

iemisc: secprop Example (R and GNU Octave)

Irucka Embry, E.I.T. (EcoC²S)

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secprop Example (R style)

```
# Example 1 (Caprani Reference)

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

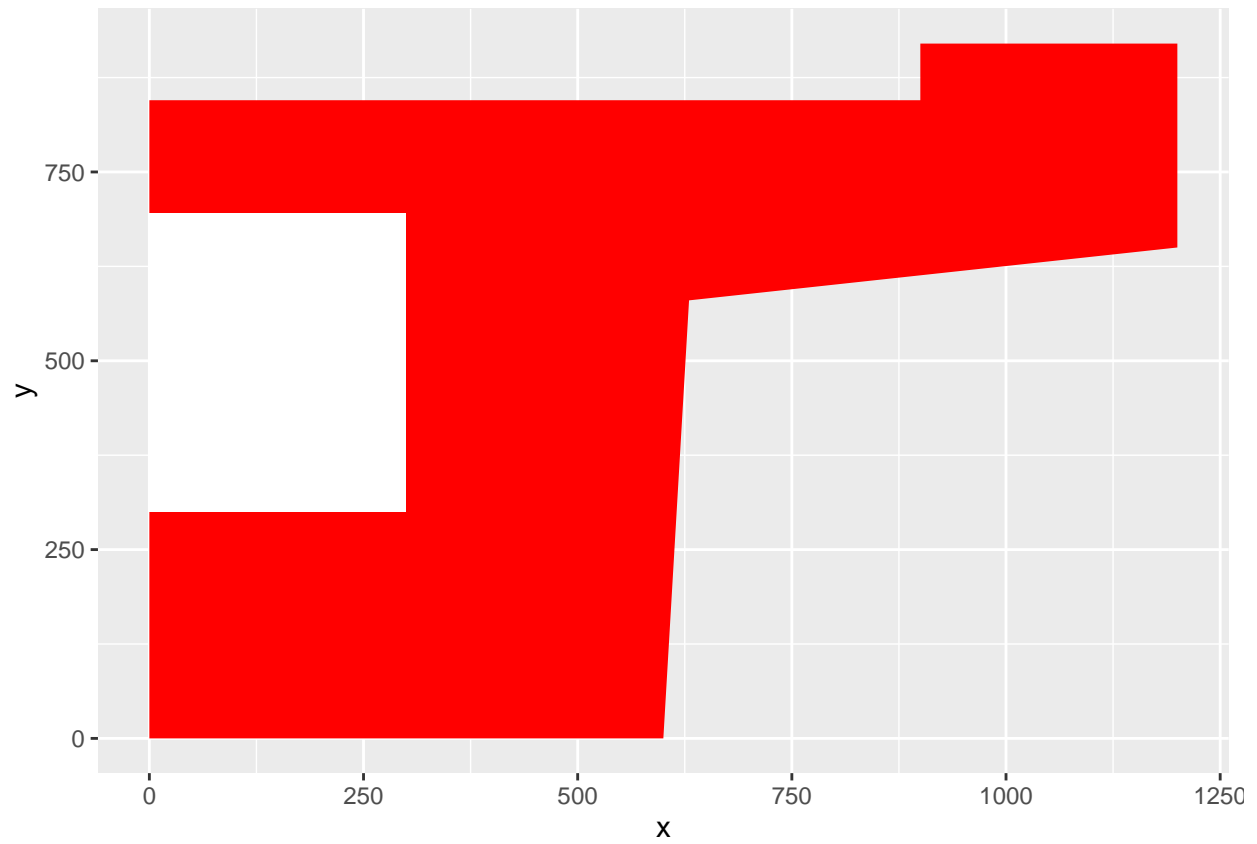
vo <- mat("0, 0; 600, 0; 630, 580; 1200, 650; 1200, 920; 900, 920; 900, 845; 0, 845")
vo

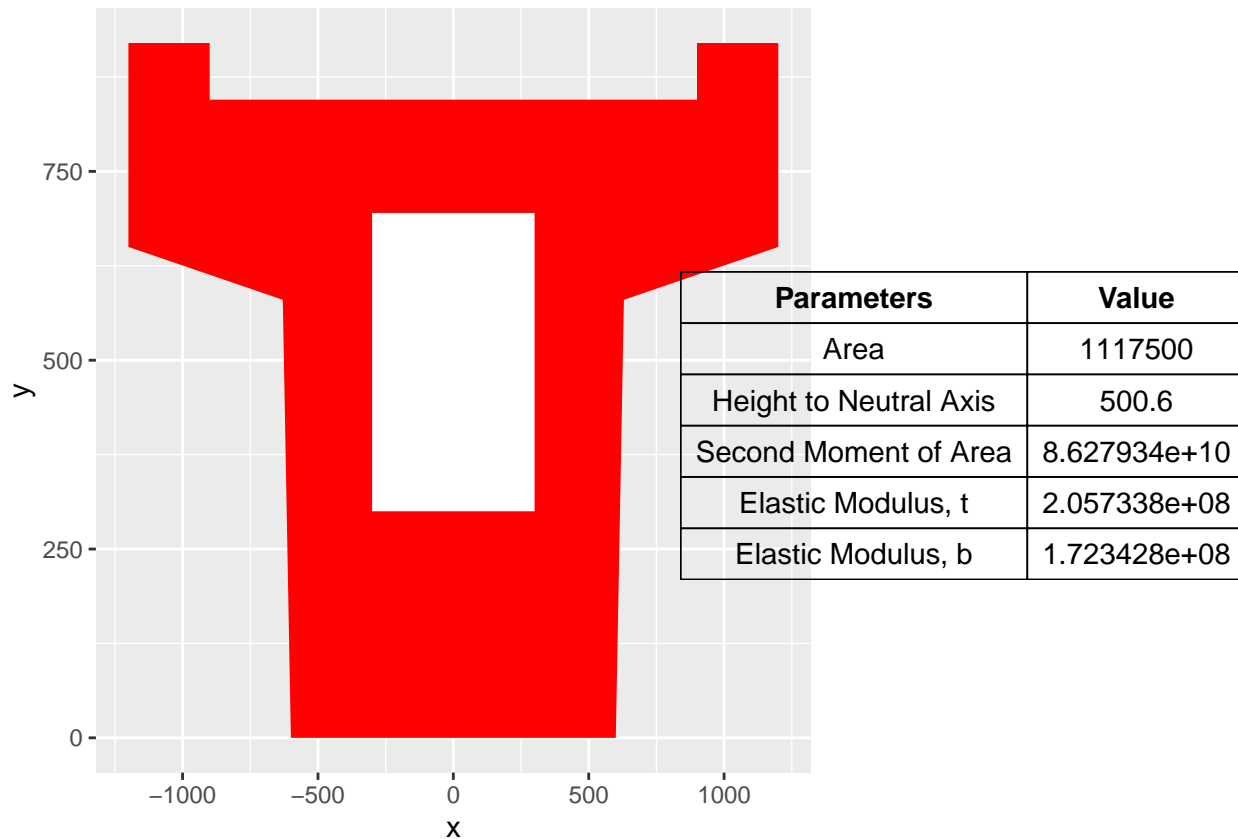
##      [,1] [,2]
## [1,]    0    0
## [2,]  600    0
## [3,]  630  580
## [4,] 1200  650
## [5,] 1200  920
## [6,]  900  920
## [7,]  900  845
## [8,]    0  845

vi <- mat("0, 300; 300, 300; 300, 695; 0, 695")
vi

##      [,1] [,2]
## [1,]    0  300
## [2,]  300  300
## [3,]  300  695
## [4,]    0  695
```

```
# The following will plot both the original and the final (transformed plot)
SP <- secprop(outer = vo, inner = vi, original_plot = 1, final_plot = 1)
```





SP

```
##          [,1]
## [1,] 1.117500e+06
## [2,] 8.627934e+10
## [3,] 4.193736e+02
## [4,] 5.006264e+02
```

secprop Example (GNU Octave style)

```
%
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%
% This program is free software: you can redistribute it and/or modify
% it under the terms of the GNU General Public License as published by
% the Free Software Foundation, either version 3 of the License, or
% (at your option) any later version.
%
% This program is distributed in the hope that it will be useful,
% but WITHOUT ANY WARRANTY; without even the implied warranty of
% MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
% GNU General Public License for more details.
```

```

%
% You should have received a copy of the GNU General Public License
% along with this program. If not, see <http://www.gnu.org/licenses/>.

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;
propsOC = algor(outer);
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 + (1/6)*(x(i)-x(i+1))*(y(i)^2 + y(i)*y(i+1) + y(i+1)^2);
end

```

```

        I = I + (1/12)*(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)

## warning: annotation: couldn't parse PROP/VAL pairs, skipping
## 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

Colin Caprani, “Section Properties Calculator”, <https://www.colincaprani.com/programming/matlab/>.

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