Summary of research (Minoru Tabata)

1. **Partial differential equations and integro-partial differential equations studied in fluid dynamics.** Minoru Tabata proved the existence of local solutions to the Cauchy problem for the system of equations describing the motion of a mixture of compressible viscous and heat-conductive fluids. He proved decay of solutions to the Cauchy problem for the linearized Boltzmann equation with an external-force term and analyzed the point spectrum of the principal term of the equation.
2. **Numerical analysis of agent-based models describing population movement.** He constructed agent-based models describing an artificial society with population movement, developed a numerical method for the models. He numerically simulated Weidlich-Haag's theory of population movement and proved that the thermodynamic limit of the agent-based models is equal to a solution to Weidlich-Haag's master equation.
3. **Numerical analysis of mathematical and statistical models using entropy.** Using the maximum likelihood estimation method, he developed an error evaluation method for the relation between the communication capacity and the synchronization for spread spectrum communication.
4. **A mathematical epidemiological model for human adult T-cell leukemia.** To analyze epidemiological phenomena of human adult T-cell leukemia, in which the concentration of population in urban areas promotes the spread of infection, he constructed a mathematical epidemiological model with the effect of population concentration. He compared the numerical-simulation results with empirical data.
5. **A nonlinear integro-partial differential equation in population dynamics.** He proved the existence of local and global solutions of the master equation, a nonlinear integro-partial differential equation in population dynamics. He analyzed the asymptotic behavior of the solutions.
6. **Nonlinear discrete equations with dual singular structure used in spatial economics.** He proved the existence of short-run and long-run equilibria of the wage equation of Krugman's core-periphery model and constructed a numerical method for short-run equilibria. He applied Kakutani's fixed point theorem to Krugman's core-periphery model and applied the simulation results to spatial economics.
7. **Evolutionary game theory in spatial economics**. He proved the existence of global solutions to the replicator equation of evolutionary games in spatial economics, analyzed the asymptotic behavior of the global solutions, developed a numerical method for the solutions, and applied the results of numerical simulations to spatial economics.