library("iemisc")
import::from(ramify, mat)

vo <- mat("0, 0; 600, 0; 630, 580; 1200, 650; 1200, 920; 900, 920; 900, 845; 0, 845")
vo

vi <- mat("0, 300; 300, 300; 300, 695; 0, 695")
vi
# The following will plot both the original and the final (transformed plot)

```r
SP <- secprop(outer = vo, inner = vi, original_plot = 1, final_plot = 1)
```

![Plot](image-url)
## Parameters

<table>
<thead>
<tr>
<th>Value</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1117500</td>
<td>Area</td>
</tr>
<tr>
<td>500.6</td>
<td>Height to Neutral Axis</td>
</tr>
<tr>
<td>8.627934e+10</td>
<td>Second Moment of Area</td>
</tr>
<tr>
<td>2.057338e+08</td>
<td>Elastic Modulus, t</td>
</tr>
<tr>
<td>1.723428e+08</td>
<td>Elastic Modulus, b</td>
</tr>
</tbody>
</table>

1.117500e+06
8.627934e+10
4.193736e+02
5.006264e+02

### secpop Example (GNU Octave style)

```octave

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```
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function SP = secprop(outer,inner,plotflag)
% Section Properties Calculator
% outer is a matrix of outer coordinates (x,y)
% inner is a matrix of coordinates for a void
% SP is a vector of A,I,yt and yb properties of the section

[nOC n] = size(outer); [nIC n] = size(inner);
outer(nOC+1,:) = outer(1,:);
inner(nIC+1,:) = inner(1,:);

propsOC = zeros(1,3); propsIC = propsOC;
if(nIC > 2); propsIC = algor(inner); end;
A = propsOC(1) - propsIC(1);
I = propsOC(2) - propsIC(2);
ybar = propsOC(3) - propsIC(3);

ybar = ybar/A;
I = I-A*ybar^2;
A = 2*A; I = 2*I;
yt = max(outer(:,2)) - ybar;
yb = ybar;
SP = [A,I,yt,yb]; SP = SP';

if plotflag == 1
outer(nOC+1:2*nOC-1,1) = -outer(nOC:-1:2,1);
outer(nOC+1:2*nOC-1,2) = outer(nOC:-1:2,2);
inner(nIC+1:2*nIC-1,1) = -inner(nIC:-1:2,1);
inner(nIC+1:2*nIC-1,2) = inner(nIC:-1:2,2);
h = fill(outer(:,1),outer(:,2),'r'); hold on;
fill(inner(:,1),inner(:,2),'w'); axis equal;

s1 = sprintf('Area = %d mm2 | Height to N-A = %3.1f mm',A,round(ybar*10)/10);
s2 = sprintf('Second Moment of Area = %d mm4',I);
s3 = sprintf('Elastic Moduli, t = %d mm3; b = %d mm3',I/yt,I/yb);
annotation1 = annotation('textbox',[0.15 0.12 0.4 0.14],
{s1,s2,s3});
% annotation1 line modified by Irucka Embry to avoid the error message associated with
% set: unknown hggroup property FitHeightToText
end
end

function props = algor(vc)
A = 0; ybar = 0; I = 0;
x = vc(:,1); y = vc(:,2);
n = length(x);
for i = 1:(n-1)
A = A + 0.5*(x(i)-x(i+1))*(y(i)+y(i+1));
\[ ybar = ybar + \left( \frac{1}{6} \right) (x(i) - x(i+1)) (y(i)^2 + y(i) y(i+1) + y(i+1)^2); \]
\[ I = I + \left( \frac{1}{12} \right) (x(i) - x(i+1)) (y(i)^3 + y(i)^2 y(i+1) + y(i) y(i+1)^2 + y(i+1)^3); \]
end
props = [A, I, ybar];
end

% check against GNU Octave

vo = [0, 0; 600, 0; 630, 580; 1200, 650; 1200, 920; 900, 920; 900, 845; 0, 845];
vi = [0, 300; 300, 300; 300, 695; 0, 695];
SP = secprop(vo, vi, 1)

print("file.png")

% Results
warning: annotation: couldn't parse PROP/VAL pairs, skip
warning: called from
    annotation at line 218 column 7
secprop at line 36 column 21

SP =

1.1175e+06
8.6279e+10
4.1937e+02
5.0063e+02
**Works Cited**


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