

Progress Report: Finalizing Section Cuts and Details

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Part 1: Problem Definition

Introduction

The purpose of this challenge is to add code to the Final Designs folder in order to automate the creation of section cuts in AutoCAD to provide users with multiple views of the plant. Previous design team members have attempted this challenge and produced code which must now be searched for errors and updated. This work will allow engineers in the field and team members here to easily obtain the section cuts of the plant that they desire. Once the code is completed, it must be added to a design method in the beta server so that the section cuts can be published to the website and made available upon request.

Design Details

Ann Newcomb and Anthony Andrews originally investigated this challenge in Fall of 2012. They compiled a list of section cuts that engineers would find useful and started the process. Songlin Guo continued on with their work and has written code for this challenge. His code relies on a function, SPTB, written by Kean Walmsley of AutoDESK specifically for AguaClara. Songlin's code creates a function, SectionCut, which defines a section plane then calls SPTB on it. In order to accommodate all the desired section cuts, he creates functions SectCut12, SectCut13, etc. each of which sets up the necessary coordinates by referencing EtFlocSedFi then calls SectionCut with these coordinates as inputs. However, his progress report (linked below) cites errors such as incorrect rotation of the output which must be investigated and resolved.

Following is a list of references of individuals who have worked on this challenge in previous years and links to some of their work:

- Ann Newcomb and Anthony Andrew's [Report](#) on Section Cuts for Fall 2012
- Songlin Guo's [Report](#) on Section Cuts for Spring 2014
- Songlin Guo's [Presentation](#) on Section Cuts

Part 2: Documented Progress

Advances

One error that was discovered with Songlin's code was that his SectionCut function called SectionPlanetoBlock instead of SPTB. SectionPlanetoBlock is an AutoCAD function that cannot be coded for with MathCAD because it requires the user to interact with a dialog box which MathCAD cannot do. SPTB is the function written specifically for AguaClara by Kean Walmsley of AutoDESK. It is a dialog box free version of SectionPlanetoBlock. It also preserves the layers of the section cut whereas SectionPlanetoBlock assigns the entire block to the most recently used layer (see comparison in the figures below).

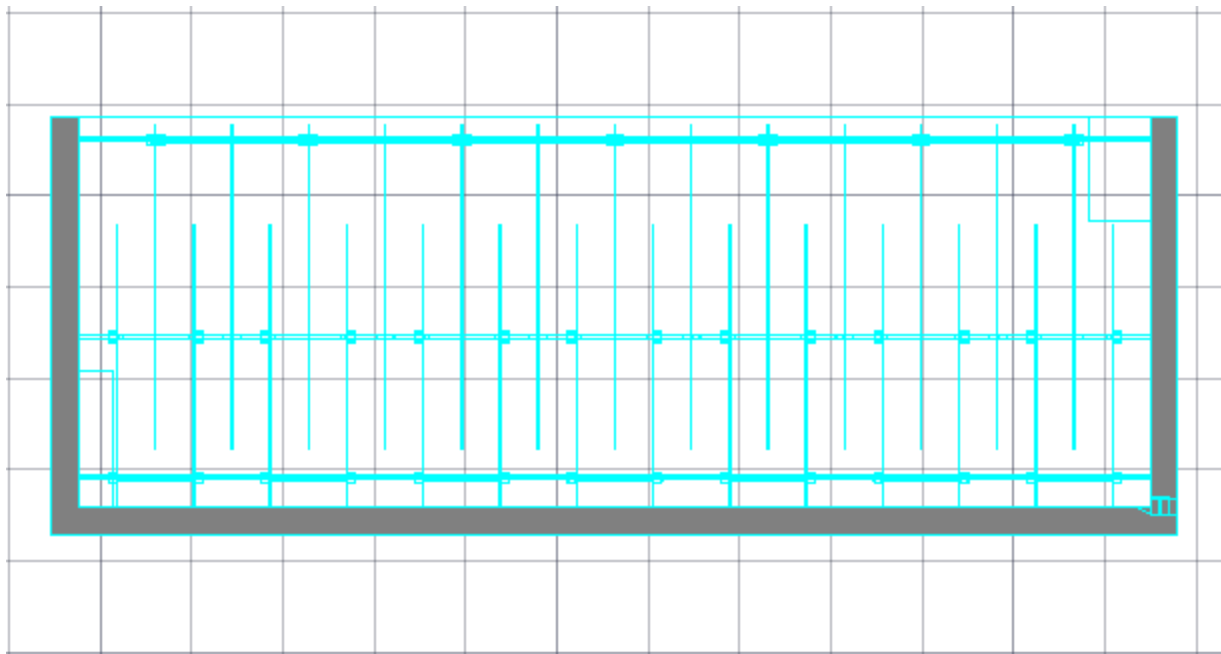


Figure 1.1: Section Cut obtained using SectionPlanetoBlock (all one layer).

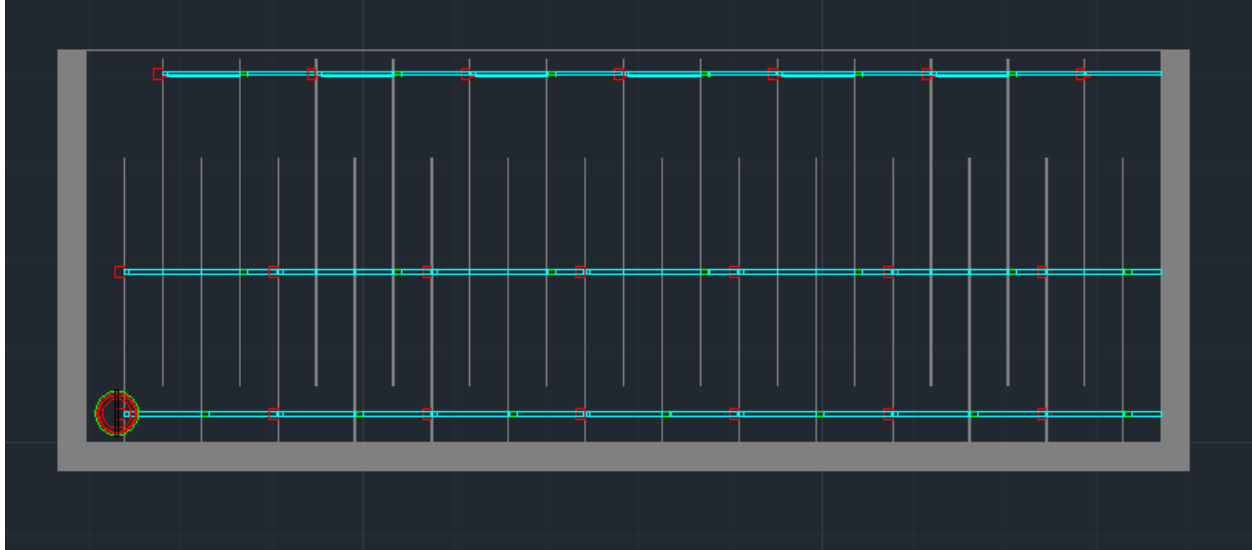


Figure 1.2: Section Cut obtained using SPTB (layers preserved).

In order to call SPTB, the user must load a .dll file into AutoCAD using the Netload command. This must be redone every time AutoCAD is opened. Some issues arose with this process because the campus computers have privacy settings that prevent files downloaded from the internet from being loaded and the SPTB file comes from an email chain. In order to allow the file to be loaded, the user must change the Configuration file for AutoCAD. This file can be accessed using the following file path: C:\Program Files\Autodesk\AutoCAD® [year ex: 2014]\Acad.exe.Config and inserting:

```
<runtime>
```

```
<loadFromRemoteSources enabled="true" />
```

```
</runtime>
```

before the final </configuration>. Once this has been done, the user can call Netload and select SectionPlanetoBlock.dll.

Some other small errors in Songlin's code were discovered. For example, in SectCut14 the defined x coordinate did not account for the concrete in the negative x direction so the concrete was cut off in the section cut. However, these errors were minor and did not raise concerns about his approach. His method is still believed to be the most effective.

The specific section cut functions were tested on only the necessary part of the plant because drawing the entire plant often causes AutoCAD to crash. However, once the errors discussed above were resolved, an attempt was made to test the scripts on the entire plant. This drew attention to the fact that the orientation of the plant is incorrect when drawn using

EtFlocSedFi. This is why Songlin observed that his output was often rotated 180 degrees (see figure below). In order for the Section Cuts code to work with the whole plant, the plant must be drawn then flipped so that it has the correct orientation.

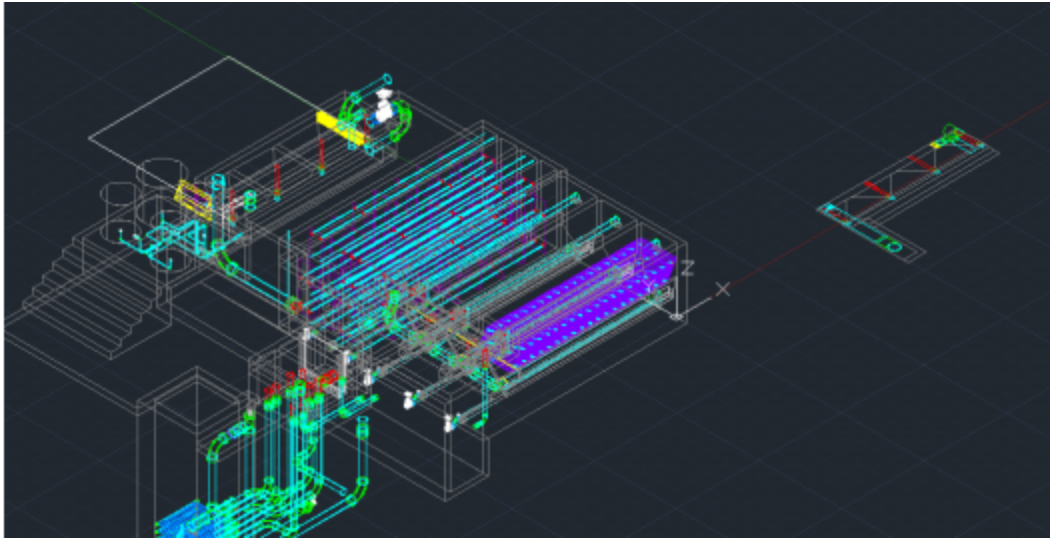


Figure 1.3: Songlin's output when calling SectionCut on an incorrectly rotated plant.

Challenges Encountered

As discussed in the Documented Progress section, the correct implementation of SPTB was a big challenge. Calling SectionPlaneToBlock and attempting to interact with the dialog box caused problems as did the safety features that prevented Netload from loading SPTB. Future groups should be very careful to always call SPTB and to correctly load it. Another challenge was the incorrect rotation of the plant when drawn with EtFlocSedFi which caused all the Section Cuts to be flipped. Future groups must always flip the plant before calling SectionCut on it.

Part 3: Future Work

As mentioned above, the plant must be rotated in order to obtain a section cut with the correct orientation. Additionally, there is currently a slight issue with the calling of SPTB. When it is called from the command line, it asks the user to select a section, then it pauses and performs a unit conversion then asks the user for an insertion point, x scale, y scale, and angle of rotation. Consequently, if L is a previously defined section plane, the user must type:

SPTB L <angle> 1 1 0

This command line interaction is shown below in figure:

```

Command: SPTB
Select section: L
Command:
Units: Unitless Conversion: 1.0000
Specify insertion point or [Basepoint/Scale/X/Y/Z/Rotate]: 28,0,0
Enter X scale factor, specify opposite corner, or [Corner/XYZ] <1>: 1 Enter Y scale factor <use X scale factor>: 1
Specify rotation angle <0>: 0

```

Figure 1.4: Command line when script is entered manually.

The resulting section cut is shown below in figure:

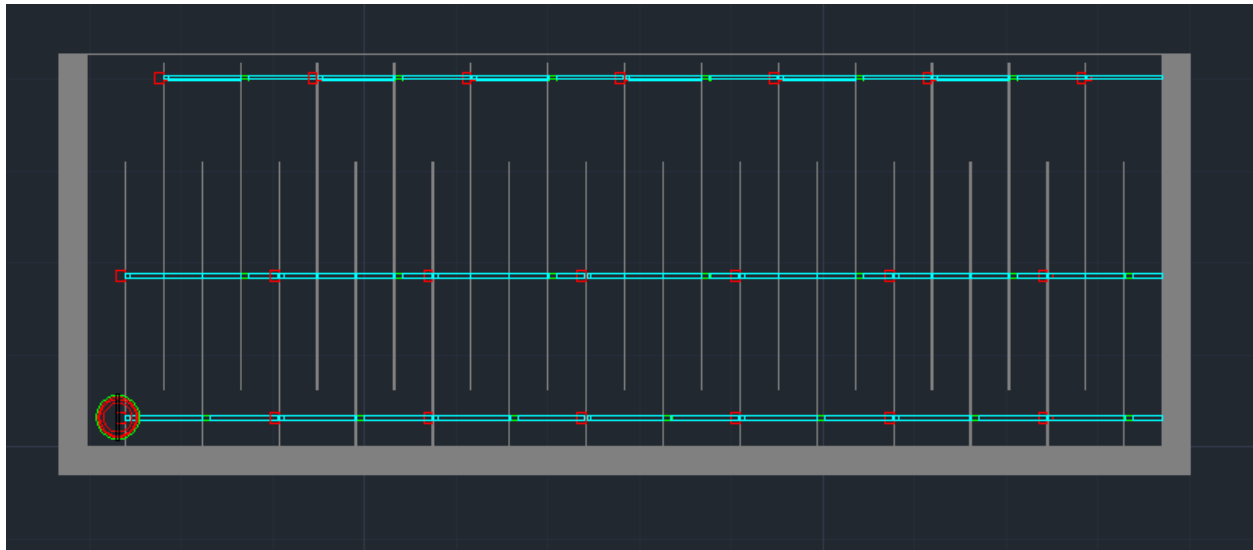


Figure 1.5: Resulting section cut when script is entered manually.

However, when this exact script is pasted into the command line, it takes the angle, x scale, y scale, and angle as unknown commands instead of inputs for Insert.

This result is shown below in Figure :

```

Command: SPTB
Select section: L
Command: 28,0,0 Unknown command "28,0,0". Press F1 for help.
Command: 1 Unknown command "1". Press F1 for help.
Command: 1 Unknown command "1". Press F1 for help.
Command: Unknown command "-INSERT". Press F1 for help.
Command:
Unknown command "SECTION0". Press F1 for help.

```

Figure 1.6: Command line when text file is pasted in.

Kean Walmsley of AutoDESK was contacted and he suggested that L is not defined as a section plane. However, the portion of the script that defines L is working so this does not seem to be the issue. It is believed that a method must be found to allow AutoCAD to pause and do the unit conversion before prompting the user for an insertion point, etc.

Once this is fixed, the modified code must be uploaded through the design server. This will be done by adding the section cut code to the Etflocsedfi so that all the section cuts will be included in the text file but not displayed on the main page with all the views when a user selects a flow rate.