



## Motivation

- By doing this conversion the information about the spatially uncertain extent of an astrocyte cell are able to be expressed implicitly rather than explicitly

- The data and models are currently being implemented in the BISQUE system

Raster - is a type of dot matrix data structure that is generally made up of a rectangular grid of pixels

Vector - is a type of data structure represented with points, curves, and regions

Less Memory

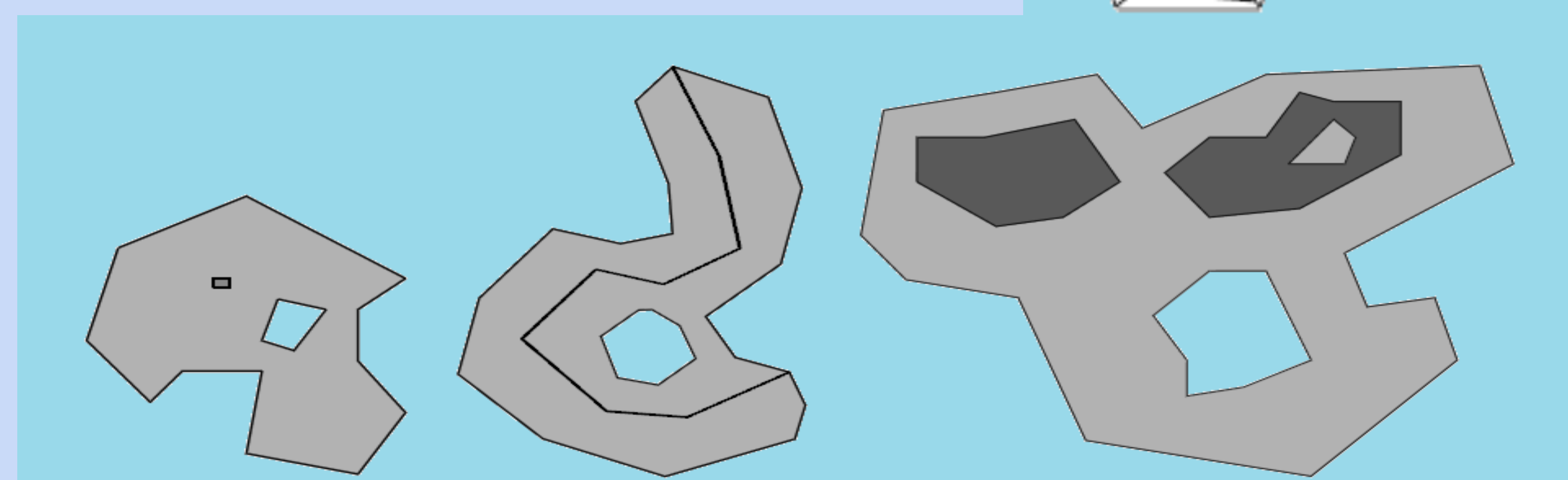
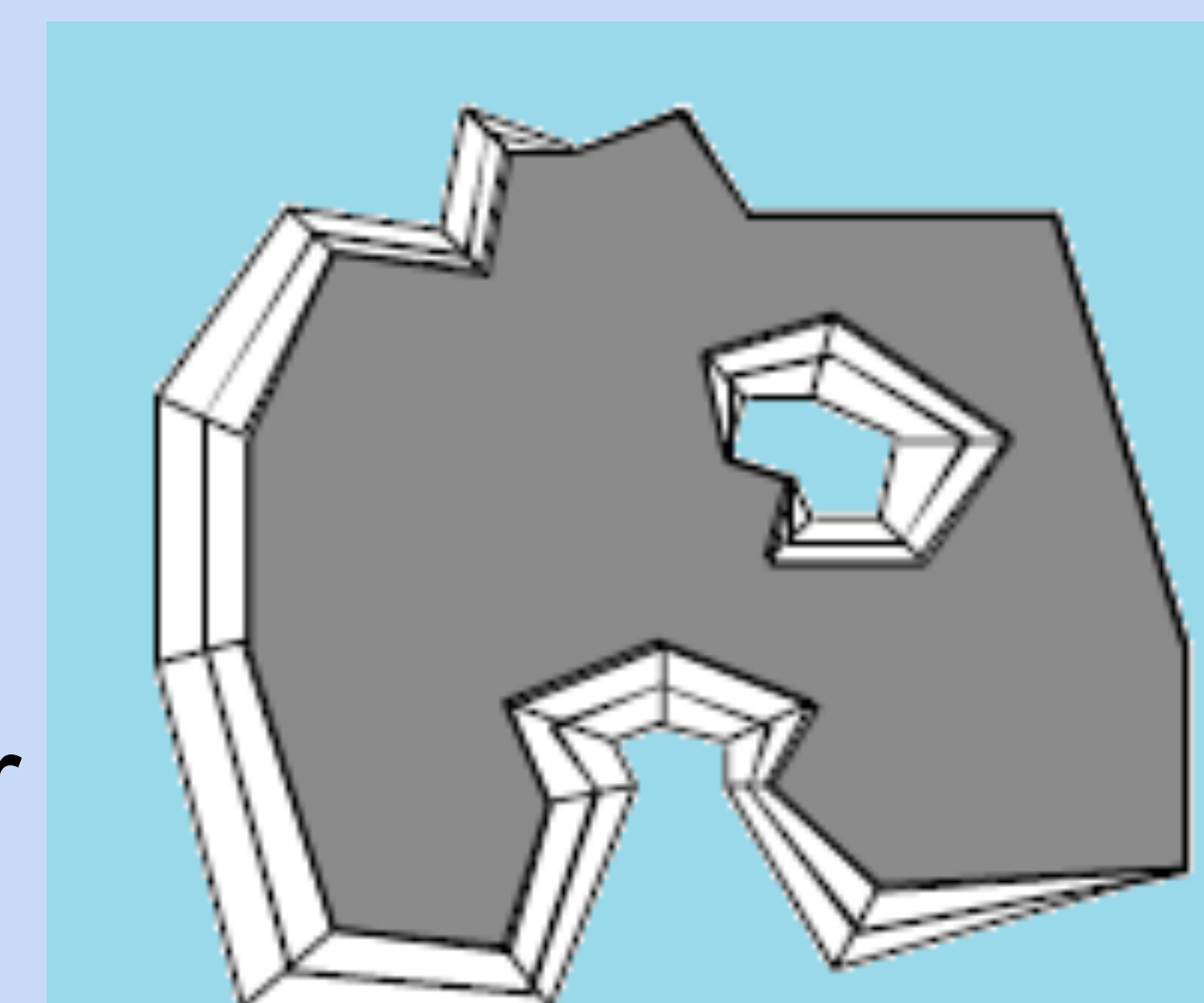
Faster Query  
Searches

## Uncertain Face

- The vectorized uncertain face consist of the following:

1. Core
2. Holes
3. Support
4. Outer region

- The uncertain face has a probability distribution when converted from raster to vector



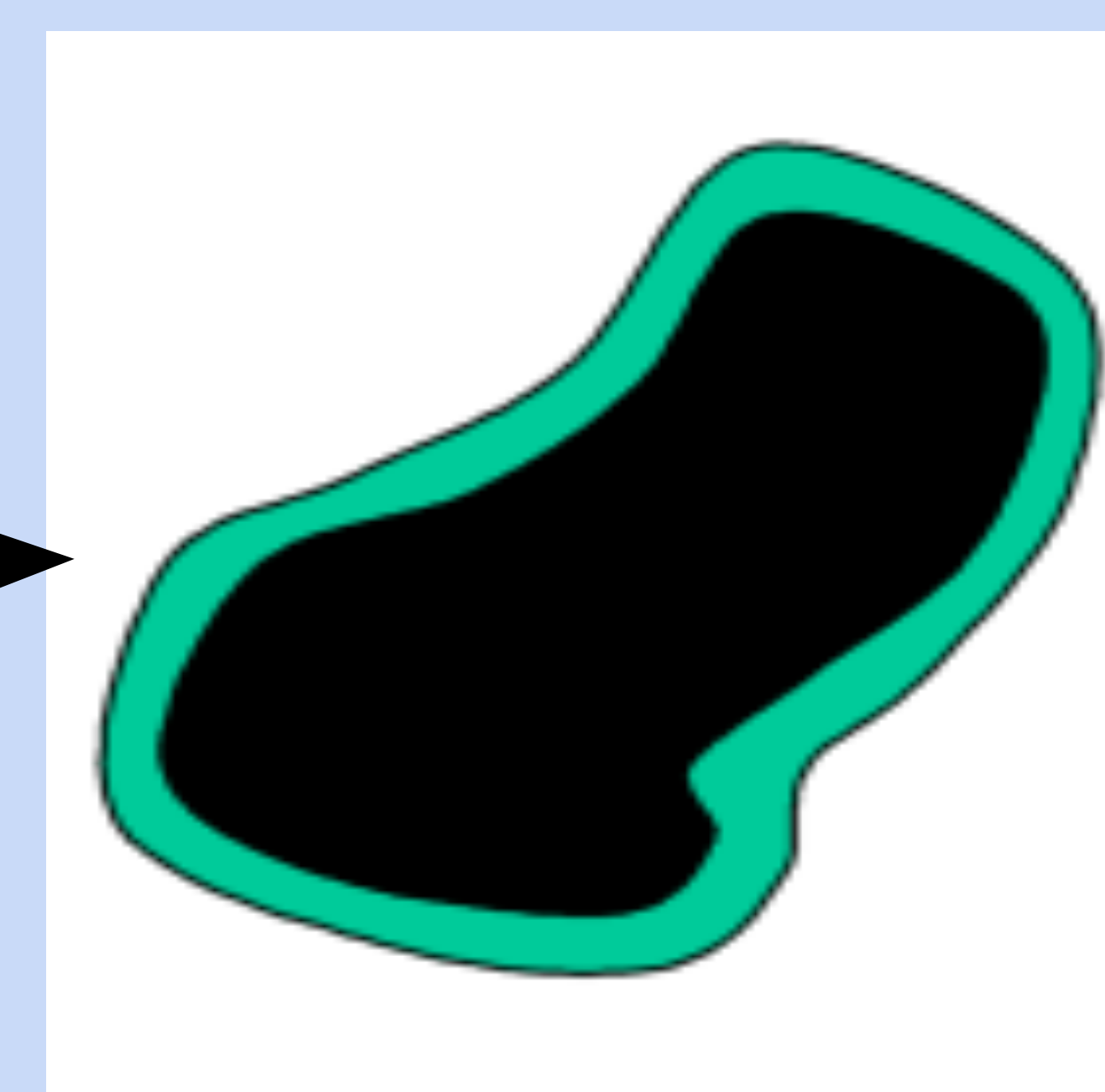
## Image "Vectorizing" in the Crisp Case

- Our approach was based off Erlend Tøssebro's work on uncertain spatial modelling

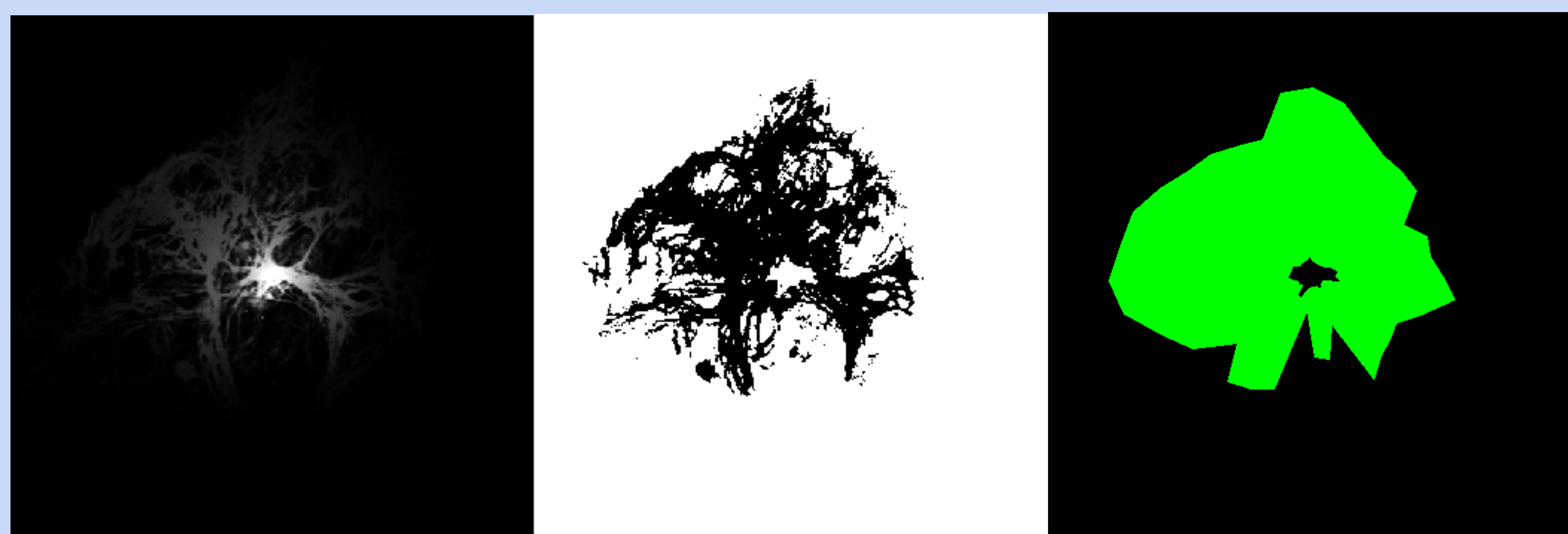
- This model consists of a support (polygonal face) and a corresponding spatial distribution  $f(x,y)$

- The distribution function of an uncertain face gives a probability value that a given point  $(x,y)$  is within the polygon

0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
0.0	0.0	0.0	0.2	0.3	0.2	0.0	0.0
0.0	0.0	0.3	0.7	0.9	0.8	0.4	0.1
0.0	0.2	0.7	1.0	1.0	1.0	0.7	0.2
0.1	0.4	0.8	1.0	1.0	0.8	0.3	0.1
0.1	0.7	1.0	1.0	0.9	0.3	0.0	0.0
0.0	0.5	0.8	0.6	0.5	0.0	0.0	0.0
0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.0



## Process



## Genetic Algorithm

- We want a genetic algorithm to learn what the parameters of the uncertain region should be.
- The genetic algorithm was chosen because:
  - the learner is unsupervised
  - the algorithm is fairly simple to implement
  - our error function (fitness function) is easily parallelizable
- The genetic algorithms fitness function test the accuracy of the raster to vector conversion
  - This is done by using the probability distribution function

## Future Work

- Complete the genetic algorithm so that the parameters of the uncertain region can be learned unsupervised
- Implement in the BISQUE database system
- Improve the "vectorizing" of the image so that a smoother representation can be created

## References

1. Erlend Tøssebro, & Mads Nygård (2003). A Medium Complexity Discrete Model for Uncertain Spatial Data, 1-9.
2. Erlend Tøssebro, & Mads Nygård (20XX). Representing uncertainty in Spatial Databases.
3. Erlend Tøssebro, & Mads Nygård (2002). An Advanced Discrete Model for Uncertain Spatial Data.
4. Erlend Tøssebro, (2002). Representing Uncertainty in Spatial and Spatiotemporal Databases.
5. Michael F. Goodchild, (1992). Geographical Data Modeling.
6. Stephan Winter. Bridging Vector and Raster Representation in GIS.