Constraint Programming (CP) is a paradigm to solve practical problems described as Constraint Satisfaction Problems (CSPs). A CSP describes the constraints the solution(s) have to respect, not how to obtain those solutions. Those constraints can be used to reduce the search space. Propagation removes parts of the search space that do not contain solutions, inside so-called propagators. In this thesis, we focus on propagators for one important constraint: the Table Constraint. Table constraints list explicitly, in their table, the allowed combinations of values for their variables. They can thus encode any constraint.

First, five different propagators are proposed for the table constraint to obtain Generalized Arc Consistency (GAC). Two of them have an optimal time complexity. Then, we present a new constraint, which is a generalization of the table constraint, called the Smart Table Constraint. In the tables of smart table constraints, simple arithmetic constraints are allowed. This makes the representation of the constraint more efficient and natural. We also devise an efficient propagator for this constraint to obtain GAC. Finally, we propose a consistency stronger than GAC for table constraints. A stronger consistency allows the constraints to further reduce the search space. The defined consistency is called Domain k-Wise Consistency (DkWC). We also define a procedure to easily enforce it, allowing us to reuse existing propagators for GAC without modification.

Throughout this thesis, all the proposed algorithms are evaluated on different benchmarks against the existing state of the art. We also define a specialized statistical procedure, based on the bootstrap method, to compare algorithms. This procedure is used, in addition to traditional measurements, to evaluate thoroughly the proposed propagators.