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Visualizing Lagrange Multiplier Optimization using CalcPlot3D. Preliminary report.

In multivariable calculus, we teach our students the method of Lagrange multipliers to solve constrained optimization problems. As we introduce this topic, many of us use some form of visual presentation to help students understand how we develop the Lagrange multiplier equation, i.e., $\vec{\nabla}f(x, y) = \lambda\vec{\nabla}g(x, y)$. Using a freely available online multivariable calculus applet named CalcPlot3D, instructors can give a dynamic demonstration of the visual nature of Lagrange multiplier optimization during class. After class, students can complete a guided exploration of this topic using the same applet. As part of this activity, students complete a pre-test, answer exploration questions, and then complete a post-test. The pre- and post-tests measure what improvement occurs in their conceptual understanding of the geometric nature of Lagrange multiplier optimization by completing the visual exploration. Student responses to this online activity can be sent to instructors for grading. CalcPlot3D is part of an NSF-funded grant project titled Dynamic Visualization Tools for Multivariable Calculus (DUE- CCLI #0736968). See <http://web.monroecc.edu/calcNSF/>. (Received September 21, 2011)