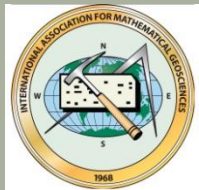


# MATHEMATICAL MORPHOLOGY IN GEOSCIENCES AND GISci

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# III.II.IV Spatiotemporal Visualization

To visualize point-data into polygonal data

Weighted Skeletonization by Influence Zones (WSKIZ)

# Point-to-Polygon Conversion

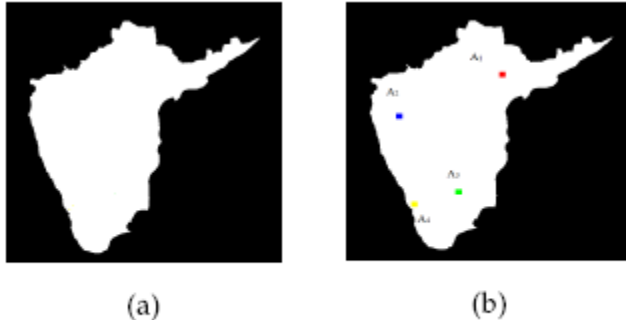


Fig. 2. (a) region considered is south India, and (b) gauge-station locations ( $A_1, A_2, A_3, A_4$ ).

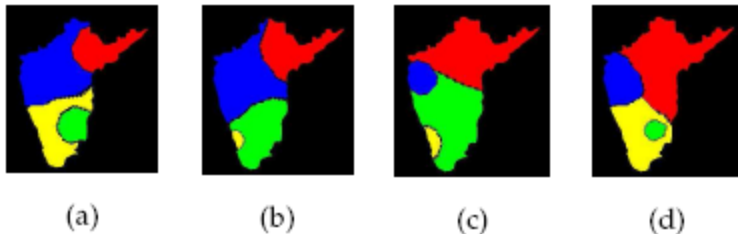


Fig. 3. The variable strengths (in terms of propagation speeds are given as (a)  $A_2 > A_4 > A_1 > A_3$ , (b)  $A_2 > A_1 > A_3 > A_4$ , (c)  $A_1 > A_3 > A_2 > A_4$ , and (d)  $A_1 > A_4 > A_2 > A_3$ .

$$Z(A_i) = \bigcup_n (\delta^{A_i} (A_i) \cap A) \setminus \bigcup_{\forall j} (\delta^{A_j} (A_j) \cap A)$$

$$Z(A) = \left( \bigcup_i (Z(A_i)) \right)^c$$

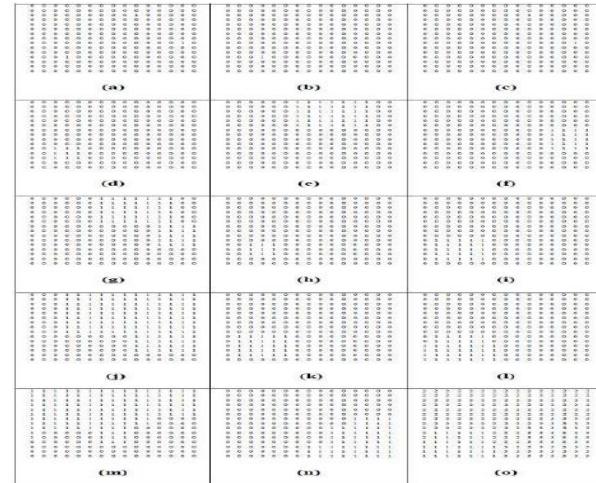


Fig. 5. (a) original map with three points (shown with 1s) for ( $A_1$ ), ( $A_2$ ), and ( $A_3$ ), (b)  $A^0$  point ( $A_1$ )-(A), (c) union of  $A^0$  points,  $\bigcup_i A_i = (A_1) \cup (A_2) \cup (A_3)$ , (d) first cycle of dilation of  $A^0$  point by  $B$  (Square in shape) with the propagation speed of  $\lambda=1$ , denoted by  $\sigma^1(A_1)$ , (e) first cycle of dilation of  $A^0$  point ( $A_2$ ) by  $B$  with the propagation speed of  $\lambda=3$ ,  $\sigma^3(A_2)$ , (f) first cycle of dilation of  $A^0$  point ( $A_3$ ) by  $B$  with the propagation speed of  $\lambda=2$ ,  $\sigma^2(A_3)$ , (g) union of  $\sigma^1(A_1)$  and  $\sigma^2(A_3)$ , (h)  $\sigma^1(A_1) \setminus \sigma^2(A_3) \cup \sigma^2(A_3)$ , (i)  $\sigma^1(A_1)$  (j) similarly for next iteration:  $\sigma^2(A_1) \cup \sigma^2(A_3)$ , (k)  $\sigma^2(A_1) \setminus \sigma^2(A_3) \cup \sigma^2(A_3)$ , (l)  $Z(A) = \bigcup_i [\sigma^{A_i}(A_i) \setminus \sigma^{A_j}(A_j) \cup \sigma^{A_j}(A_j)]$ , (m) similarly follow the steps from (b-1) by changing the  $A^0$  point from ( $A_1$ ) to ( $A_2$ ), and by treating ( $A_1$ ) and ( $A_2$ ) as  $A^0$  points; the  $Z(A_1)$  is obtained, (n) obtained  $Z(A_1)$ , and (o) three zones  $Z(A_1)$ ,  $Z(A_2)$ , and  $Z(A_3)$  are shown with 1s, 2s, and 3s.

# Point-to-Polygon Conversion

<http://www.isibang.ac.in/~bsdsagar/AnimationOfPointPolygonConversion.wmv>

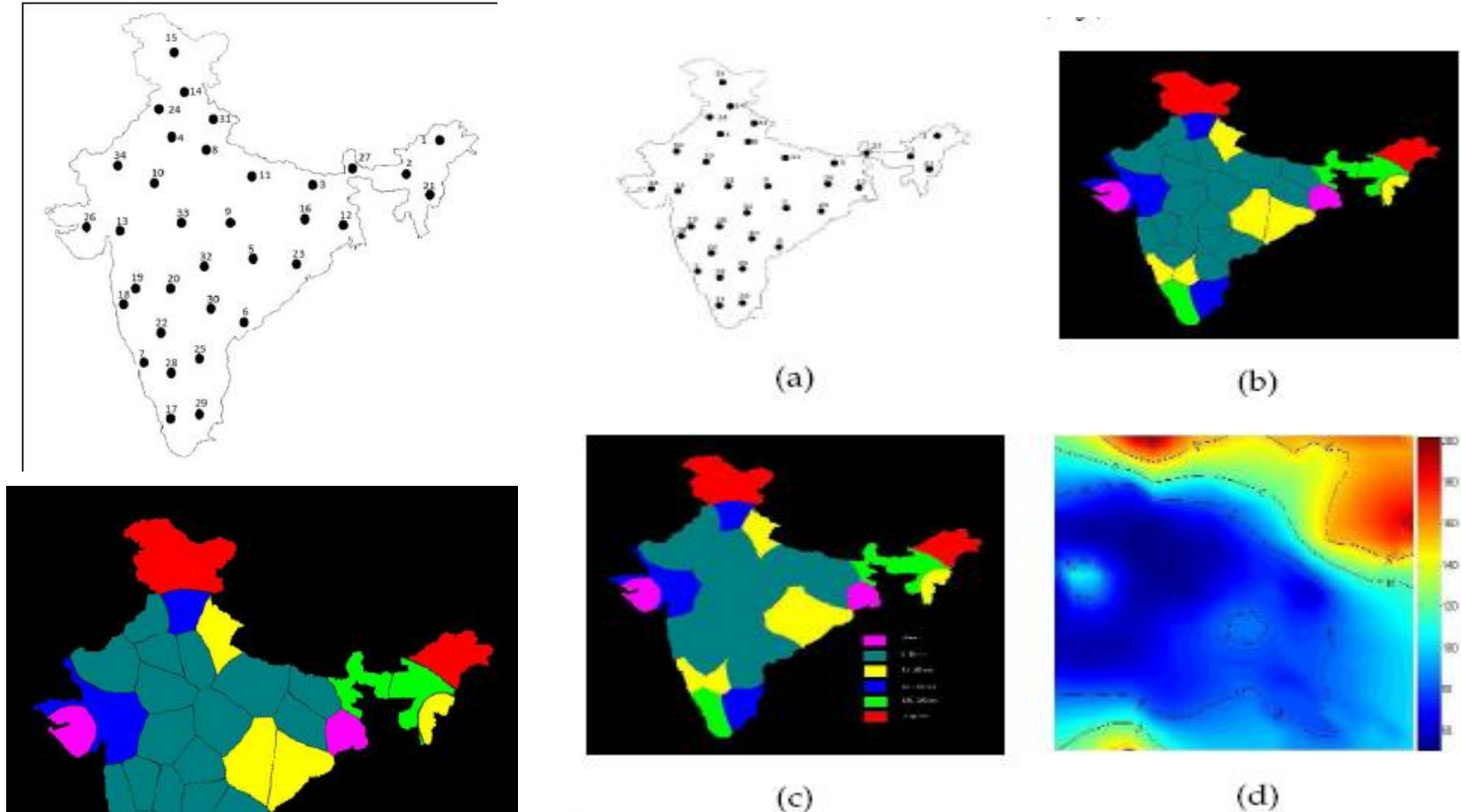


Fig. 4. (a) 34 points (locations) of rain-gauge stations spread over India indexed ( $A_1 - A_{34}$ ), (b) Rainfall zonal map generated by having various possible propagation speeds, and the variable strengths in terms of propagation speeds are given according to ranks shown in Table 1, (c) broader zones obtained after merging the zones (Fig. 4b) obtained with similar propagation speeds, and (d) kriged map generated for 34 gauge station data.