



Supplement of

Structural synthesis of plane kinematic chain inversions without detecting isomorphism

Jinxi Chen et al.

Correspondence to: Rongjiang Cui (cuijongjiang2009@163.com)

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The computer programme code for synthesizing kinematic chain inversions is provided as follows.

```
void CKCinversionDlg::OnSynthesis()
{
    clock_t start, finish;
    float time;
    start = clock();
    CClientDC dc(this);
    CString c="";
    UpdateData();
    N=m_N; F=m_F;
    char s_n,s_f;
    CString str1="[";
        if(N>9) s_n=(char)(N+55);
        else s_n=(char)(N+48);
    s_f=(char)(F+48);
    str1=str1+s_n+s_f+']';
    CStdioFile fileinversion;
    fileinversion.Open("inversion.txt",CFile::modeReadWrite);
    fileinversion.SeekToBegin();
    CString str2="";
    bool sign=false;
    while(fileinversion.ReadString(str2))
    {
        if(str2==str1) {sign=true;break;}
    }
    if(sign==true) MessageBox("The inversions have been synthesized!");
    else
    {
        fileinversion.SeekToEnd();
        fileinversion.WriteString(str1);
        fileinversion.WriteString("\n");
        CStdioFile fileKC;
        fileKC.Open("KCmatrix.txt",CFile::modeRead);
```

```

fileKC.SeekToBegin();
while(fileKC.ReadString(str2))
{
    if(str2=="") continue;
    else if(str2[0]=='['&&str2[1]==s_n&&str2[2]==s_f) break;
}
int i,j,k,sum,count=0;
int adjmatrix[20][20],adjmatrix2[20][20],adjmatrix3[20][20],adjmatrix4[20][20],adjmatrix5[20][20];
for(i=0;i<20;i++)
    for(j=0;j<20;j++)
    {
        adjmatrix[i][j]=0;
        adjmatrix2[i][j]=0;
        adjmatrix3[i][j]=0;
        adjmatrix4[i][j]=0;
        adjmatrix5[i][j]=0;
    }
int temp=0;
vector<int> vec1;
vec1.clear();
vector<vector<int> >AM5;
AM5.clear();
CString str3="",inversionstr="";
while(fileKC.ReadString(str2))
{
    if(str2=="") continue;
    else if(str2[0]=='['&&str2[1]==s_n&&str2[2]==s_f) continue;
    else if(str2[0]=='['&&(str2[1]!=s_n||str2[2]!=s_f)) break;
    else
    {
        str2.Delete(0,1);
        str2.Delete(0,1);
        str3=str2;
        k=0;

```

```

for(i=0;i<N-1;i++)
  for(j=i+1;j<N;j++)
  {
    if(str2[k]=='1') adjmatrix[i][j]=1;
    else adjmatrix[i][j]=0;
    k++;
  }
for(i=1;i<N;i++)
  for(j=0;j<i;j++)
adjmatrix[i][j]=adjmatrix[j][i];
for(i=0;i<N;i++)
  for(j=0;j<N;j++)
  {
    sum=0;
    for(k=0;k<N;k++)
    {
      sum+=adjmatrix[i][k]*adjmatrix[k][j];
    }
    adjmatrix2[i][j]=sum;
  }
for(i=0;i<N;i++)
  for(j=0;j<N;j++)
  {
    sum=0;
    for(k=0;k<N;k++)
    {
      sum+=adjmatrix2[i][k]*adjmatrix[k][j];
    }
    adjmatrix3[i][j]=sum;
  }
for(i=0;i<N;i++)
  for(j=0;j<N;j++)
  {
    sum=0;

```

```

for(k=0;k<N;k++)
{
    sum+=adjmatrix3[i][k]*adjmatrix[k][j];
}
adjmatrix4[i][j]=sum;
}
for(i=0;i<N;i++)
for(j=0;j<N;j++)
{
    sum=0;
    for(k=0;k<N;k++)
    {
        sum+=adjmatrix4[i][k]*adjmatrix[k][j];
    }
    adjmatrix5[i][j]=sum;
}
AM5.clear();
for(i=0;i<N;i++)
{
    vec1.clear();
    for(j=0;j<N-1;j++)
    {
        for(k=j+1;k<N;k++)
        {
            if(adjmatrix5[i][j]<adjmatrix5[i][k])
            {
                temp=adjmatrix5[i][j];
                adjmatrix5[i][j]=adjmatrix5[i][k];
                adjmatrix5[i][k]=temp;
            }
        }
    }
    for(j=0;j<N;j++) vec1.push_back(adjmatrix5[i][j]);
}
AM5.push_back(vec1);

```

```

        }
    for(i=0;i<N-1;i++)
        for(j=i+1;j<N;j++)
        {
            if(AM5[i]==AM5[j]) {AM5[j].clear();AM5[j].push_back(0);}
        }
    for(i=0;i<N;i++)
    {
        if(AM5[i].size()==N)
        {
            inversionstr="-"+str3;
            if(i>8) inversionstr.Insert(0,(char)(i+1+55));
                else inversionstr.Insert(0,(char)(i+1+48));
            fileinversion.SeekToEnd();
            fileinversion.WriteString(inversionstr);
            fileinversion.WriteString("\n");
                count++;
        }
    }
}

c.Format("%d",count);
MessageBox(c);
}

finish = clock();
time=(float)(finish-start)/CLOCKS_PER_SEC;
CString timeshow="";
timeshow.Format("time is %f seconds",time);
MessageBox(timeshow);
}

```