



## Heuristic Evaluation

Project Client:  
Syntax2D  
Taubman College of Architecture  
& Urban Planning  
University of Michigan

Tao Dong  
Maureen Hanratty  
Adam Torres  
Lingyun Xu

# Table of Contents

Executive Summary . . . . .	1
Introduction . . . . .	1
Evaluation Goals. . . . .	2
Overview of Syntax2D . . . . .	2
Methodology . . . . .	2
Tasks Evaluated . . . . .	3
Findings . . . . .	3
Problem Areas . . . . .	5
Success Areas . . . . .	7
Conclusion . . . . .	8
References . . . . .	8

---

## Appendix

Complete Heuristic Evaluation . . . . .	10
Individual Heuristic Evaluations . . . . .	12
Tao Dong . . . . .	12
Maureen Hanratty . . . . .	13
Adam Torres . . . . .	15
Lingyun Xu . . . . .	21

# Heuristic Evaluation of Syntax2D

## Executive Summary

### Product and Goals

This report documents a heuristic evaluation of Syntax2D, an open source spatial analysis software program developed by the Taubman College of Architecture and Urban Planning at the University of Michigan. The goals of this heuristic evaluation were to evaluate the usability of Syntax2D using a set of heuristics and disclose a prioritized list of issues to developers' attention. The findings along with the suggestions will guide future changes in the software's interface.

### Methods

Researchers utilized Nielsen's ten usability heuristics (Nielsen, 1994) to evaluate two common tasks in Syntax2D: grid isovist and path isovist creation. Each team member independently performed tasks multiple times, recorded usability issues and which heuristic violations occurred, then rated each issue in terms of severity. Researchers later consolidated and prioritized usability issues according to severity.

### Findings

This evaluation identified 49 usability issues in total. We described eight usability issues in detail and proposed solutions to each of them in the report. The following are the most severe usability issues outlined in the report:

1. The system cannot recognize layers in a file. Users are required to specify layer names. The system does not provide feedback that the layer name the user specified was incorrect or undetected.
2. The user must initialize a grid before creating a grid. However the system allows a user to click "create grid isovist" before she has clicked "initialize grid," as well as, click 'initialize grid' before performing grid setup.
3. There are no coordinates displayed on the interface of Syntax2D.
4. Overall, errors dialog boxes do not provide helpful diagnostic information.
5. There are no clues to prevent users from clicking options that don't work in the "Show Point Properties" Menu and there are no error messages after clicking.

## Introduction

This report document is a heuristic evaluation of Syntax2D, an open source software suite for urban and architectural spatial analysis developed at the Taubman College of Architecture & Urban Planning (TCAUP) at the University of Michigan.

The analysis starts with an overview of Syntax 2D. Next, a literature survey on spatial analysis

is presented to give an idea about the state of the art in this area. An overview of the methodologies and criteria used are given in the third section of the report. The particular systems used for comparison are Depthmap, Omini-Vista, Confeego, and Spatialist. A functionality matrix is provided to visualize the difference between the systems. Detailed findings flesh out the data documented in the functionality matrix.

## Evaluation Goals

The goals of this heuristic evaluation were to evaluate the usability of Syntax2D using a set of heuristics and disclose a prioritized list of issues to developers' attention. The findings along with the suggestions will guide future changes in the software's interface. As a discount usability engineering method prior to formal user testing, heuristic evaluation is an easy, fast, and cheap approach to evaluate the usability of systems (Nielsen, 1994).

## Overview of Syntax2D

Syntax2D is an open source spatial analysis software program developed by the Taubman College of Architecture and Urban Planning at the University of Michigan. It is a suite of tools for researchers and practitioners to analyze spatial configuration of buildings and urban spaces. Syntax2D features isovist, grid, and axial analysis as well as path analysis and counting features intended to assist with field research. Measures such as connectivity, integration and mean depth can be visualized on a grid and also exported to an Excel spreadsheet as quantitative data. Source files for Syntax2D are computer-aided design (CAD) drawings in the 2000 .DXF format.

## Methodology

Researchers utilized Nielsen's ten usability heuristics (Nielsen, 1994) to evaluate two common tasks in Syntax2D: grid isovist and path isovist creation. The ten heuristics can be seen in table 1. Each team member independently performed each task, recorded usability issues and which heuristic violations occurred, then rated each issue in terms of severity. Usability issue severity rating system can be seen below in table 2. Each task was performed numerous times utilizing three or four heuristics at a time. Researchers later discussed their independent findings, then consolidated and prioritized usability issues according to severity.

Table 1: Heuristics Evaluated

- 1 Visibility of system status
- 2 Match between system and the real world
- 3 User control and freedom
- 4 Consistency and standards
- 5 Error prevention
- 6 Recognition rather than recall
- 7 Flexibility and efficiency of use
- 8 Aesthetic and minimalist design
- 9 Help users recognize, diagnose, and recover from errors
- 10 Help and documentation

Table 2: Severity Rating

- 0 - don't agree that this is a usability problem
- 1 - cosmetic problem

- 2 - minor usability problem
- 3 - major usability problem; important to fix
- 4 - usability catastrophe; imperative to fix

## Tasks Evaluated

The tasks evaluated are grid isovist and path isovist creation. During interviews users identified these tasks as being the most commonly executed using Syntax2D.

A grid isovist is also referred to as visibility graph analysis and is used to determine how visible any point in the spatial configuration is from any other point (Turner, 2003). To complete the task the user first imports an interior or urban plan into Syntax2D. The user then sets up the grid options, initializes the grid into individual cells, and finally creates the grid visualization. After this process the user can examine various space syntax measures.

A path isovist is a visibility analysis of a specific path through an interior or urban space. After importing a plan the user specifies what path she wants to examine. The user then creates observation points before she creates the path isovist. After this process the user can examine various space syntax measures related to the path.

## Findings

Below are a selected group of findings divided into two sections: Problem Areas and Success Areas. Eight problem areas and three success areas are presented. For each finding there is a table listing the specific issue, the heuristic(s) violated, and the severity of the issue. The first number in the table refers to the number of the issue as it appears in the complete heuristic

evaluation list in the Appendix.

### Problem Areas

#	Issue	Heuristic(s)	Severity
36	The system cannot recognize layers in a file; users are required to specify layer names. The system does not provide feedback that the layer name the user specified was incorrect or undetected.	#5 #6 #9	4

### Details

Importing a .DFX file is the starting point for all analyses in Syntax2D. However, the system cannot automatically recognize layers in a file. Users are required to specify names for each layer in order to import a layer successfully. Although it presents default values for layer names, the actual layer names are not always the same as those default names. In many cases that we observed, they could be quite different from the default ones.

This issue violates the sixth heuristic: "Recognition rather than recall." Users cannot import layers unless they have memorized or noted the layer names. Secondly, Syntax2D does a poor job of preventing users from errors when importing layers and lacks a mechanism to "help users recognize, diagnose, and recover from errors." Syntax2D neither warns users that the layer name they specified was incorrect nor informs users about which layers have been successfully imported.

### Proposed Solution

Since .DFX is an open format, we believe that detecting layer names within a .DFX file is possible. DepthMap has realized this highly-desirable feature. If the development team of Syntax2D isn't able to add this feature soon,

we suggest the program give error messages or warnings to keep users aware of how many layers are going to be imported or have been imported.

#	Issue	Heuristic(s)	Severity
10	The user must initialize a grid before creating a grid. However the system allows a user to click 'create grid isovist' before she has clicked 'initialize grid.'	#3 #5 #9	4

### Details

The creation of the grid isovist cannot be completed without the initialization of the grid; yet, the necessary progression is not imposed upon the user. Furthermore, when a user skips the two necessary steps they are met with the same screen as if the proper steps were executed, leading them further down the wrong path. The system gives the user too much freedom. A lack of constraints on the user leads to errors. Compounding the issue, the software does not provide any useful information when a user does commit an error.

The obvious and necessary succession of steps is a prime opportunity to impose constraints upon the user to prevent errors and wasted effort.

### Proposed Solution

A simple and common solution is to make certain features unavailable until prerequisites are met. For example, the 'Initialize Grid' and 'Create Grid Isovist' menu items could be made unavailable to the user until the necessary steps are completed.

#	Issue	Heuristic(s)	Severity
25	There are no clues to prevent users from clicking options that don't work in the "Show Point Properties" Menu and there are no error messages after clicking.	#1 #5 #9	3

### Details

When users click "Show Point Properties" under "Path" menu, more than a dozen measures are listed. However, many of them will provide data for the current analysis. A user cannot tell, by their appearance, which measures will provide data and which measures will not provide data. When a user clicks on a measure that is inactive, there is no system response alerting the users that measure will bear no results. Instead the grid goes completely black.

### Proposed Solution

Measures that will not provide data for the current analysis should appear gray and should not be selectable by the user.

#	Issue	Heuristic(s)	Severity
33	There are no coordinates displayed in the interface of Syntax2D.	#1 #3	4

### Details

It is important for users to know the coordinates for specific points on plans, but in Syntax2D users cannot see the coordinates on the main window. Coordinates do not appear when mousing over a point either next to the mouse pointer or in the status bar. The only way a user can view coordinates for the current point is by examining the "Isovist Properties" dialog box by clicking the menu item "Isovist --> Point Isovist Properties..." Once open, the dialog box

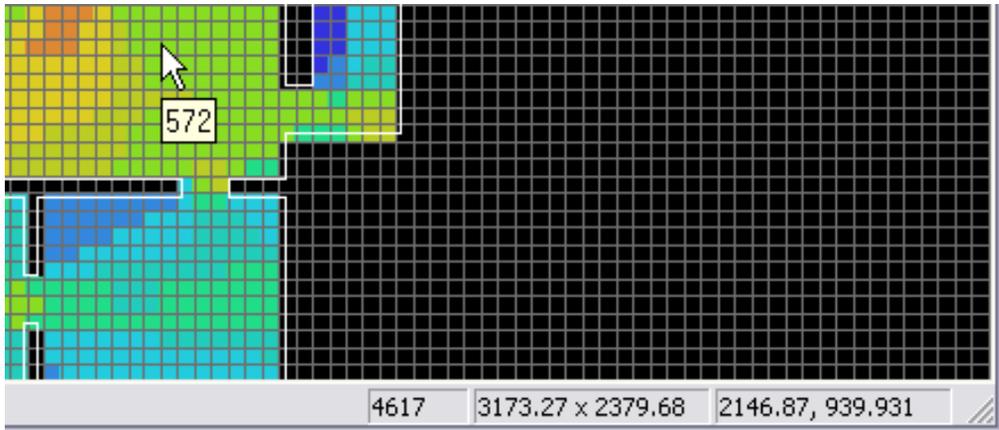


Figure 1. In Depthmap a mouseover displays isovist value. Coordinates for the point appear of the status bar.

becomes the foreground of the application and locks the main window. Consequently, users have to close the dialog box in order to restore the control of main window.

Because of the quantitative nature of spatial syntax analysis, it is very critical that users are aware of the coordinates of a point. Researchers are often interested in gathering visual and quantitative data on specific key points in the interior or urban plan thus it is critical that users are aware of point coordinates. One interviewee told us that her task requires her to look up the coordinates of points frequently and she was frustrated that she had to repetitively open and close the “Isovist Properties” dialog box to obtain point coordinates.

#### *Proposed Solution*

To solve this issue, Syntax2D may consider implementing the method a competing space syntax software program, DepthMap, utilizes by displaying coordinates in the bottom-left corner of the status bar when the mouse pointer is hovered over a point as shown in Figure 1.

#	Issue	Heuristic(s)	Severity
28	Users must go back to the Grid menu and select “Show Grid Properties” and to ensure what measure is being displayed, nor is it obvious what measures are available.	#1	3
27		#6 #7	

#### *Details*

After the grid isovist has been created, the imported floor plan displays a spectrum of colors according to what measure is being displayed. There are a number of problems that occur at this point. First, while the grid is being displayed, there is no way of knowing which measure is being displayed, as seen in figure 1. Secondly, the user must delve two levels deep into the Grid menu to find a list of measures that can possibly be displayed. Finally, the list of measures in the Grid menu does not provide feedback to the user as to what measure is being displayed.

The problems detailed above arise because users are not aware of the current state of the

system. This lack of visibility forces users to use a method to identify which measure is currently being displayed that is inefficient and a waste of effort. In addition, rather than providing all the measures up front, the user must recall that other measures are available.

#### *Proposed Solution*

Syntax2D can learn from Depthmap's method of displaying measures and options of measures to the user. A possible solution, like Depthmap, is to use data layers. Each layer represents a different measure and the highlighted layer is the measure currently being displayed. This would solve the issue of what measures are available; users could simply recognize measures rather than recall them. It also provides information about the current state of the system, i.e. what measure is currently represented in the visualization.

#	Issue	Heuristic(s)	Severity
47	Overall, errors dialog boxes do not provide helpful diagnostic information.	#5 #9	4

#### *Details*

While creating a path isovist one evaluator unintentionally skipped necessary steps of creating observation points. When this error occurred, the evaluator was presented with an error dialog box that stated, "Invalid Path," as seen in Figure 2. Although the evaluator could see the path and had setup the path correctly, the evaluator had forgotten to create the observation points. Though an error dialog box appears it does not tell the user the necessary steps to fix the error. Instead, the error could read, "Must create Observations Points prior to running analysis." This would help guide the user in completing the task.



Figure 2. Syntax2D error dialogue box.

#### *Proposed Solution*

Create more informative error dialog boxes that are more descriptive about the error that occurred. Use the error dialog box as an opportunity to guide the user in a specific direction that will help them complete the task.

#	Issue	Heuristic(s)	Severity
11	The cancel button is mislabeled as "OK" on the Progress dialog box popped up after clicking "Create Grid Isovist."	#4 #6	2

#### *Details*

When users click "Create Grid Isovist," a progress bar pops up offering two options for the users: either start the grid creation process or cancel it (see Figure 3). The cancel button is mislabeled as "OK". Users are easily misled to click "OK" because people normally believe that "OK" means agreeing to do something (in this case, to create grid isovist).

The labeling of the cancel button does not comply with the professional standards and is not consistent with people's cognitive habits.

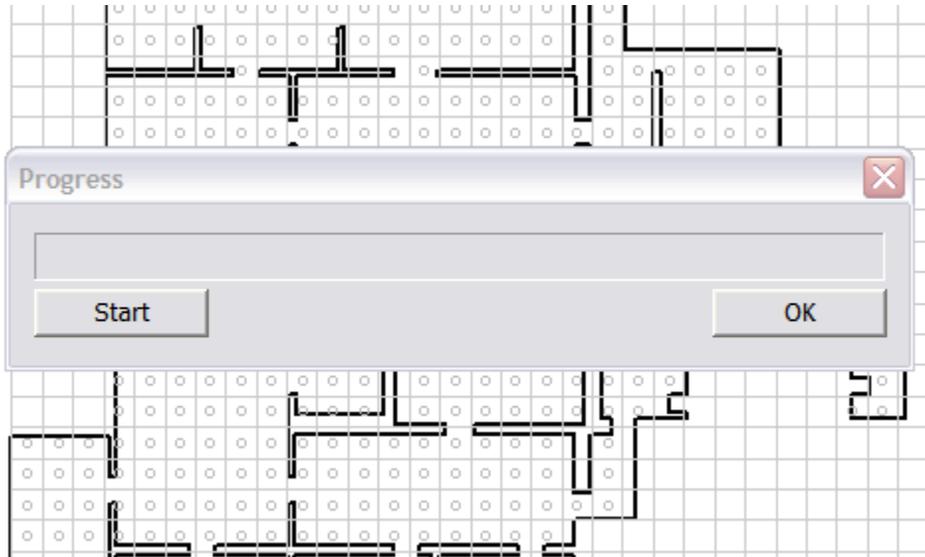


Figure 3. Progress bar of Create Grid Isovist in Syntax2D.

### *Proposed Solution*

Change the label of “OK” to “Cancel”.

#	Issue	Heuristic(s)	Severity
14	System gives users no indication how much time creating a grid will take. Computation time is provided but only after the action is complete.	#1	2

### *Details*

After users click “Create Grid Isovist”, a progress bar pops up with two choices for users. They can either start to create a grid isovist or cancel the process. However, the system does not indicate how long the grid creation process will take. Only after the process is complete, does a window appear informing the users of the actual time spent (see Figure 4). Though this gives the user feedback that she can use to determine how long a future grid creation task might take, it is not helpful in the moment.

The current state of the system is ambiguous if the user does not know how much time will pass before the grid creation task is complete.

### *Proposed Solution*

On the top corner of the progress bar display the estimated time needed for grid isovist creation while the process is taking place, not after.

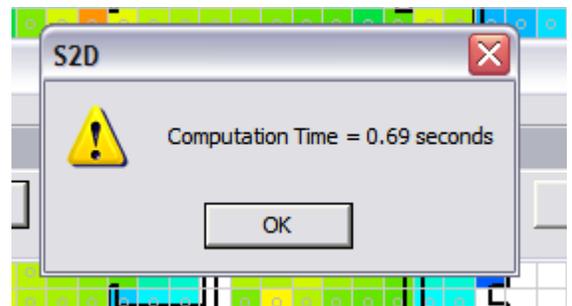


Figure 4. Progress bar of Create Grid Isovist in Syntax2D.

## Success Areas

#	Issue	Heuristic(s)	Severity
1	Syntax2D Manual gives easy to follow instructions on how to execute major system tasks.	#10	0

While simplistic, the current Syntax2D manual does a good job of walking the user through major system tasks. The tasks presented are: import a file, navigation, point isovist, grid isovist (visibility graph analysis), path isovist, path count, point count, and axial line analysis. The manual provides screen shots of steps in each task, which help the new user verify that she is executing the task correctly. Without this documentation the evaluation group would not have been able to execute a single task in the system. A link in the “Help” menu to an online version of the manual would enhance the value of the manual. An important possible addition to the manual is a list and explanation (possibly with mathematical formulas) of space syntax measures. The evaluation group suggests that the manual remain simple and task based. One user reported frustration with the complexity of Depthmap’s researcher’s handbook. The newer versions of the Syntax2D manual should avoid unnecessary detail.

#	Issue	Heuristic(s)	Severity
52	On pull down menu the user can only “Import DXF.” “Export” restricts user to “comma separated values.”	#5	0

Syntax2D does a good job of informing the user exactly what type of file, .DXF, may be imported into the system. When importing a file via the pull down menu the user mouses over “Import,” “DXF” is the only option that appears. The toolbar icon for importing a file is a file

folder with DXF as text. Similarly, when a user exports data from the system there is only one option for “Export,” which is “Comma Separated Values.” Both functions could be improved however if the pull down menu listed “Import DXF” or “Export Comma Separated Values” instead of making the user mouse over “Import” and “Export” to get to the options.

#	Issue	Heuristic(s)	Severity
53	Toggleing between views using toolbar buttons.	#5	0

The evaluation team found it helpful to use the “Show/Hide” buttons on the toolbar to toggle between views. The user can “Show/Hide Walls,” “Show/Hide Point Isovist,” “Show/Hide Path Isovist,” “Show/Hide Markers,” “Show/Hide Grid Isovist,” etc. An application of this functionality is hiding a path isovist during a path isovist analysis in order to focus attention on viewing the visual data generated by isovist measures. The “Show/Hide” buttons are always visible and easy to access in the toolbar. The user gains control and flexibility with minimal cognitive and physical effort.

## Conclusion

Researchers yielded a large number of usability problems from the heuristic evaluation of Syntax2D. The solutions to many of the usability issues uncovered are well documented and have been implemented in other software products. The Syntax2D development group can use the list of usability issues, in order of severity, to guide the redesign of the software’s interface.

## References

Nielsen, J. (1994). Heuristic evaluation. In J.

Nielson & R. L. Mack (Eds.), Usability inspection methods (pp. 25-62). New York: John Wiley & Sons.

Turner, A. (2003). Analysing the visual dynamics of spatial morphology. *Environment and Planning B: Planning and Design*, 30(5), 657-676.

### Issues and Success Areas Found Using Heuristic Evaluation Methods

#	Issue	Heuristics Violated	Severity
10	The user must initialize a grid before creating a grid. However, the system allows users to 'create grid isovist' before the user has clicked 'initialize grid.'	#3, #5, #9	4
31	When clicking on the "New" button or the same menu item, you will lose your current work without warning.	#5, #3	4
33	There are no coordinates displayed on the interface of the Syntax2D.	#1, #3	4
36	The system cannot recognize layers in a file. Users are required to specify layer names. The system does not provide feedback that the layer name the user specified was incorrect or undetected.	#5, #6, & #9	4
41	There is no measure shown by default after the path isovist is created.	#1	4
42	No "undo" function.	#9	4
46	There is no color spectrum on the left side of the screen to help the user understand the path isovist measures. This is inconsistent with the grid isovist presentation.	#1, #4, #6	4
47	Overall, errors dialog boxes do not provide helpful diagnostic information, for example when a user skips to the create path isovist without preparing the path or observation points, an error dialog box simply states "invalid path" rather than providing useful instructions.	#5, #9	4
50	System requires polylines but does not give the user feedback that he/she has uploaded a drawing without complete polylines. If there is a gap in between lines it floods the area with cells during grid initialization. The user must go back to AutoCAD, redo the drawing, then re-import to Syntax2D.	#4, #5 & #9	4
28	Cannot tell what measure you are looking at (default measure = area) after the grid isovist has been created	#1	3
27	Must go back to pull down menu to "Show Grid Properties" to select a different measure	#1, #6, #7	3
2	"Help" menu item and toolbar item does not lead to any system documentation, only leads to about information.	#4, #10	3
5	When the program is started a white canvas appears. It appears that action can be taken on the file, yet a file must be imported before any action is taken. All the buttons and menu items are clickable even if no file has been imported.	#1	3
17	No system feedback after "Grid Setup" to prompt user to initialize grid.	#1	3
20	The system will allow users to initialize the grid without performing grid setup, and does so using default settings.	#1, #3, #5, & #9	3
22	System does not give the user feedback that the span size they requested has too many cells for the program to process.	#5, #9	3
30	If you did not click on "Calculate graph measures" on the "Grid Setup/Options" then many of the measures will produce no results. You must redo the entire create grid process in order to recover these measures.	#9	3
34	The color and size of the measure are not legible.	#1	3
35	Gradations on side color bar are too subtle to distinguish from one another	#6	3
43	For the "Display Method" "By Radius" and "By Area" it is very hard to distinguish the thin gray line of the circle with the gray of the isovist.	#1	3
39	Have to know to select "Show Path Properties" from the pull down in order to show measures	#6	3
25	There are no clues to prevent users from clicking options that don't work in the "Show Point Properties" Menu and there are no error messages after clicking.	#1, #5, & #9	3
3	Only "New," "Open," and "Save" have keyboard short cut.	#7	2
7	To import a DXF file, the user selects the import icon or File > Import. But when the dialog box pops up, it says 'Open' in the title bar and the button the user must click to complete the action is also called 'Open.' It is inconsistent.	#4	2
11	The cancel button is mislabeled as "OK" on the progress dialog box popped up after clicking "Create Grid Isovist."	#4, #6	2

14	System gives users no indication how much time creating a grid will take. Computation time is provided but only after the action is complete.	#1	2
18	Must remember to "Initialize Grid"	#6	2
19	Must remember to "Create Grid Isovist"	#6	2
29	No help to tell you what measures mean, either a narrative or formula)	#10	2
38	"Create Observation Points" dialog doesn't display the current setting, nor does the canvas.	#1	2
40	Hard to see observation point numbers or path numbers	#8	2
45	You can't hide a particular path that you don't need.	#3, #7	2
48	Panning not consistent with panning in AutoCAD	#4	2
49	User cannot zoom in by making a rectangle in the canvas area	#4	2
4	It is not obvious to tell if a new file has been initialized when Syntax2D get started. Users may execute "File -->New" unnecessary.	#1	1
8	On pull down menu, when you hover on "Import" it pops up a menu with "Import DXF." Extra step.	#8	1
12	The Progress dialog box doesn't disappear automatically when the creation of grid isovist is done. Extra step.	#7	1
13	The 'start' button should stick out more than the cancel button on the Progress dialog box popped up after clicking 'Create Grid Isovist.'	#8	1
15	Have to press "OK" on progress bar is confusing because the shadow on the "Start" button makes you think you should press that	#2	1
16	System should not allow you to press "Start" again	#5	1
21	Users should be made aware that by changing span size, count X, or count Y that all will be effected (Photoshop does this well with link icon)	#4, #6	1
23	The use of field sets is only used on one portion of the dialog box (Offset). It may feel more consistent to use field sets for the rest of the dialog box.	#4	1
24	"Out of memory" error is misleading. Should state "there are too many cells"	#2, #9	1
26	"Calculate graph measures" gets lost among other choices in dialog box	#8	1
32	Cannot export "View Report" to a document	#3	1
37	Progress for processing points on a path is presented in the blue toolbar. Inconsistent with status bar implementation.	#1, #4	1
44	Cannot export "Path Isovist Data" to a document (though I assume it is a representation of the comma separated values.)	#2	1
1	Syntax2D Manual, while simplistic, does a good job of taking the user through the basic steps of the process; screenshots a big plus.	#10	0
6	Scroll mouse like AutoCAD	#5	0
52	On pull down menu the user can only "Import DXF." Export restricts user to "comma separated values."	#5	0
53	Toggling between views using toolbar buttons.	#5	0

#	Issue	Heuristics Violated	Severity
1	Only "New," "Open," and "Save" have keyboard short cut	#7	1
2	It is not obvious to tell if a new file has been initialized when Syntax2D get started. Users may execute "File -->New" unnecessary.	#1	1
3	All the buttons and menu items are clickable even no layer imported; They are not gray.	#1, #4, #5	3
4	All the operations have to start with import layers, but there is no clue to inform users.	#5, #1	2
5	Users have to specify layer names	#6	4
6	The cancel button is mislabeled as OK on the Progress dialog box popped up after clicking "Create Grid Isovist."	#4	2
7	The Progress dialog box doesn't disappear automatically when finishing	#7	1
8	There are no clues to prevent users from clicking options that don't work in the "Show Point Properties" Menu and there are no error messages after clicking.	#5, #9	3
9	The program doesn't indicate what is the current property/measure being shown on the canvas	#1, #6	3
10	When clicking on the "New" button or menu item, you will lost your current work with out warning.	#5, #3	4
11	There are no coordinate displayed on the interface of the Syntax2D	#1	3
12	The color and size of the measure are not legible	#1	3
13	"Create Observation Points" dialog doesn't display the current setting	#1	2
14	No "undo" function	#9	3
15	No Color-Value map in the path isovist analysis	#6	2

Grid Isovist		
Heuristic	Explanation	Severity
	Syntax2D Manual, while simplistic, does a good job of taking the user through the basic steps of the process; screenshots a big plus.	0
	10 On pull down menu can only Import DXF	0
	4 Scroll wheel on mouse consistent with AutoCad	0
	8 "Calculate graph measures" gets lost among other choices in dialog	1
6, 4	Users should be made aware that by changing span size, count X, or count Y that all will be effected (Photoshop does this well with link icon)	1
1, 2, 6	No feedback about what changing the "Offset" does.	1
	No help or documentation to tell user what changing the "Offset" X, Y values does	1
	System does not give the user feedback that the span size they requested was too many cells for the program to process	1
5, 9	"Out of memory" error sign is misleading. Should state "you selected too many cells"	1
2, 9	9 After "out of memory" error user had to force quit program	3
	1 No system feedback after "Grid Setup"	3
	6 Must remember to "Initialize Grid"	3
	6 Must remember to "Create Grid Isovist"	3
	Have to press "Start" on progress bar that pops up after pressing	
2	"Create Grid Isovist" is extra labor	2
	If you want to stop the creation of a grid there is no cancel button.	
	Though ok does this function it makes the user think it cannot get out of the process	2
6	Computation time pop-up - wasn't sure if that meant the computation was complete or that it was beginning	
2	Is it necessary to have to click "OK" button?	1
5	System should not allow you to press "Start" again	1
	Have to press "OK" on progress bar is confusing because the shadow on the "Start" button makes you think you should press that	2
2	Cannot tell what measure you are looking at (default measure = area)	3
1	Gradiations on side color bar are to subtle to distinguish from one another	2
6	Numbers on sidebar have strange interval (3.52). Not sure what number means	
2	Cannot get rid of point isovist (won't go away if you click out of the grid)	1
3	Must go back to pull down menu to "Show Grid Properties" and to select a measure	3
6	Cannot tell what measure you just selected	3
6	No help to tell you what measures mean, either a narrative or formula)	3
10	4 When switching measures, point isovist disappears	1
	If you did not click on "Calculate graph measures" on the "Grid Setup/Options" then many of the measures will produce no results (cells will go black. There is no way for the user to know what measures are/are not available to them	4
5	Must remember to go to "Export" in pull down menu to export data as comma separated values.	
6	Cannot export "ViewReport" to a document	1

- 1, 6, 5 "Export" restricts user to "comma separated values" 0
- Like how you can toggle between grid view/non-grid view with icon.
- 8 Helps when looking at point isovists 0

Path Isovist		
Heuristic	Explanation	Severity
	6 User must remember that they need to Import the Path	2
	If "Import Path" at the bottom of the pull down menu. If it is the first step	
2, 4	it might be more appropriate to have it at the top of the pull down	1
	6 User must remember the name of the path layer	3
	Inconsistent-sometimes it recognizes that there is a path (urban plan)	
	4 sometimes it doesn't (all plan)	2
	6 Must remember to "Create Observation Points"	3
	6 Must remember to "Create Path Isovist"	3
	Progress for processing points on a path is presented in the blue	
	4 toolbar. Inconsistent with status bar implementation	2
	Have to know to select "Show Path Properties" from the pull down in	
	6 order to show measures	2
	8 Hard to see observation point numbers or path numbers	1
	For the "Display Method" "By Radius" and "By Area" it is very had to	
	8 distinguish the thin gray line of the circle with the gray of the isovist.	2
	2 Cannot export "ViewReport" to a document	1
	Cannot export "Path Isovist Data" to a document (though I assume it is	
	2 a representation of the comma separated values.	1

Path Count		
Heuristic	Explanation	Severity
	"Path Count" is at the bottom of the "Show Grid Properties" pull down,	
	8 the 27th item	1
	Because it is a path analysis, would users expect to find it under the	
	2 "Path" pull down?	2
	How does the system know which path to run the path count on?	
	Confusing because you select the path on "Path>Path Options" not	
1, 2	under the "Grid" pull down	3
General		
Heuristic	Explanation	Severity
	3 Can toggle between views but cannot undo a path isovist for instance.	3

## Grid Isovist

## 1. [Violation of HE 1] [Severity 1] [Fix 0]

## Action: Starting the Program

This may be a bit too picky, but when the program is started the canvas is white. This leads me to believe that it is ready and the file I need to work with has already been created. I get this feeling from using Photoshop, for example, when you have created a document, you have a canvas, but when you don't, its grayed out and there is nothing there you can do except create a new document or import. In other words the status is somewhat confusing.

## 2. [Violation of HE 4] [Severity 2] [Fix 0]

## Action: Importing the DXF file

The action is importing an existing DXF file, so logically I click the import icon or File > Import. But when the dialog box pops up, it says 'Open' in the title bar and the button I must click to complete the action is also called 'Open.' There seems to be an inconsistency between the actions and the language used to complete these actions. This is an easy fix--just change the title and the button to say import. This is important due to the fact that there is another action called open that opens .ss2 files not .DXF files.

## 3. [Violation of HE 3, 5, 9] [Severity 3] [Fix ??]

## Action: Create Grid Isovist

We know that the creation of the grid isovist cannot be completed without the initialization of the grid. Yet, like I did, I went straight to create grid isovist and it presents me with a pop up that leads me to believe that I am doing the right thing when in fact I'm not. It presents me with the pop up with start and progress bar. The program gives me too much freedom to go out of order, in addition, it doesn't prevent me from going through the process in which I create a grid that shows nothing, so it doesn't prevent that error.

My suggestion is to gray out the 'Create Grid Isovist' menu option and the icon from the tool bar, so that users will wonder why they cannot select this option.

## 4. [Violation of HE 1, 3, 5, &amp; 9] [Severity 2] [Fix 2]

## Action: Grid Initialization

The system will allow me to initialize the grid using default settings. While this may be good for a person that knows the default grid settings, it doesn't tell the user under what settings the grid is being initialized. If this an unintended action, it doesn't prevent the user from initializing a grid without desirable settings, it provide feedback as to what settings are being applied to the grid, and provides too much freedom of choice.

My suggestion is to either combine the grid setup and initialize grid into a single action or if a user does skip the grid setup step, then provide a information dialog box that states that default grid settings will be applied,

and the user would then click okay and the grid would be initialized without using the grid setup.

5. [Violation of HE 4] [Severity 1] [Fix 0]

Action: Grid Options Dialog

The use of field sets is only used on one portion of the dialog box (Offset). It may feel more consistent to use field sets for the rest of the dialog box, for example a field set for the total cells options called Granularity or Total Cells. This could also provide the user with more context as to what the options actually do. This would support more first time users than expert users.

6. [Violation of HE 7] [Severity 3] [Fix ??]

Action: Overall Experience

The program doesn't support expert users well because it doesn't have keyboard shortcuts available for common task such as grid creation or file importation. Although this program is used very infrequently that keyboard shortcuts may be useless, I think the effort in implementing is low enough that the benefits for some users will be much higher.

7. [Good HE 6 Implementation]

Action: Overall Experience

The program does a great job at providing options visually (although not in every case as you will see) so that users can recognize their possible next steps. They do this by providing options through the menu and the toolbar.

8. [Violation of HE 4] [Severity 2] [Fix 0]

Action: Create Grid Isovist

The okay button is actually a cancel button. It doesn't complete the creation of the grid, it actually backs out of the process. I would just change okay to cancel.

9. [Good HE 1]

Action: Grid Creation Progress Bar

Through our user interviews, we have heard that the grid creation process can take a long time. The progress bar does a good job of making the user aware of the current system state. Not only in total progress, but in the number of passes it needs to complete and has completed. Maybe, adding a progress bar for total progress would help make this better.

10. [Violation of HE 1, 6, 7] [Severity 4] [Fix 3]

Action: Changing the displayed measure of the grid isovist

It isn't visibly clear what measure is being displayed (Area vs. Connectivity). It also isn't visible which choices we have available to us because they are buried in the menu two levels deep. The user must recall what measure is being displayed, then go to the menu of measures and select the one they would like to view.

This could be solved by using something like layers in photoshop--but you can only view one layer at a time. Each layer would represent a different measure, the highlighted one is being viewed currently, but also a user could view what other measures they have at their disposal (like Depthmap).

11. [Violation of HE 6 & 7] [Severity 4] [Fix 3]

Action: Changing the displayed measure of the grid isovist

In addition, it isn't clear which measures we have the ability to utilize (Area vs. Connectivity) based off our grid options settings (whether Calculate graph measures what checked or not). This could be solved by my previous suggestion in number 10. An alternate solution to the layers is simply graying out the measures that are not available. Because at this time, when you click on a measure that is unavailable, the grid turns black.

12. [Violation of HE 1 & 7] [Severity 4] [Fix 1]

Action: Identify which measure is being displayed

The menu of measures doesn't provide any information as to which menu is being currently being displayed. They could add a bullet point to the one that is being displayed at the moment rather than making the user select a measure to ensure that that measure is being displayed. This is inefficient.

13. [Violation of HE 4 & 10] [Severity 4] [Fix 1]

Action: Documentation and Help

The documentation within the program is nearly non-existent. The only reason why I say nearly rather than completely non-existent is because they have a menu item and a toolbar item that are called help, although they do not lead to any form of help through documentation or a website. In addition to simply not having documentation, the item called help is mislabeled and should be called about.

It should be noted that there is documentation on the website, so linking to the documentation would be an easy fix. I think incorporating it in to the program itself would be better.

14. [Violation of HE 1, 3, 5, 6 & 9] [Severity 4] [Fix 4]

Action: Importing DXF File

The user has too much freedom when they are faced layer names. They are required to type in the layer names in which they can type whatever they want. The system doesn't prevent them from entering anything, and worse, it doesn't let them know when the layer names are wrong, it simply imports which layers are correct. Another problem with this method is it requires the user to recall the layer names.

A possible solution would be to inspect the file, retrieve the layer names and present the user with drop downs for each possible layer. For example, boundaries would have a drop down of all layer names within the file, paths would have the same drop down, and so on.

Path Isovist

1. [Violation of HE 1, 3, 5, 6 & 9] [Severity 4] [Fix 4]

Action: Importing DXF File, specifically for the path layer.

The user has too much freedom when they are faced layer names. They must recall, rather than recognize, the path layer name it was assigned within autoCAD. And if it's wrong, it simply doesn't get imported, so there is no error prevention. Also, it is difficult to diagnose the problem.

A possible solution was suggested in the previous section in number 14.

2. [Violation of HE 3, 5, & 9] [Severity 2] [Fix 2]

Action: Creating the Path Isovist

We know that the creation of observation points need to be setup, but before that we know that the path option need to be set. Despite this obvious progress of steps, a user can select either of the aforementioned options before going through the path options setup. There is too much freedom to choose given to the user and thus they have the option of going out of order. This freedom also allows for errors to be made and when they are, there is no helpful diagnostic information provided to the user.

A possible solution is to gray out options that are dependent on actions that need to come first. This would prevent users from going out of order and prevent wasted effort. It also provides users with steps without using a wizard.

3. [Violation of HE 4] [Severity 1] [Fix 1]

Action: Modifying Path Options dialog

The use of field sets is only used on one portion of the dialog box (Results Display). It may feel more consistent to use field sets for the rest of the dialog box, for example a field set for the Length options. This could also provide the user with more context as to what the options actually do. This would support more first time users than expert users. This dialog box is also funny because they have what looks to be a header called length, but nothing surrounding the options.

4. [Good use of HE 1 & 5]

Action: Completion of Path Options Dialog

They make it apparent that a path has been selected by making the previously black line, red. And if you're

dealing with multiple paths, it shows the one that you have selected, so if you selected the wrong one, it would be obvious.

5. [Violation of HE 3, 5 & 9] [Severity 3] [Fix 3]

Action: Completion of Path Options Dialog

It isn't entirely obvious what needs to be done next. Mainly because of what I mentioned in number 2--that is users have too much freedom. For example, I can select 'Create Path Isovist' despite not going through the observations creation task. The system does not prevent this error from occurring and when the error is made, there is no useful information given to the user. As I mentioned before, graying out the options that are dependent upon other task being completed before the Path Isovist creation would help to guide the user without the use of a wizard.

6. [Violation of HE 1 & 4] [Severity 4] [Fix 3]

Action: During the creation of the Path Isovist

There is no obviously visible progress bar providing status of the system while the path isovist is being created. This is really bad because I was wondering what was going on because my mouse cursor turned into an hour glass. Whereas with the grid isovist, the progress bar popped up to show me the progress and number of passes complete. So this isn't consistent within it's own system. The number of passes completed out of the total number of passes needed for the path isovist to be created shows up in the application title bar, which in my case was in the top left corner of my screen. It didn't provide me with a dialog to start it, nor did it give me the total computational time like it did when I created the grid isovist. My suggestion is to simply make it consistent.

7. [Violation of HE 1, 6, 7] [Severity 4] [Fix 3]

Action: Creation of Path Isovist is Complete

It isn't visibly clear what measure is being displayed (Area vs. Drift). It also isn't visible which choices we have available to us because they are buried in the menu two levels deep. The user must recall what measure is being displayed, then go to the menu of measures and select the one they would like to view.

This could be solved by using something like layers in photoshop--but you can only view one layer at a time. Each layer would represent a different measure, the highlighted one is being viewed currently, but also a user could view what other measures they have at their disposal (like Depthmap).

8. [Violation of HE 1] [Severity 4] [Fix 2]

Action: Creation of Path Isovist is Complete

There is no measure shown by default after the path isovist is created. The user must select a measure to be shown. There should be a default measure shown.

9. [Violation of HE 1 & 4] [Severity 2] [Fix 1]

Action: Understanding the measure

This is inconsistent with the grid isovist presentation--there is no color spectrum on the left side of the screen to help the user understand the measures. I suggest keeping it consistent.

10. [Violation of HE 1] [Severity 4] [Fix 2]

Action: Creation of Path Isovist is Complete

There is no measure shown by default after the path isovist is created. The user must select a measure to be shown. There should be a default measure shown.

11. [Violation of HE 4 & 10] [Severity 4] [Fix 1]

Action: Documentation and Help

The documentation within the program is nearly non-existent. The only reason why I say nearly rather than completely non-existent is because they have a menu item and a toolbar item that are called help, although they do not lead to any form of help through documentation or a website. In addition to simply not having documentation, the item called help is mislabeled and should be called about.

It should be noted that there is documentation on the website, so linking to the documentation would be an easy fix. I think incorporating it in to the program itself would be better.

- | 1. | Issue  | Heuristics Violated | Severity |
|----|--|---------------------|----------|
| 2. | No Help document found when users click the question mark on the tool bar  | #10                 | 2        |
| 3. | When users exit the file they were working on or import a new file, there is no warning message asking if they want to save the changes to the older file.                 | #1, #3              | 3        |
| 4. | Under “Path” menu, the “Import path..” option is at the bottom of the dropdown list, which is not consistent with the common sense.  | #2                  | 2        |
| 5. | Some options listed under “Show Grid Properties”, “Show Point properties”, and “Show Axial Line Properties” don’t work actually. Users may be confused by this.            | #1, #9              | 3        |
| 6. | The “Option” menu seems redundant as all the options under it have been listed under other pull-downs.   | #4                  | 1        |
| 7. | When click “Create Grid Isovist”, a progress bar pops out. On it, the “OK” button should be labelled as “Cancel”.  | #4                  | 2        |
| 8. | When click “Create Grid Isovist”, a progress bar pops out. On it, the “OK” button instead of “Start” button looks more stickout and seems to be set as the default choice. | #4, #8              | 2        |
| 9. | When the progress of “Create Grid Isovist” finishes, the progress bar does not disappear automatically.  | #1, #4, #8          | 2        |