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Solving problems in quantum mechanics is an essential skill and research activity for physicists, mathematicians, engineers and others. Nowadays, the labor of scientific computation has been greatly eased by the advent of computer algebra packages, which do not merely perform number crunching, but also enable users to manipulate algebraic expressions and equations symbolically. For example, the manipulations of noncommutative operators, differentiation and integration can now be carried out algebraically by the computer algebra package.

This book collects standard and advanced methods in quantum mechanics and implements them using SymbolicC++ and Maxima, two popular computer algebra packages. Throughout, the sample programs and their outputs are accompanied with explanatory text of the underlying mathematics and physics explained in detail. Selected problems have also been implemented using two other popular packages _ Mathematica and Maple _ while some problems are implemented in C++.

Modern developments in quantum theory are covered extensively, beyond the standard quantum mechanical techniques. The new research topics added to this second edition are: entanglement, teleportation, Berry phase, Morse oscillator, Magnus expansion, wavelets, Pauli and Clifford groups, coupled Bose-Fermi systems, super-Lie algebras, etc.

Contents:
Wave Packet and Free Schrödinger Equation
Unitary Operators
Unitary and Hermitian Operators
Anharmonic Oscillator
Radial Symmetric Potential and Bound States
Helium Atom and Trial Function
Gauge Theory
Berry Phase

Bose Operators and Number States
Coherent States
Perturbation Theory
Teleportation
Legendre Polynomials
Hermite Polynomials
Spherical Harmonics
and other papers