

Title: Data-flow reversal and Garbage Collection

Abstract: After some introduction on AD, we focus on Source-Transformation reverse AD, a remarkably efficient way to compute gradients. One cornerstone of reverse AD is Data-flow reversal, the process of restoring memory states of a computation in reverse order. It is well-known that the use of dynamic memory, involving dynamic allocation, deallocation, and pointers, pose delicate problems to data-flow reversal. Several strategies have been devised in AD tools to cope with dynamic memory, often satisfying but sometimes partial. We here explore the case of languages with Garbage Collection (GC), which have received little attention so far. Given the specifics of dynamic memory with GC, we propose a strategy to organize data-flow reversal that relies of pseudo-addresses and finalization actions. We experiment this strategy on a Java 2D Navier-Stokes solver. We compare its performances with adjoint code of the same solver rewritten in Fortran or C, therefore without GC, and differentiated through more classical AD approaches.