**Lab Report**

Title: Cost Surface Model, Dory's Hike from Home to Whitewater State Park

Notice: Dr. Bryan Runck

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**Project Repository:**[**https://github.com/ThisFord/GIS5571-arc1.git**](https://github.com/ThisFord/GIS5571-arc1.git)

**Time Spent:***40*

**Abstract**

*<Delete this text in light grey throughout>*

*250 words max. Clearly summarize the following major sections. Each gets one or two sentences.*

**Problem Statement**

Dory wants to find the best route to her favorite fishing spot. She wants avoid farm fields and water that is too deep for wading; she prefers using bridges to cross streams and prefers the path with the most gradual slope.

Map

Description automatically generated

*The area of interest for Dory’s journey, the two dots represent the start and end points, while the red circle is the boundary of the study area.*

*Describe the specific problem and the context. Provide an illustrative figure and/or context map here. In the table, translate the qualitative problem statement elements into specific requirements for the analysis.*

*Table 1. Requirements*

|  |  |  |  |
| --- | --- | --- | --- |
| **#** | **Requirement** | **Defined As** | **Prep** |
| 1 | ArcGIS Pro | Software for geospatial processing |  |
| 2 | Jupyter Notebook in ArcPro | Python programming interface in esri’s ArcPro software |  |
| 3 | Lucid Chart | Model sketching online software | Sketch out workflows |
| 4 | Model Builder in Arc Pro | For building Geoprocessing workflows in Arc Pro and visualizing the process | Create and execute workflows |

**Input Data**

*Describe the data in two paragraphs max. Fill out the table.*

*Table 2. <insert caption>*

|  |  |  |  |
| --- | --- | --- | --- |
| **#** | **Title** | **Purpose in Analysis** | **Link to Source** |
| 1 | Minnesota Roads | Raw input dataset for routing analysis from MNDOT | [Mn GeoSpatial Commons](https://gisdata.mn.gov/dataset/trans-roads-mndot-tis) |
| 2 |  |  |  |
| 3 |  |  |  |
|  |  |  |  |

**Methods**

This project will compile multiple feature layers and raster data sets into normalized weighted surfaces based on Dory’s user preferences to find the optimal path of travel between her home and destination at Whitewater State Park. Figure X dercibes the following workflow. We begin by wrangling data that pertains to the area of interest (aoi), make them into a comparable raster datatype, then we normalize the raster data through a reclassification process based on a scale of 1-10, using the user preferences as a guide. After each data set has the raster cell values reclassified to the same scale based on our interpretation of Dory’s preferences we combine all of the normalized surfaces into a single weighted surface where each input surface has a different percent impact of the final cell value. This surface is used to create a cos distance raster and a back link raster, which computes the cost of moving from one cell to another based on neighboring values. These two surfaces form the final input to our cost path analysis. In our initial cost path analysis the input surfaces are weighted as follows, generating the cost path in figure X below:

*Include a data flow diagram or screenshot from model builder. Do references in line (Rammankutty, 2033). Document any and all steps that you did to the input data in the data flow diagram. Provide natural language description of the most important steps, giving a narrative arc and provide well formatting screenshots with a boarder and centered throughout.*

*Resources on Data Flow Diagrams:*

* [*https://www.visual-paradigm.com/tutorials/data-flow-diagram-dfd.jsp*](https://www.visual-paradigm.com/tutorials/data-flow-diagram-dfd.jsp)
* [*https://www.lucidchart.com/pages/data-flow-diagram/how-to-make-a-dfd*](https://www.lucidchart.com/pages/data-flow-diagram/how-to-make-a-dfd)

*Figure 1. Data flow diagram.*

*If appropriate, add in pseudo-code describing model algorithms and/or objects. If using mathematical equations, create a clear mapping between the reference equation, pseudo-code, and actual implementation in a programming language.*

**Results**

*Show the results in figures and maps. Describe how they address the problem statement.*

*Follow best practice for map design, coloring, etc.*

**Results Verification**

*How do you know your results are correct? This can be a qualitative or quantitative verification.*

**Discussion and Conclusion**

*What did you learn? How does it relate to the main problem?*

**References**

*Use a common format*

**Self-score**

*Fill out this rubric for yourself and include it in your lab report. The same rubric will be used to generate a grade in proportion to the points assigned in the syllabus to the assignment.*

|  |  |  |  |
| --- | --- | --- | --- |
| **Category** | **Description** | **Points Possible** | **Score** |
| **Structural Elements** | All elements of a lab report are included **(2 points each)**:  Title, Notice: Dr. Bryan Runck, Author, Project Repository, Date, Abstract, Problem Statement, Input Data w/ tables, Methods w/ Data, Flow Diagrams, Results, Results Verification, Discussion and Conclusion, References in common format, Self-score | 28 |  |
| **Clarity of Content** | Each element above is executed at a professional level so that someone can understand the goal, data, methods, results, and their validity and implications in a 5 minute reading at a cursory-level, and in a 30 minute meeting at a deep level **(12 points)**. There is a clear connection from data to results to discussion and conclusion **(12 points)**. | 24 |  |
| **Reproducibility** | Results are completely reproducible by someone with basic GIS training. There is no ambiguity in data flow or rationale for data operations. Every step is documented and justified. | 28 |  |
| **Verification** | Results are correct in that they have been verified in comparison to some standard. The standard is clearly stated **(10 points)**, the method of comparison is clearly stated **(5 points)**, and the result of verification is clearly stated **(5 points)**. | 20 |  |
|  |  | 100 |  |