

Article

A standalone executable software for network visualization

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Abstract

A standalone executable software for network visualization, netVisual 2.0, was developed based on the previous studies. It can be used in Windows operating systems and is not dependent upon any runtime environment. Based on the data of network information, netVisual 2.0 will generate a HTML file from which a network can be visualized and user-interacted in the web browsers. Both netVisual 2.0 and demonstration data files were given.

Keywords network visualization; software; netVisual; HTML.

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1 Introduction

Construction, analysis, simulation and control of biological networks are all focus in network biology (Kuang and Zhang, 2011; Huang and Zhang, 2012; Li and Zhang, 2013; Jiang et al., 2015; Zhang et al., 2014; Zhang, 2011, 2012b-c, 2016a-b, 2018; Zhang and Li, 2016; Qi et al., 2018; Zhang and Zhang, 2019; Xin and Zhang, 2020, 2021; Zhang, 2021b; Yang and Zhang, 2022), among which, network visualization is an area for utilization (Narad et al., 2017; Zhang, 2007, 2021a, 2024a-b). So far, numerous visualization software or tools have been developed and used (Zhang, 2007; Zhang, 2012a-b; Li and Zhang, 2013; Zhang and Zhang, 2019; Xin and Zhang, 2020, 2021; Yang and Zhang, 2022).

In a recent study, I proposed a Java application for visualizing networks (2024b) on the basis of Zhang (2012a) in which the data must be loaded with ODBC database. However it is still dependent on the JRE. Therefore I developed a Matlab software for visualizing user-interface interactive networks (Zhang, 2024a) based on the previous web tool (Zhang, 2021a). The software may handle the networks with more than thousands of nodes and links and the generated HTML page is easier to be saved. But still, it is dependent upon the Matlab environment. In present study, I developed a standalone executable software for generating a HTML file of network visualization, from which the network can be visualized and interacted by users in the web browsers.

2 Software and Data

2.1 Software

The standalone executable software, netVisual 2.0, was developed using Delphi (Fig. 1), based on the previous web tool (Zhang, 2021, 2024a). The following are the main Delphi codes of the software:

```
unit Unit1;

interface

uses
  Windows, Messages, SysUtils, Classes, Graphics, Controls, Forms, Dialogs,
  StdCtrls;

type
  TForm1 = class(TForm)
    Button1: TButton;
    GroupBox1: TGroupBox;
    GroupBox2: TGroupBox;
    GroupBox3: TGroupBox;
    RadioButton1: TRadioButton;
    RadioButton2: TRadioButton;
    RadioButton3: TRadioButton;
    RadioButton4: TRadioButton;
    RadioButton5: TRadioButton;
    RadioButton6: TRadioButton;
    RadioButton7: TRadioButton;
    GroupBox4: TGroupBox;
    Edit1: TEdit;
    GroupBox5: TGroupBox;
    Edit2: TEdit;
    GroupBox6: TGroupBox;
    Edit3: TEdit;
    GroupBox7: TGroupBox;
    Edit4: TEdit;
    OpenFileDialog1: TOpenDialog;
    OpenFileDialog2: TOpenDialog;
    SaveDialog1: TSaveDialog;
    procedure Button1Click(Sender: TObject);

  private
    { Private declarations }
  public
    { Public declarations }
  end;
```

```
var
  Form1: TForm1;
  nname: array[1..10000] of string;
  nnameg: array[1..10000] of Integer;
  links: array[1..100000,1..4] of Integer;
  n,m: Integer;
  str,nsizel,llen,nnsizel,opacity,ntype,nfont,nvis: string;
```

```
implementation
```

```
{ $R *.DFM }
```

```
procedure TForm1.Button1Click(Sender: TObject);
```

```
var
```

```
  F: TextFile;
  filename: string;
  i,k: Integer;
```

```
begin
```

```
  nsizel:=Edit1.Text;
  llen:=Edit2.Text;
  nnsizel:=Edit3.Text;
  opacity:=Edit4.Text;
  if RadioButton1.Checked then
    ntype:='1';
  if RadioButton2.Checked then
    ntype:='0';
  if RadioButton3.Checked then
    nfont:='Times New Roman';
  if RadioButton4.Checked then
    nfont:='Sans Serif';
  if RadioButton5.Checked then
    nfont:='Arial';
  if RadioButton6.Checked then
    nvis:='1';
  if RadioButton7.Checked then
    nvis:='0';
  Form1.Visible:=false;
  if OpenFileDialog1.Execute then
    begin
      filename:=OpenDialog1.FileName;
      AssignFile(F,filename);
      Reset(F);
      n:=0;
      while not Eof(F) do
```

```

begin
n:=n+1;
Readln(F,k,nnameg[n],nname[n]);
end;
CloseFile(F);
end;
if OpenFileDialog2.Execute then
begin
filename:=OpenDialog2.FileName;
AssignFile(F,filename);
Reset(F);
m:=0;
while not Eof(F) do
begin
m:=m+1;
Readln(F,links[m,1],links[m,2],links[m,3],links[m,4]);
end;
CloseFile(F);
str:=str+'<html style="width: 100%; height: 100%;">';
str:=str+'<head><meta charset="utf-8">';
str:=str+'<title>User-Interface Interactive Network</title>';
str:=str+'<script type="text/javascript" src="http://www.iaees.org/publications/software/netJa/netJsrc1.js"></script>';
str:=str+'<script type="text/javascript" src="http://www.iaees.org/publications/software/netJa/netJsrc2.js"></script>';
str:=str+'<script type="text/javascript" src="http://www.iaees.org/publications/software/netJa/netJsrc3.js"></script>';
str:=str+'</head>';
str:=str+'<body style="margin: 0px; padding: 10px; overflow: hidden; width: 100%; height: 100%; background-color: white;">';
str:=str+'<font face="Times New Roman" size="1" color="cyan">User manual: Zhang WJ. 2024. A standalone executable
software for network visualization. Network Pharmacology, 9(1-2): 1-10</font>';
str:=str+'<div id="htmlwidget_container" style="position: absolute; top: 10px; right: 10px; bottom: 10px; left: 10px;">';
str:=str+'<div id="htmlwidget-50742ce3f4548458b168" style="width: 100%; height: 100%;" class="forceNetwork"></div>';
str:=str+'</div>';
str:=str+'<font face="Times New Roman" size="3">';
str:=str+'<script type="application/json" data-for="htmlwidget-50742ce3f4548458b168">';
str:=str+'{"x":{"links":{"source":[';
for i:=1 to m do
begin
str:=str+IntToStr(links[i,1]-1);
if i<m then
str:=str+',';
end;
str:=str+'],'target':[';
for i:=1 to m do
begin
str:=str+IntToStr(links[i,2]-1);
if i<m then
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```

```

    str:=str+',';
end;
str:=str+'],'value':[:;
for i:=1 to m do
begin
str:=str+IntToStr(links[i,3]);
if i<m then
    str:=str+',';
end;
str:=str+'],'colour':[:;
for i:=1 to m do
begin
str:=str+'#+IntToStr(links[i,4])+'';
if i<m then
    str:=str+',';
end;
str:=str+'],'nodes':{ "name":[:;
for i:=1 to n do
begin
str:=str+''+Trim(nname[i])+'';
if i<n then
    str:=str+',';
end;
str:=str+'],'group':[:;
for i:=1 to n do
begin
str:=str+IntToStr(nnameg[i]);
if i<n then
    str:=str+',';
end;
str:=str+'],'options':{ "colourScale": "d3.scaleOrdinal(d3.schemeCategory20);","NodeID": "name","Group": "group","arrows":';
str:=str+ntype+', "fontSize":'+nsize+', "fontFamily":'+nfont+';';
str:=str+'linkDistance':+llen+', "linkWidth": "function(d)                                {                                return
Math.sqrt(d.value)}', "charge":'+-'+nsize+', "opacity":'+opacity+', "opacityNoHover":'+nvis+'}';';
str:=str+'evals':[], "jsHooks":[]</script>';
str:=str+'</script><script                                type="application/htmlwidget-sizing"
data-for="htmlwidget-50742ce3f4548458b168">{"viewer":{"width":450,"height":350,"padding":10,"fill":true},"browser":{"wid
th":960,"height":500,"padding":10,"fill":true}}</script>';
str:=str+'</font></body></html>';
SaveDialog1.Execute;
filename:=SaveDialog1.FileName;
AssignFile(F,filename);
Rewrite(F);
Write(F,#$EF+#$BB+#$BF);
Writeln(F,UTF8Encode(str));

```

```

CloseFile(F);
end;
Application.Terminate;
end;
end.

```

Run the software, make choices, input parametrical values, load data files, and finally a HTML file is generated. In the HTML file, the Json codes, netJsrc1.js, netJsrc2.js, and netJsrc3.js, were compiled from networkD3 package in the free R software (R, 2019; Zhang, 2021, 2024a).

Compared to the previous version (Zhang, 2024a), netVisual 2.0 does not need any running environment.

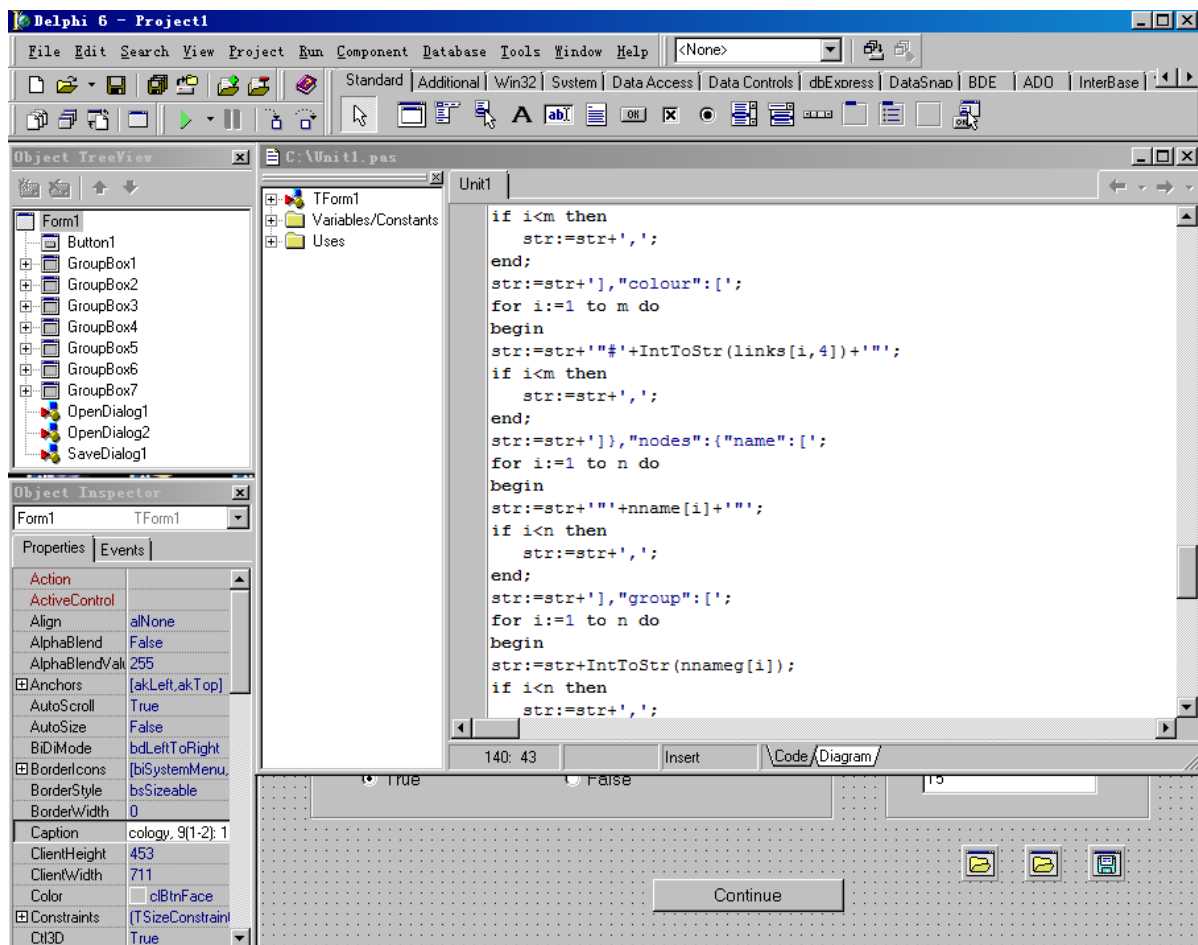


Fig. 1 The Delphi environment for developing netVisual 2.0.

2.2 Data

In the nodes file, the 1st column are node IDs (1, 2, etc), and the 2nd column are node group IDs (e.g., 1, 2, etc), and the 3rd column are node names. Data are separated by space(s).

In the links file, the 1st and 2nd columns are node IDs of source nodes and target nodes for links, the 3rd column are link widths (e.g., 10), and the 4th column are link colors (e.g., 666). Data are separated by space(s).

Double-click the HTML file to visualize the network in a web browser (e.g., Chrome) connected to

Internet. The software and demo data files are included in the package: [http://www.iaees.org/publications/journals/np/articles/2024-9\(1-2\)/e-suppl/Zhang-Supplementary-Material.rar](http://www.iaees.org/publications/journals/np/articles/2024-9(1-2)/e-suppl/Zhang-Supplementary-Material.rar)

3 Demonstration

The network data for, e.g., Fas signaling pathway and correlational network of medicinal attributes and functions of Chinese Herbal Medicines are used (Huang and Zhang, 2012; Li and Zhang, 2013; Zhang, 2017), among which the data for Fas signaling pathway are stored in two space delimited text files (Fas_signaling-pathway_nodes.txt, Fas_signaling-pathway_links.txt) as shown in Fig. 2.

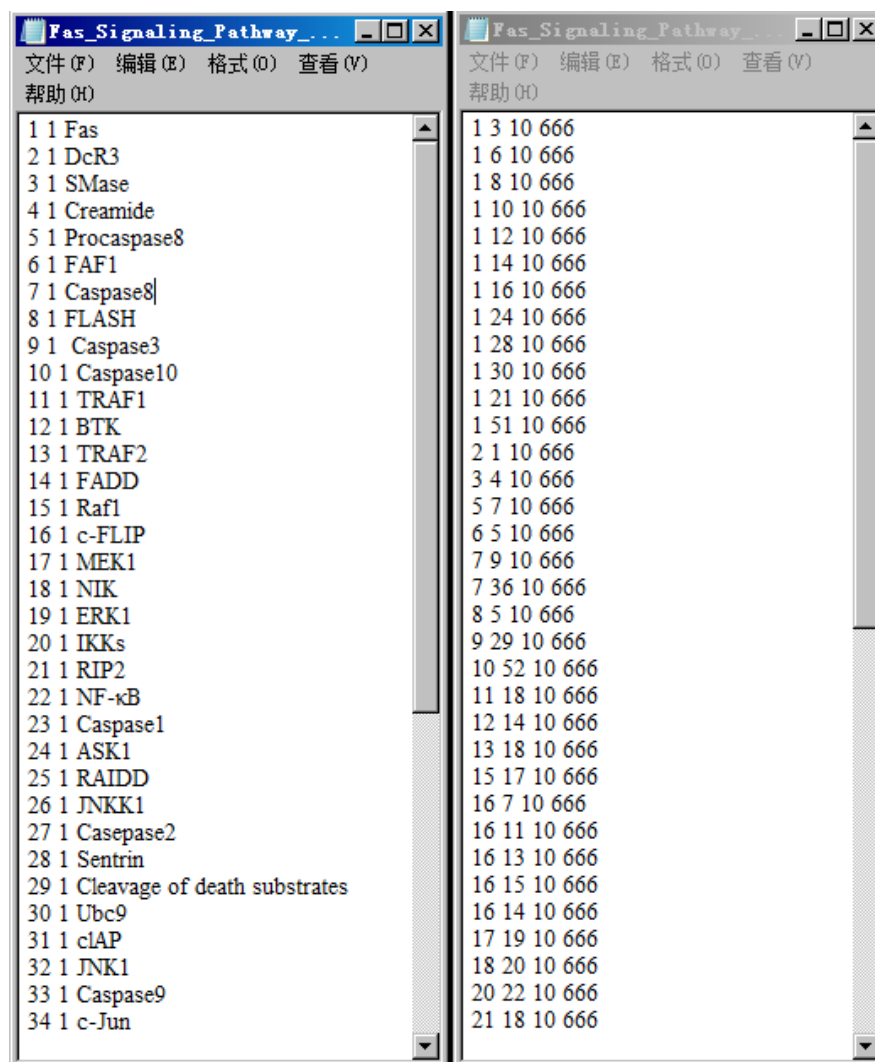


Fig. 2 The data for Fas signaling pathway. Left: Fas_Signaling-Pathway_nodes.txt; Right: Fas_Signaling-Pathway_links.txt.

Run the software netVisual 2.0, make some choices, input some parametrical values, and load the data file above (Fig. 3), a HTML file for the interactive network can be generated. The HTML file can be loaded in a suitable web browser connected to Internet, and the nodes in the network can be dragged by the user to exhibit a better layout of the network (Fig. 4 and 5).

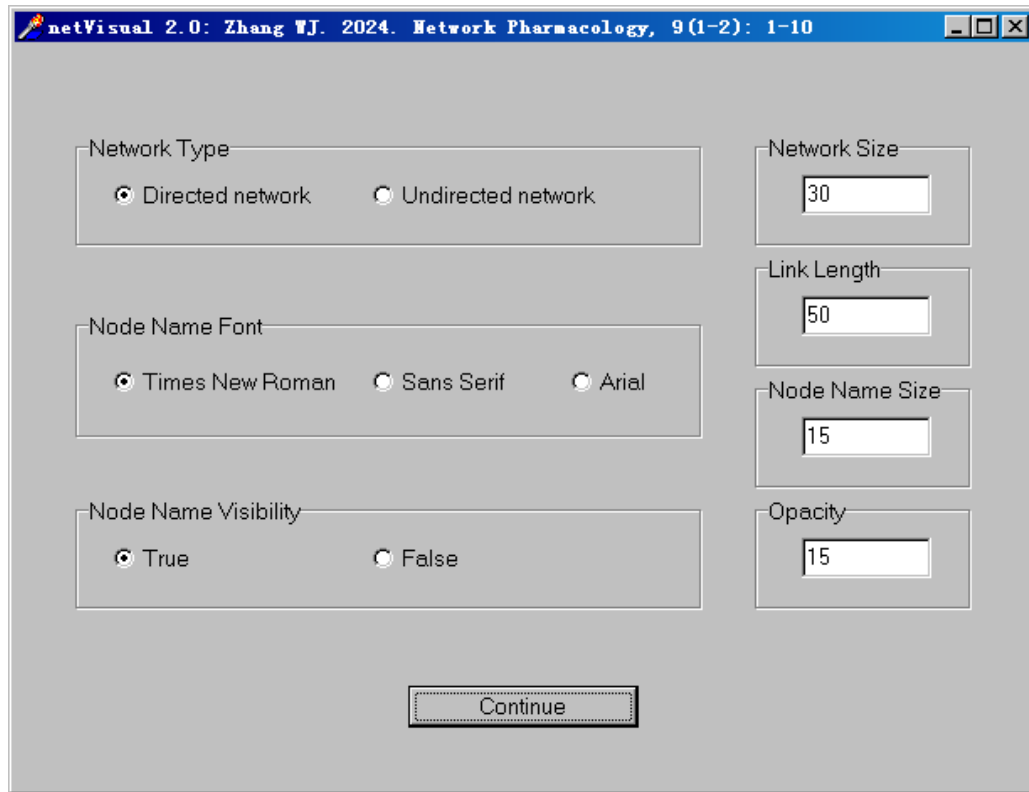


Fig. 3 An interface of the software, netVisual 2.0.

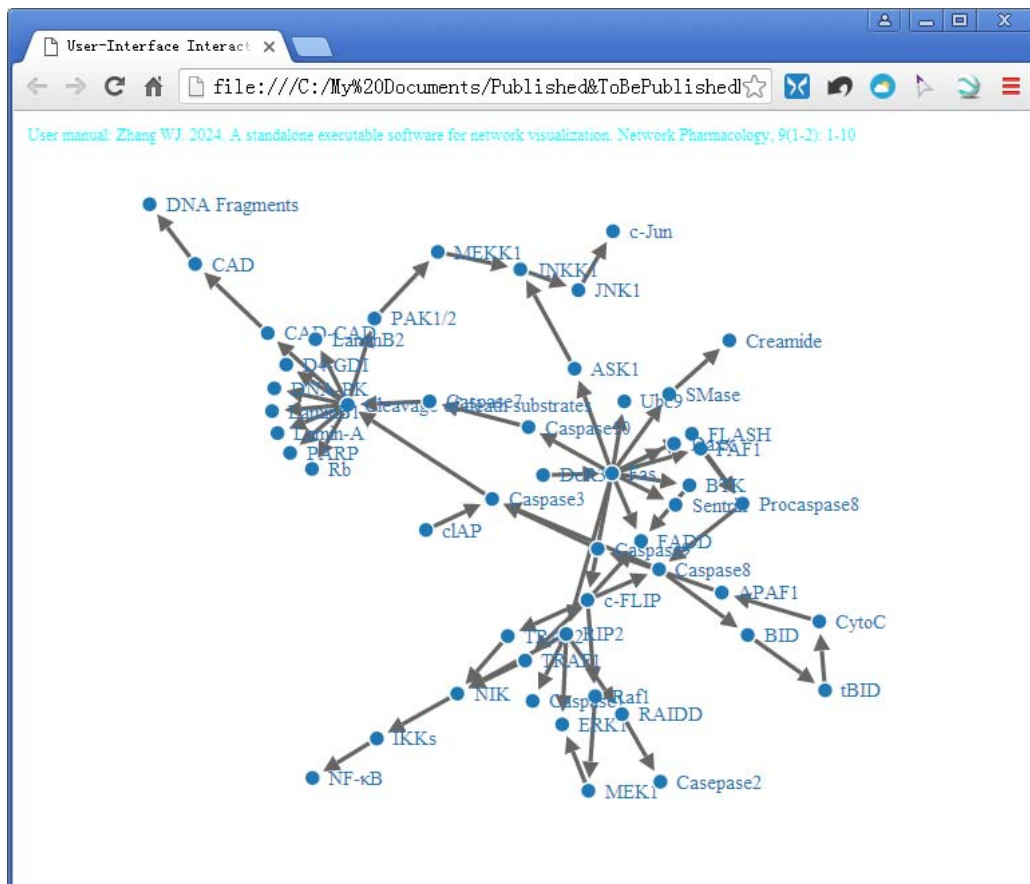


Fig. 4 The user-interface interactive network for Fas signaling pathway, generated by netVisual 2.0.

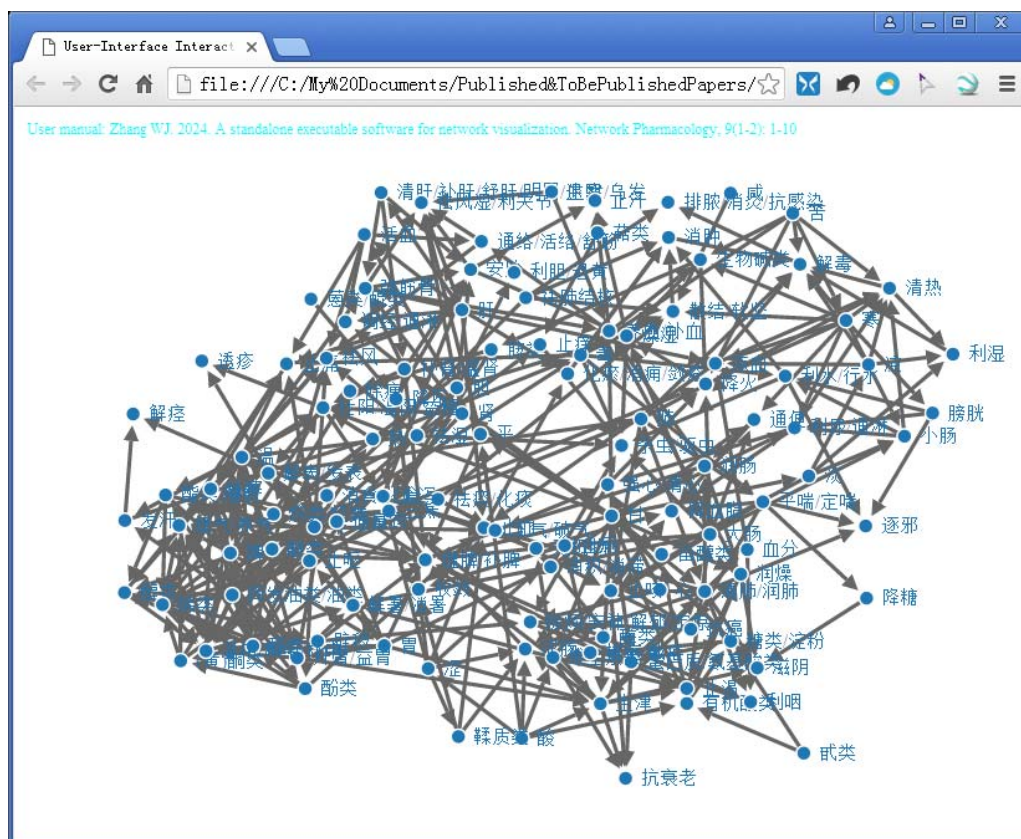


Fig. 5 The user-interface interactive network for correlational network of medicinal attributes and functions of Chinese Herbal Medicines (Zhang, 2017), generated by netVisual 2.0.

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