Hausdroff distance is the maximum distance of a set to the nearest point in the other set. It is distance from set A to set B and called a maximin function, and defined as

Given two finite point sets

$A = \{a_1, a_2 \dots a_p\}$ and

$B = \{b_1, b_2 \dots b_q\}$

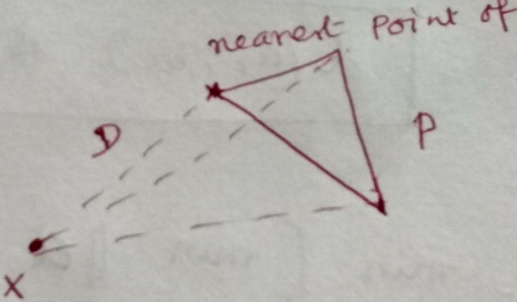
$$H(A,B) = \max\left(h(A,B),\ h(B,A)\right)$$

where

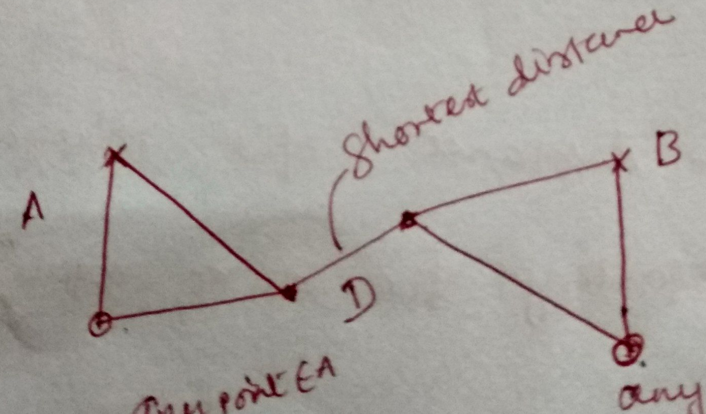
$$h(A,B) = \max_{a \in A}\left\{\min_{b \in B} \|a-b\|\right\}$$

Shortest Distance:

Motivation: Eg : 2



Eg : 3



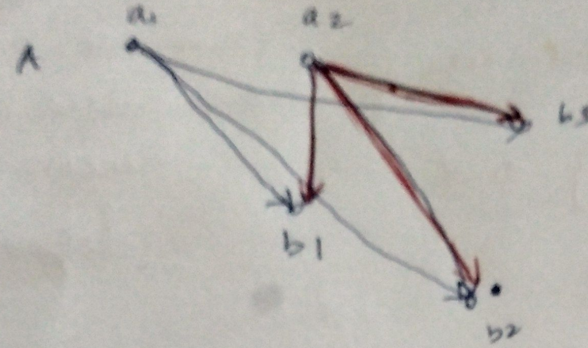
(minimin f

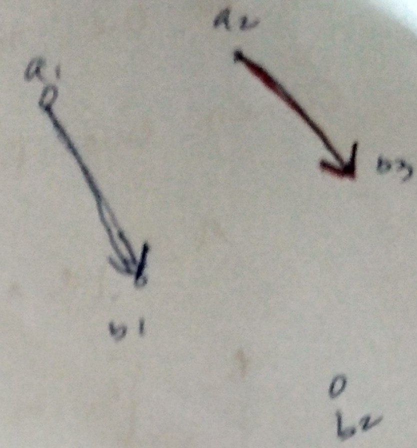
$$D(A,B) = \min_{a \in A}\left\{\min_{b \in B}\{d(a,b)\}\right\}$$

$\|a-b\|$

Consider set of points

eg:1





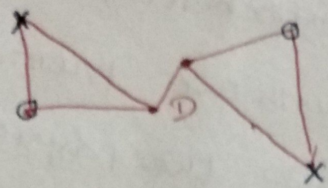
For every point $a \in A$; for any point $b \in B$ find the smallest distance; Finally keep the smallest distance among all point $\underline{\underline{a}}$.

$$\boxed{d(a_2, b_3) \text{ is the } D(A, B)}$$

$$D(A, B) = \min_{a \in A} \left\{ \min_{b \in B} \|a - b\| \right\} \Rightarrow \text{minimin function.}$$

This def of distance b/w polygons can bec quite unsatisfactory for some applications;

Consider eg: 3 now



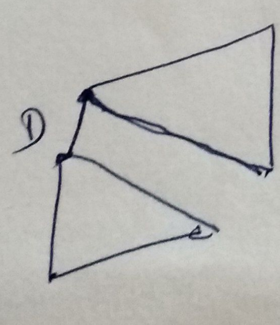
"The shortest distance doesn't not Consider the whole shape

The shorest distance 'D' between these polygons means that no point of one polygon is far from the other polygon.

In this sense; the two polygon shown are not so close; as their furthest points 'x' could actually be very far ~~away~~ away from other polygon.

* Clearly The shortest distance is totally independe of each polygonal shape.

Another issue:



Where we have same two triangles at the sa shortest distance; but in different position.

It is quite obvious that the shortest distance
D
concept carries very low information, as the distance value did not change with the previous case, while something did change with the polygon (objects)

These two issues, which are ignored by the Shortest distance is handled by Hausdroff distan