

Approssimazione del raggio spettrale della matrice di iterazione

del metodo SOR

Enrico Bertolazzi

- Carica le librerie

```
> initialize ;  
with(LinearAlgebra) :  
with(plots):  
  
initialize  
Warning, the name changecoords has been redefined
```

- Definisce la procedura **Maxabs**

```
> Maxabs := proc(v)  
  local i ;  
  return max(seq(abs(v[i]),i=1..Dimension(v))) ;  
end proc :
```

- Definisce la procedura **SOR_itmat**

```
> SOR_itmat := proc(A, omega)  
  local i, j, dm, L, D, U ;  
  dm := RowDimension(A) ;  
  L := Matrix(dm, dm) ;  
  D := Matrix(dm, dm) ;  
  U := Matrix(dm, dm) ;  
  for i from 1 to dm do  
    for j from 1 to dm do  
      if i < j then  
        U[i, j] := - A[i, j] ;  
      else  
        if i > j then  
          L[i, j] := - A[i, j] ;  
        else  
          D[i, i] := A[i, i] ;  
        end if ;  
      end if ;  
    end if ;  
  end do ;  
end do ;
```

```

return (ScalarMultiply(D,1/omega) - L)^(-1)
      .(ScalarMultiply(D,(1-omega)/omega)+U) ;
end proc :

```

- Definisce la procedura **RAY_mat**

```

> RAY_mat := proc(A)
return Maxabs(evalf(Eigenvalues(A))) ;
end proc :

```

- Definisce la procedura **RAY_plot**

```

> RAY_plot := proc(A,a,b,n)
local SM, om, omega, i, rays ;
SM := SOR_itmat(A,omega) ;
rays := [] ;
for i from 0 to n do
om := evalf( a + i*(b-a)/n ) ;
rays := [ op(rays), [om, RAY_mat(subs(omega=om,SM))] ] ;
end do ;
plot(rays,style=line,thickness=2,color=blue);
end proc :

```

- Esempio d'uso (matrice simmetrica)

```

> # definisce la matrice
A := <<2,0,-1,-1>|<0,2,0,-1>|<-1,0,1,0>|<-1,-1,0,2>> ;

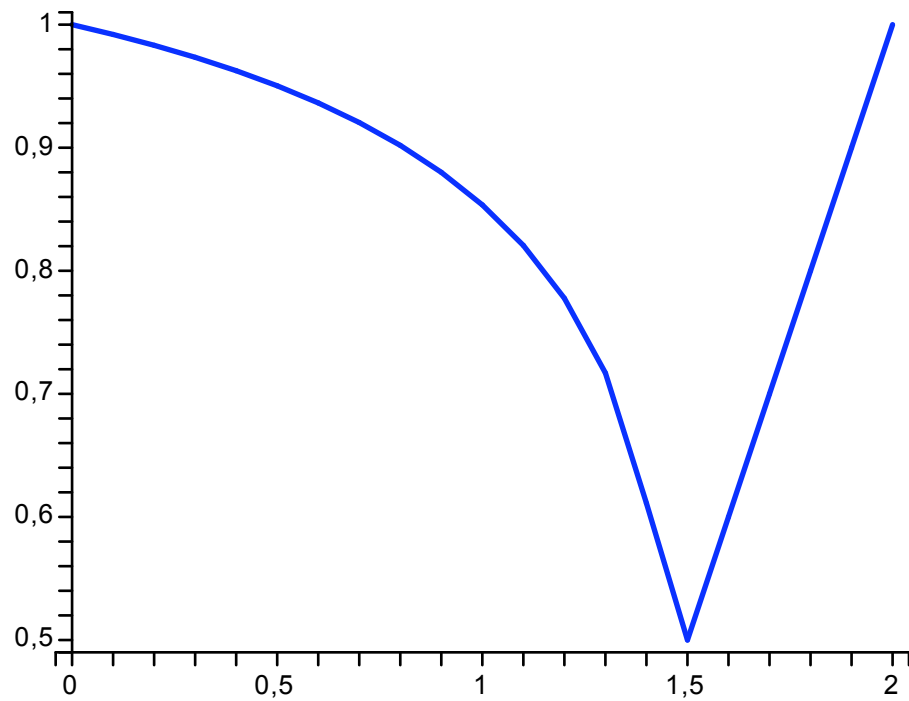
```

$$A := \begin{bmatrix} 2 & 0 & -1 & -1 \\ 0 & 2 & 0 & -1 \\ -1 & 0 & 1 & 0 \\ -1 & -1 & 0 & 2 \end{bmatrix}$$

```

> RAY_plot(A,0,2,20) ;

```



Esempio d'uso (matrice non-simmetrica)

```
> # definisce la matrice
  B := <<2,0,-2,1>|<0,2,0,-1>|<-1,0,1,0>|<-3,-1,0,1>> ;
```

$$B := \begin{bmatrix} 2 & 0 & -1 & -3 \\ 0 & 2 & 0 & -1 \\ -2 & 0 & 1 & 0 \\ 1 & -1 & 0 & 1 \end{bmatrix}$$

```
> RAY_plot(B,0,2,20) ;
```

