Pattern Recognition

Hausdroff's Distance Example

Subin Sahayam M

Department of Computer Engineering
Indian Institute of Information Technology Design and Manufacturing
Kancheepuram

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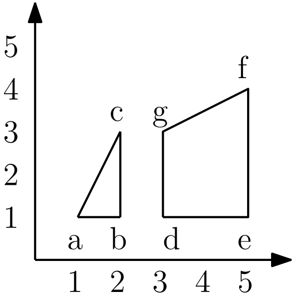
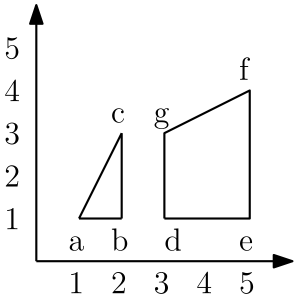
Hausdroffs Distance Example



From the above figure, let the triangle be polygon A and the quadrilateral be polygon B. The vertex coordinates of polygon A are a=(1,1), b=(2,1) and c=(2,3) and B are d=(3,1), e=(5,1), f=(5,4) and g=(3,3)

Hausdroffs Distance Example



Bidirectional Hausdroffs distance

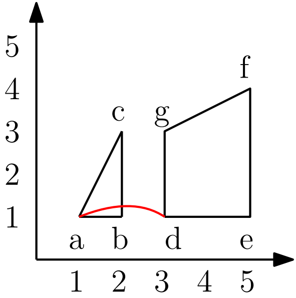
H(A,B) =max($\hat{H}$(A,B), $\hat{H}$(B,A))

$\hat{H}$(A,B)= max(min(d(a,b)))

d(a,b) = Eucledian Distance between all points a ϵ A and b ϵ B

$$\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

Hausdroffs Distance Example



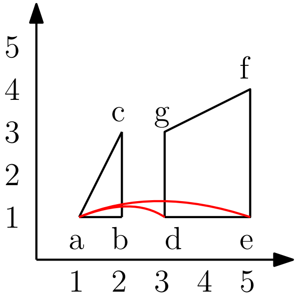
$\hat{H}$(A,B) Calculation

$\hat{H}$(A,B)= max(min(d(a,b)))

a=(1,1) and d = (3,1)

$$d(a,d) = \sqrt{(1-3)^2 + (1-1)^2} = \mathbf{2}$$

Hausdroffs Distance Example



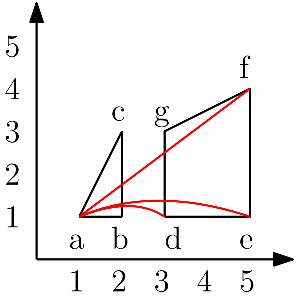
$\hat{H}$(A,B) Calculation

$\hat{H}$(A,B)= max(min(d(a,b)))

a=(1,1) and e = (5,1)

d(a,e) $= \sqrt{(1-5)^2 + (1-1)^2} = \mathbf{4}$

Hausdroffs Distance Example



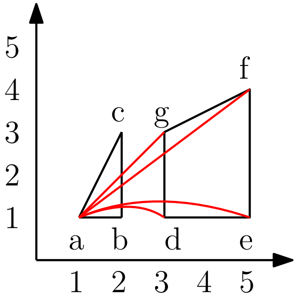
$\hat{H}$(A,B) Calculation

$\hat{H}$(A,B)= max(min(d(a,b)))

a=(1,1) and f = (5,4)

$$d(a,f) = \sqrt{(1-5)^2 + (1-4)^2} = \mathbf{5}$$

Hausdroffs Distance Example



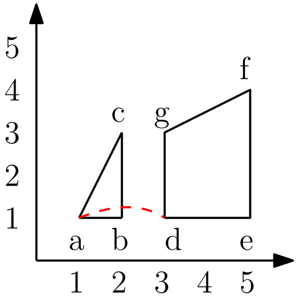
$\hat{H}$(A,B) Calculation

$\hat{H}$(A,B)= max(min(d(a,b)))

a=(1,1) and g = (3,3)

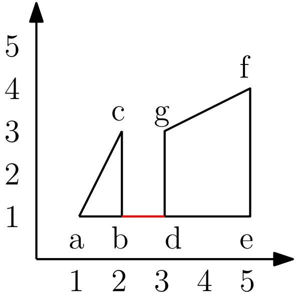
d(a,g) = $\sqrt{(1-3)^2 + (1-3)^2}$ = **2.83**

Hausdroffs Distance Example



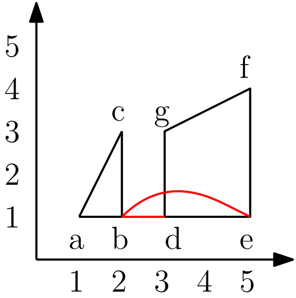
d(a,d) $= 2$
d(a,e) $= 4$
d(a,f) $= 5$
d(a,g) $= 2.83$
Minimum distance among the 4 is
d(a,d)=2

Hausdroffs Distance Example



$\hat{H}$(A,B) Calculation
$\hat{H}$(A,B)= max(min(d(a,b)))
b=(2,1) and d = (3,1)
d(b,d) = $\sqrt{(2-3)^2 + (1-1)^2} = \mathbf{1}$

Hausdroffs Distance Example



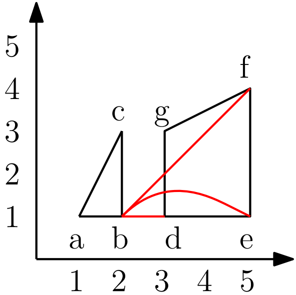
$\hat{H}$(A,B) Calculation

$\hat{H}$(A,B)= max(min(d(a,b)))

b=(2,1) and e = (5,1)

$d(b,e) = \sqrt{(2-5)^2 + (1-1)^2} = \mathbf{3}$

Hausdroffs Distance Example



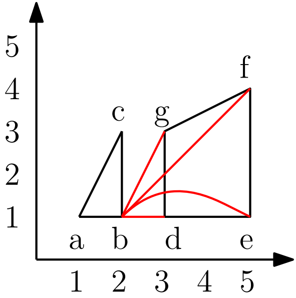
$\hat{H}$(A,B) Calculation

$\hat{H}$(A,B)= max(min(d(a,b)))

b=(2,1) and f = (5,4)

d(b,f) = $\sqrt{(2-5)^2 + (1-4)^2}$ = **4.24**

Hausdroffs Distance Example



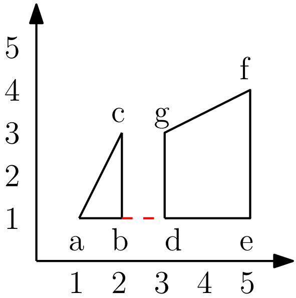
$\hat{H}$(A,B) Calculation

$\hat{H}$(A,B)= max(min(d(a,b)))

b=(2,1) and g = (3,3)

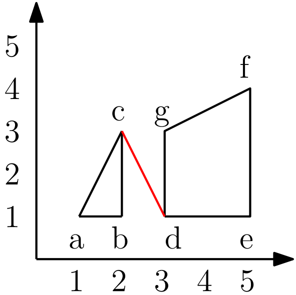
$$d(b,f) = \sqrt{(2-3)^2 + (1-3)^2} = \mathbf{2.24}$$

Hausdroffs Distance Example



d(b,d) = 1
d(b,e) = 3
d(b,f) = 4.24
d(b,g) = 2.24
Minimum distance among the 4 is
d(b,d)=1

Hausdroffs Distance Example

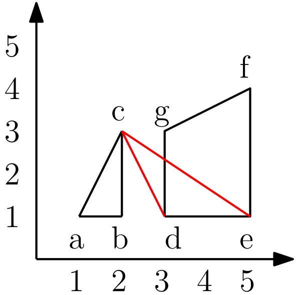


$\hat{H}$(A,B) Calculation

$\hat{H}$(A,B)= max(min(d(a,b)))

c=(2,3) and d = (3,1)

$d(c,d) = \sqrt{(2-3)^2 + (3-1)^2} = \mathbf{2.24}$



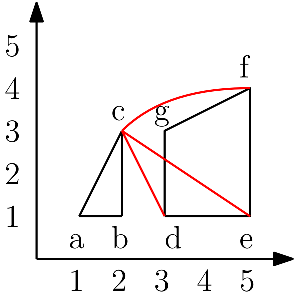
$\hat{H}$(A,B) Calculation

$\hat{H}$(A,B)= max(min(d(a,b)))

c=(2,3) and e = (5,1)

d(c,e) = $\sqrt{(2-5)^2+(3-1)^2}$ = **3.61**

Hausdroffs Distance Example

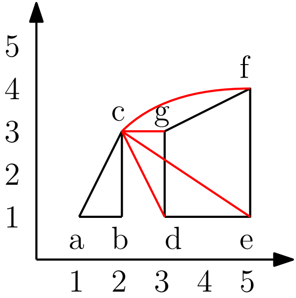


$\hat{H}$(A,B) Calculation

$\hat{H}$(A,B)= max(min(d(a,b)))

c=(2,3) and f = (5,4)

$$d(c,f) = \sqrt{(2-5)^2 + (3-4)^2} = \mathbf{3.16}$$



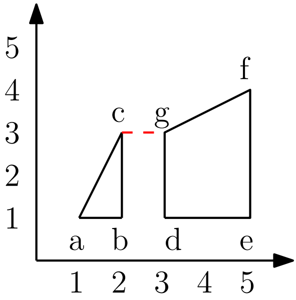
$\hat{H}$(A,B) Calculation

$\hat{H}$(A,B)= max(min(d(a,b)))

c=(2,3) and g = (3,3)

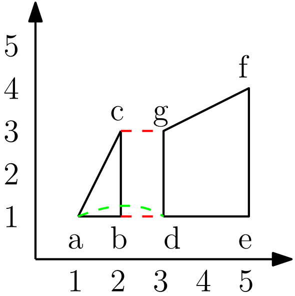
$d(c,g) = \sqrt{(2-3)^2 + (3-3)^2} = \mathbf{1}$

Hausdroffs Distance Example



d(c,d) = 2.24
d(c,e) = 3.61
d(c,f) = 3.16
d(c,g) = 1
Minimum distance among the 4 is
d(c,g)=1

Hausdroffs Distance Example



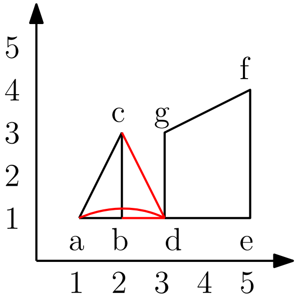
The minimum distance values from each point of polygon A are, **d(a,d)=2, d(b,d)=1 and d(c,g) =1**

$\hat{H}$(A,B) = max(d(a,d), d(b,d), d(c,g))

$\hat{H}$(A,B) = max(2, 1, 1)

$\hat{H}$**(A,B) = 2** (Shown in Green)

Hausdroffs Distance Example



$\hat{H}$(B,A)= max(min(d(a,b)))

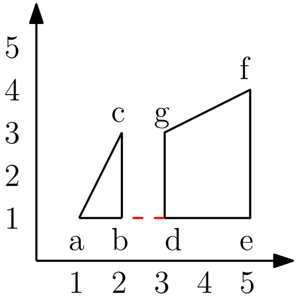
Euclidean distance is symmetric, so distance from point d to points in poligon A are,

d(d,a) = 2

d(d,b) = 1

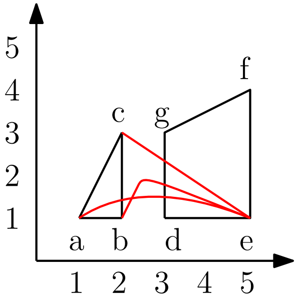
d(d,c) = 2.24

Hausdroffs Distance Example



$\hat{H}$(B,A)= max(min(d(a,b)))
d(d,a) = 2
d(d,b) = 1
d(d,c) = 2.24
Minimum distance among the 3 is
d(d,b)=1

Hausdroffs Distance Example



$\hat{H}$(B,A)= max(min(d(a,b)))

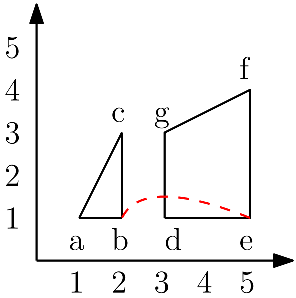
Euclidean distance is symmetric, so distance from point e to points in poligon A are,

d(e,a) = 4

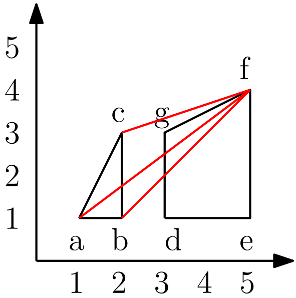
d(e,b) = 3

d(e,c) = 3.61

Hausdroffs Distance Example



$\hat{H}$(B,A)= max(min(d(a,b)))
d(e,a) = 4
d(e,b) = 3
d(e,c) = 3.61
Minimum distance among the 3 is
d(e,b)=3



$\hat{H}$(B,A)= max(min(d(a,b)))

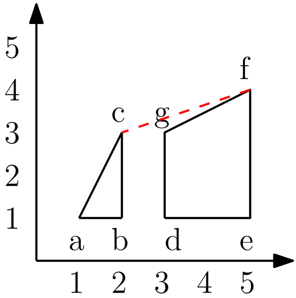
Euclidean distance is symmetric, so distance from point f to points in poligon A are,

d(f,a) = 5

d(f,b) = 4.24

d(f,c) = 3.16

Hausdroffs Distance Example



$\hat{H}$(B,A)= max(min(d(a,b)))

d(f,a) = 5

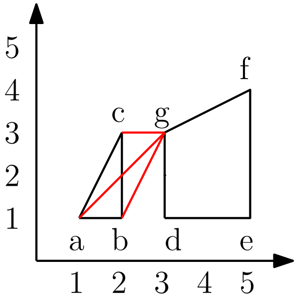
d(f,b) = 4.24

d(f,c) = 3.16

Minimum distance among the 3 is

d(f,c)=3.16

Hausdroffs Distance Example

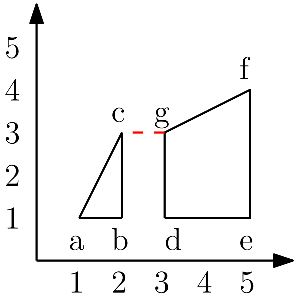


$\hat{H}$(B,A)= max(min(d(a,b)))

Euclidean distance is symmetric, so distance from point f to points in poligon A are,

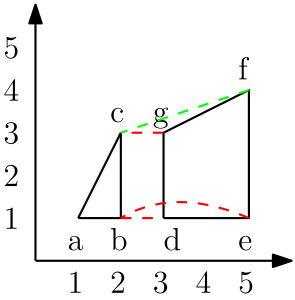
d(g,a) = 2.83
d(g,b) = 2.24
d(g,c) = 1

Hausdroffs Distance Example



$\hat{H}$(B,A)= max(min(d(a,b)))
d(g,a) = 2.83
d(g,b) = 2.24
d(g,c) = 1
Minimum distance among the 3 is
d(g,c)=1

Hausdroffs Distance Example



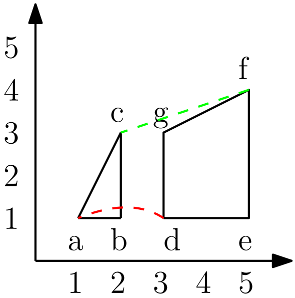
The minimum distance values from each point of polygon B are, **d(d,b)=1, d(e,b)=3, d(f,c) =3.16 and d(g,c) =1**

$\hat{H}$(B,A) = max(d(d,b), d(e,b), d(f,c), d(g,c))

$\hat{H}$(B,A) = max(1, 3, 3.16, 1)

$\hat{H}$**(B,A) = 3.16** (Shown in Green)

Hausdroffs Distance Example



The bidirectional Hausdroffs distance

H(A,B)=max($\hat{H}$(A,B),$\hat{H}$(B,A))

H(A,B)=max(d(a,d),d(f,c))

H(A,B)=max(2, 3.16)

H(A,B)=3.16 (Shown in Green)

Distance Measure Summary