

RESEARCH ASSOCIATE IN NUMERICAL ANALYSIS FOR IMPROVED LAND MINE DETECTION

VACANCY REF: S&E-09353

Salary: Grade 6, £31,076 to £38,183 per annum
Hours: 1 FTE
Duration: Fixed term available asap until December 2017
Location: Oxford Road, Manchester

Enquiries about the vacancy, shortlisting and interviews:

Name: Professor Bill Lionheart

Email: bill.lionheart@manchester.ac.uk

Background

Anti-personnel land mines constitute a major threat to human life in post conflict areas and faster ways to detect and clear these minimal metal mines, and importantly to discriminate between them and non-threat objects, is an important humanitarian goal and a difficult research challenge. As part of our Centre for International Research into Clearance of Landmines and Explosives (CIRCLE) , funded by the charity Find a Better Way we aim to improve metal detectors to by developing better algorithms for location and discrimination and to improve the design of coil arrays.

Overall Purpose of the Job

We seek a Post Doctoral Research Associate to implement a numerical method to calculate the polarization tensors that determine the response of a conductive object in a low frequency electromagnetic field. This will build on the work in this area by Lionheart at Manchester and Ledger at Swansea, using the framework of the boundary element library BEM++ developed by Betcke at UCL. The successful candidate will have experience of scientific computing and numerical solution of partial differential equations. Previous experience in Python, C++ and Matlab is desirable. The PDRA will also work with Peyton's group in CIRCLE to validate the calculations against experimental data as well as results computed using other codes.

The appointment will be in the School of Mathematics in the Inverse Problems Group, with

membership of CIRCLE, and is funded by a one year Royal Society Challenge Grant.

Key Responsibilities, Accountabilities or Duties

The range of duties will include:

- Understanding the relevant existing work on polarization tensors for metal detectors.
- Working with Lionheart, Ledger and Betcke, develop an efficient boundary integral based method to compute the complex polarization tensor, in the time harmonic eddy current regime, of objects with specified shape and properties
- Implement and test the above in the frame work of BEM++,
- In collaboration with Peyton's team in CIRCLE to test the computed and measured time harmonic polarization tensors for a range of objects.
- Deliver a short training course on the use of the code developed.
- Assist researchers in CIRCLE to use the code as an aid to designing new coil arrays for metal detectors.

Person Specification

Essential

- Have, or be about to obtain, a relevant PhD (or equivalent)
- Proven track record in scientific computing including the numerical solution of partial differential equations
- Ability to implement numerical algorithms in compiled and interpreted languages and to adapt ,reuse and extend existing code
- A background in numerical analysis including numerical linear algebra and numerical solution of integral equations and partial differential equations
- Ability to use sound software engineering principles in scientific computing including documentation, testing and version control.
- Ability to work with engineers and scientists to compare measured data with numerical predictions, and to analyse and correct models and suggest ways to improve experiments when they disagree.
- A working understanding of Maxwell's equations including necessary analysis of systems of partial differential equations.
- Ability to author and co-author academic journal papers in English.
- Ability to present papers at scientific meetings.
- Excellent communication skills in English and interpersonal skills
- Excellent time management and organisational skills
- Ability to work independently and as part of a team
- Ability to liaise confidently and effectively with a range of individuals across discipline boundaries including scientists, engineers and demining experts.
- Flexible approach to dealing with research problems as they arise
- Willingness to learn and develop present in both written and oral publications
- Ability to work to deadlines
- Understand equal opportunity issues as they may impact on areas of research content.

Desirable:

- Experience in developing scientific software in Python, C++ and Matlab
- Ability to write scientific papers and presentations in LaTeX
- Knowledge and experience in computational electromagnetics
- Experience in using and implementing Boundary Element Method
- A working knowledge of Linux for scientific computing including use of collaborative source code management systems.