Instructions for using the research code of the paper

**1. project overview**

 **Project name:** Fourier model algorithm for trajectory data.

 **Introduction:** this algorithm model is used to fit the trajectory data. Combined with the road network data, this algorithm regards the trajectory data as a signal that changes dynamically with time, converts it from time domain to frequency domain through Fourier transform, fits the trajectory points in the spectrum domain, and converts the discrete trajectory points into time continuous line elements.

 **Description of development environment:** this algorithm model is mainly based on ArcGIS Engine provided by ESRI company in the United States Net framework.

 **Development language used:** c#.NET

**2. system requirements**

 **Operating system:** windows10 or later

 **Programming environment:** Visual Studio 2010 and above, ensure that the correct version of .NET Framework is installed (typically.Net 4.5 or later).

 **Related dependencies and tools:** ArcGIS Engine

 **Hardware environment requirements:**

 **CPU:** multi core processor

  **Memory:** at least 4 GB (8 GB or more is recommended)

 **Hard disk space:** at least 2 GB of free space

 **Display:** display supporting 1024x768 resolution

**3. use steps**

1. Detailed installation steps of ArcGIS Engine it is recommended to check the official documentation of ESRI or contact technical support.

2. Visual Studio 2010 and above it is recommended to refer to Microsoft's support page or community forum for help.

3. From https://doi.org/10.6084/m9.figshare.28151696 Download the compressed package of Fourier trajectory.rar software from the website, and decompress the package to generate the Fourier trajectory directory.

4. In the visual studio development environment, open the Fourier trajectory.sln project under the Fourier trajectory directory to open the development package of the Fourier model algorithm for trajectory data.

5. After opening the project for compilation, click "attach to process" on the "tools" menu bar on the development interface , the attach to process interface pops up, and select the ArcMap.exe process from the available processes . At this time, the debugging right of the program is handed over to the ArcMap process.

6. In the ArcMap working interface of ArcGIS, select the layer to be fitted on the layer (as shown by the blue arrow in figure.1), and then click the "Fourier fitting" control (as shown by the red arrow in figure.1) to call the Fourier fitting module. The form of calling the Fourier module is selected by the user.

Figure 1: Calling the Fourier fitting module in the arcMap interface

**4. function details**

 **Module 1**

 **Function name:** calculation module of the number of Fourier expansion terms K

 **Function Description:** take the duration and number of points of the original discrete trajectory data as the input parameters of this module, you can obtain the number of Fourier expansion terms K appropriate to the duration and number of points.

 **Example code:**

**1.** definition of duration, number of points and k-value variables

 double FTM; // Duration double pTNM; // Points double kn; // K value

 2. Partial display of item number K calculation function body

 kn=645.7799241556678-96.73611649253812 \* FTM+32.1074078103927 \* pTNM

+7.372789355356099 \* FTM \* FTM



 **Module 2**

 **Function name:** Fourier fitting module

 **Function Description:** Fourier transform the selected trajectory points according to the time sequence

 **Example code:**

 1.definition of Fourier model class

 class FourierAnalysis

 2.generation of Fourier model objects

* +  FourierAnalysis m\_FourierAnalysis = new FourierAnalysis(listTrajectPoint,

setFourierParameter.nExpand, true);

 3. Fourier transform function call, converting from time domain to frequency domain

* +  m\_FourierAnalysis.CalculateAllValue();

 4. The inverse Fourier transform function is called to complete the fitting of Fourier

 m\_FourierAnalysis.GetOriginPosCoordinate(setFourierParameter.nTruncate);

**5. contact information**

 If you have any questions and suggestions, please contact us (mailto: shuaiyun@cug.edu.cn).