



# YMC 2006



## Young Mathematicians Conference 2006

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### DESIGN AND OPTIMIZATION OF EXPLICIT RUNGE-KUTTA FORMULAS

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**Abstract of Report Talk:** Explicit Runge-Kutta methods have been studied for over a century and are used in the sciences as well as mathematical software such as MATLAB's `ode45` solver. However, we have taken a new look at fourth- and fifth-order Runge-Kutta methods by utilizing techniques based on Gröbner bases to design an explicit fourth-order Runge-Kutta formula and a (4,5) formula pair that minimize higher-order truncation error. Gröbner bases, useful tools for eliminating variables, also helped to reveal a pattern among the error terms. A MATLAB program based on step-doubling was then developed to compare the accuracy and efficiency of Runge-Kutta formulas and `ode45`.

[DS10004223]

[Joint work with Michael Yoshizawa]

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