John Deere Field Boundaries

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About: John Deere is a global leader in the creation of agricultural technology.

Problem: John Deere often collects coordinates and groups them into sets to mark where a field is. However, it happens often that there are multiple data sets to describe the same field. Our goal was to automate finding field boundary polygons that cover the same physical space.

Objective: Find ways to identify boundary polygons that cover the same physical geospatial area and merge them into one field.

Data Sources: John Deere provided obfuscated data we could use to test our implementations. This data was meant to simulate field boundary data sets that John Deere typically works with.

## Data Visualization & Preprocessing

- We used Folium to plot the field boundaries over a map to represent the shapes and space they take up in the data's real world counterparts.
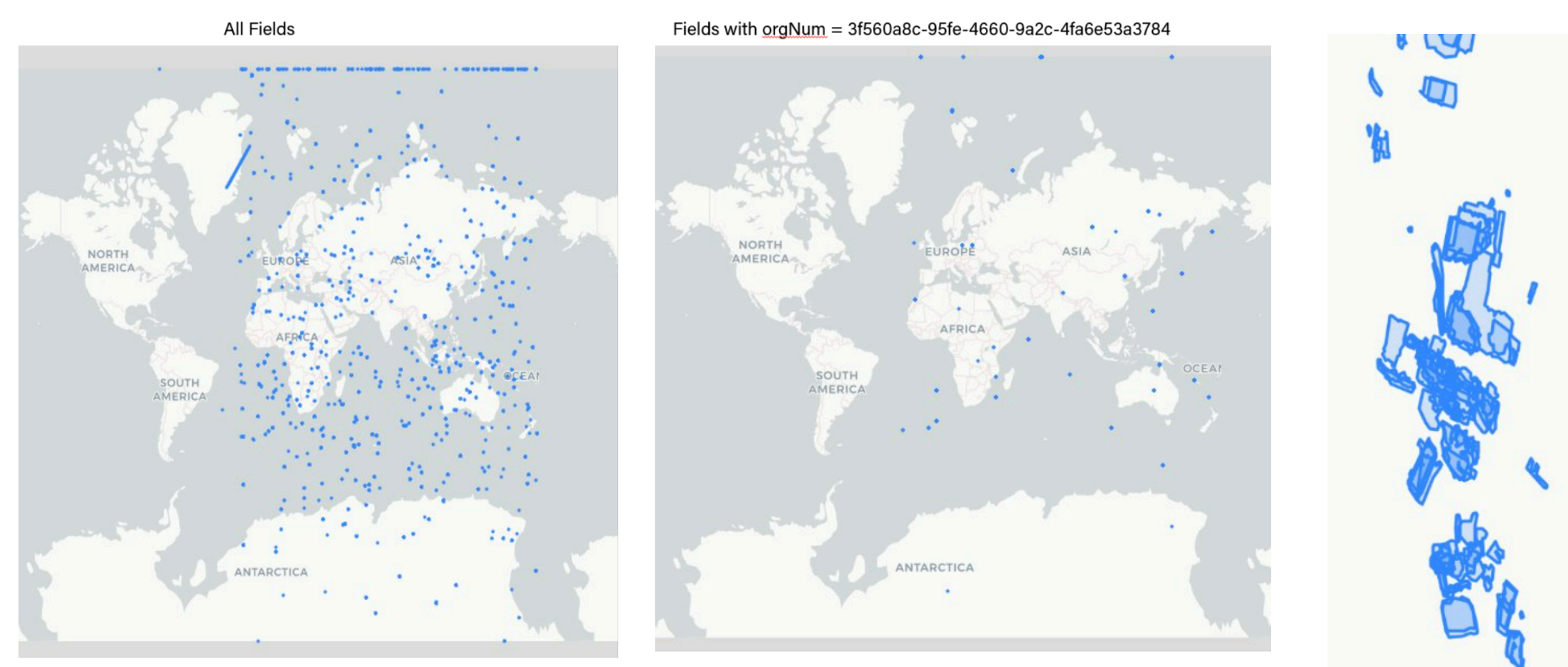
- Before fields can be merged, they have to be arranged into clusters
- We clustered fields using the H3 library
- The H3 library assigns each field a hex shape of a certain size. Fields with hexes of the same size are grouped together.
- The size of hexes to merge is increased until there are no new fields to merge.

Superfields

- Fields in the same cluster are analyzed to determine where the boundaries overlap. A shape is drawn on the outline of the overlapping field boundaries to create a "superfield".
- This method uses all data points to create a precise field, but does not smoothen edges to create the most probable field
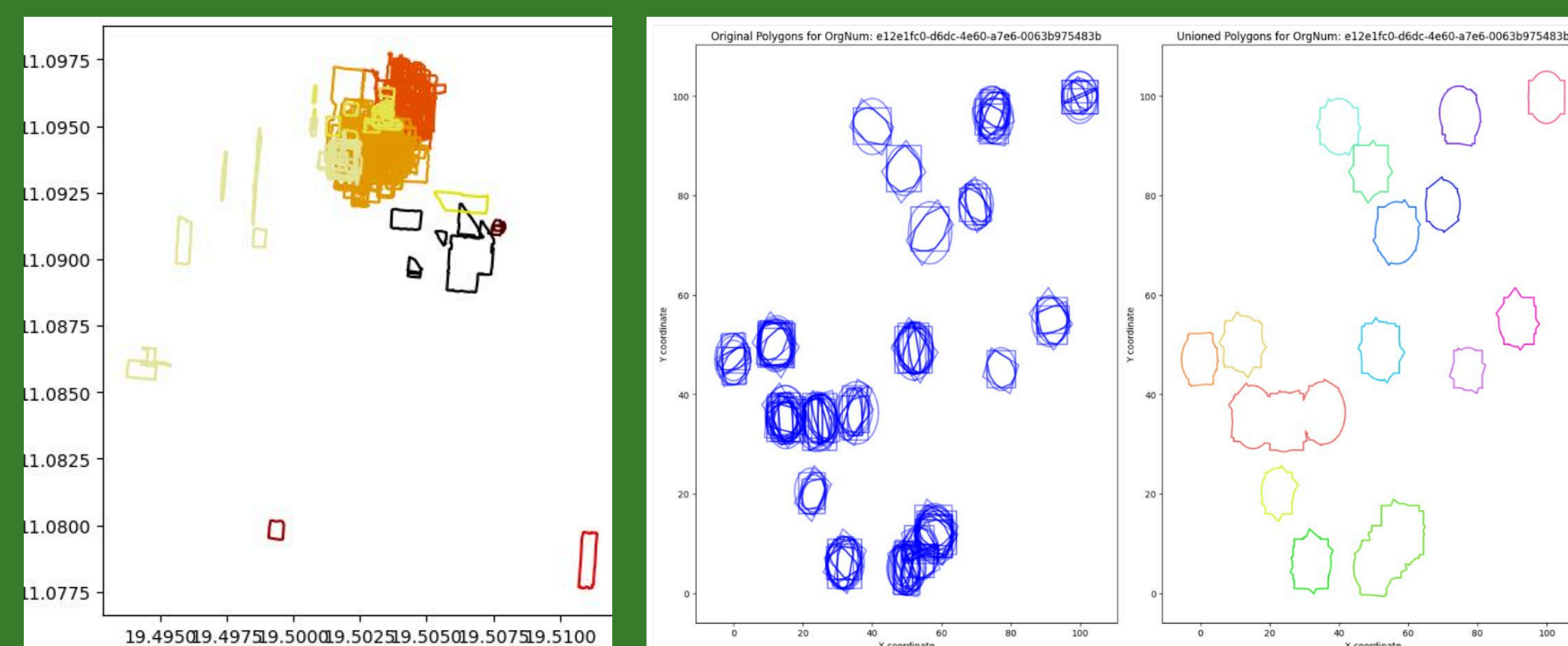
Smart Merge

- . Each cluster is analyzed to determine if there are any overlapping fields. The shape of overlapping fields is analyzed to see where common boundaries are.
- These boundaries are used to draw more general shapes to create a porbably approximation of where the field boundary lies.
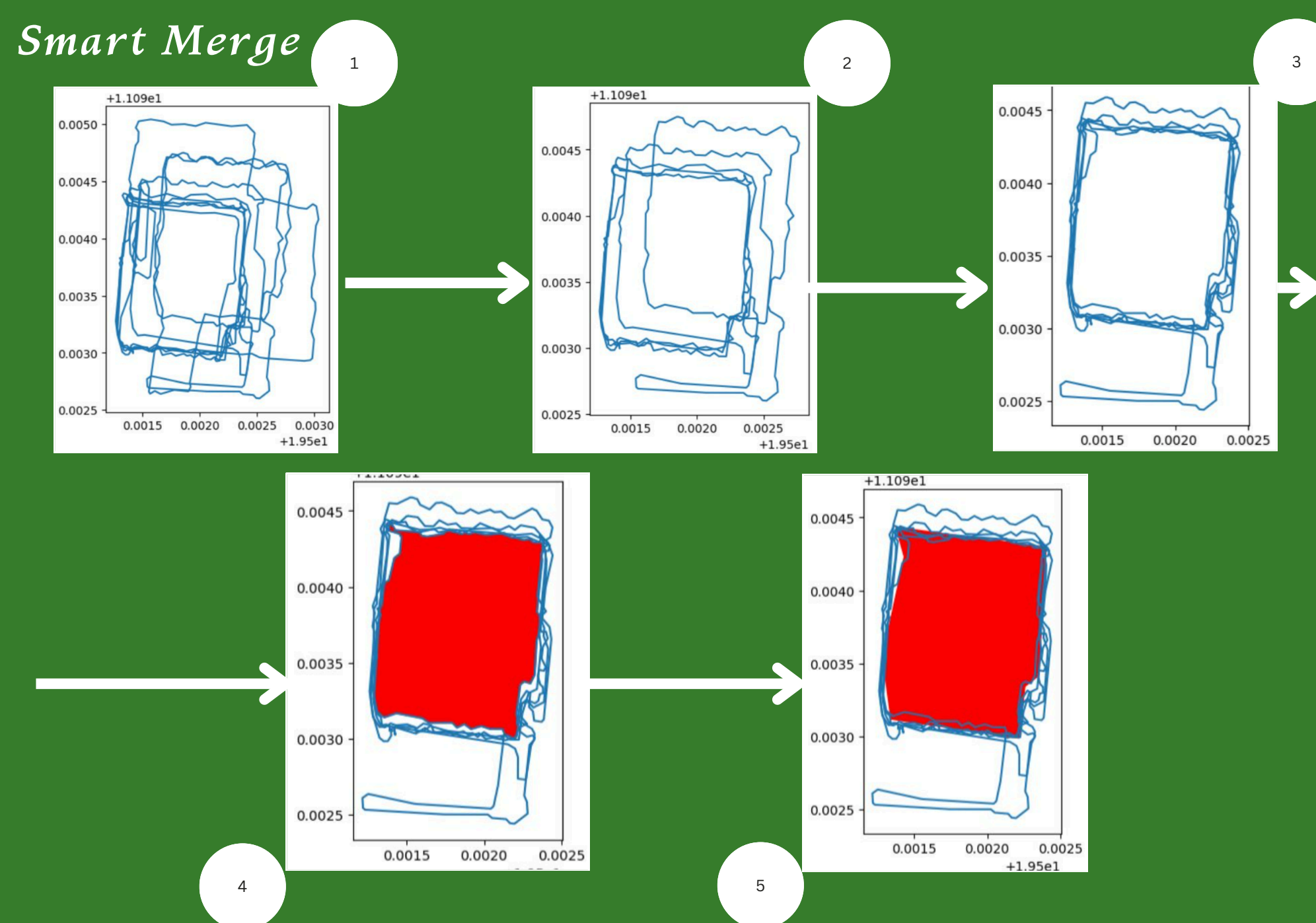- This method smoothens edges to create more probable fields

Conclusion

This semester, we worked on two different methods of merging overlapping field boundaries. We found that the smart merge algorithm gave more accurate merged boundaries.

Future Goals

- Combine boundary smoothing and boundary separation. The goal of this would be to remove unnecessary overlap and approximate straighter boundaries.
- Strengthen the clustering process to check for overlap between fields. This would be a way to verify that fields being clustered together should be merged together
- Implement a cleaner and more intuitive UI.

Smart Merge

Acknowledgments