1077-41-810 **Hongbo Li*** (hli@mmrc.iss.ac.cn), Zhong Guan Cun East Rd. 55, Beijing, 100190, Peoples Rep of China, **Ruiyong Sun** (sunruiyong@126.com), Zhong Guan Cun East Rd. 55, Beijing, 100190, Peoples Rep of China, **Shoubin Yao** (yaoshoubin@163.com), Zhong Guan Cun East Rd. 55, Beijing, 100190, and **Ge Li** (liyoucun@126.com), Zhong Guan Cun East Rd. 55, Beijing, 100190, Peoples Rep of China. *Approximate Rational Solutions to Rational ODEs Defined on Discrete Differentiable Curves.*

In this paper, a new concept is proposed for discrete differential geometry: *discrete n-differentiable curve*, which is a tangent n-jet on a sequence of space points. A complete method is proposed to solve ODEs of the form

$$\mathbf{n}^{(m)} = \frac{\mathbf{F}(\mathbf{r}, \mathbf{r}', \ldots, \mathbf{r}^{(n)}, \mathbf{n}, \mathbf{n}', \ldots, \mathbf{n}^{(m-1)}, u)}{G(\mathbf{r}, \mathbf{r}', \ldots, \mathbf{r}^{(n)}, \mathbf{n}, \mathbf{n}', \ldots, \mathbf{n}^{(m-1)}, u)},$$

where $\mathbf{F}$, G are respectively vector-valued and scalar-valued polynomials, where $\mathbf{r}$ is a discrete curve obtained by sampling along an unknown smooth curve parametrized by u, and where $\mathbf{n}$ is the vector field to be computed along the curve. Our Maple-13 program outputs an approximate rational solution with the highest order of approximation for given data and neighborhood size.

The method is used to compute rotation minimizing frames of space curves in CAGD. For one-step backward-forward chasing, a 6th-order approximate rational solution is found, and 6 is guaranteed to be the highest order of approximation by rational functions. The theoretical order of approximation is also supported by numerical experiments. (Received September 13, 2011)