Magnetotelluric inversion is the reconstitution of the pattern of underground geoelectric conductivities out of an incomplete and noisy set of measurements of the electromagnetic field at various points of the surface, and at various frequencies. In the forward problem we assumed a two-dimensional plane cutting the surface of the Earth, in which prisms with different values of conductivity are identified, and used to feed Maxwell’s equations to yield the field on the surface. The problem instances we have used require discovering the conductivities at 70 rectangular underground patches, out of 20 measurements of the magnetic field on the surface, at 10 distinct frequencies.

Previously (in a paper presented during the last edition of this conference) we tackled this problem and formulation through a gradient-based optimiser together with an entropy-based regularisation principle, and obtained good results. In this paper we review the problem cases therein, with an evolutionary computation approach.

Among the contributions of this new approach we point out the development of a new kind of crossover operator that is appropriate for handling two-dimensional candidate solutions (individuals), as is the present case. In this way, when producing the offspring the spatial correlation is preserved between parts of the chromosome, thus enforcing that spatially adjacent patches of an individual are kept close to each other for periods of the search.

Another point worth of mention is that the search process eventually developed turned out to be a hybrid one, in which the evolutionary process is interspaced by a simple local search around the
best individual of the population.

Very good results have been obtained with synthetic data corrupted with gaussian noise. These results suggest that the current evolutionary approach is more robust than the classical one represented by our previous work.