The first two examples are of the same volume (a sphere with radius 5 cm) but with a different center position. Notice the visual editor pictures are almost identical.

```
Example geometry with sphere
C Cells
99 0   1     imp:p=0 $ graveyard, universe, outside world
20 0  -1     imp:p=1 $ this is three dimentional object defined by the surface number 1

C Surfaces
1 so 5              $ sphere centered at origin (0,0,0) of radius 5 cm

C Physics
c we won't focus on this for now
mode p
nps 1000
sdef erg=1  par=p

```

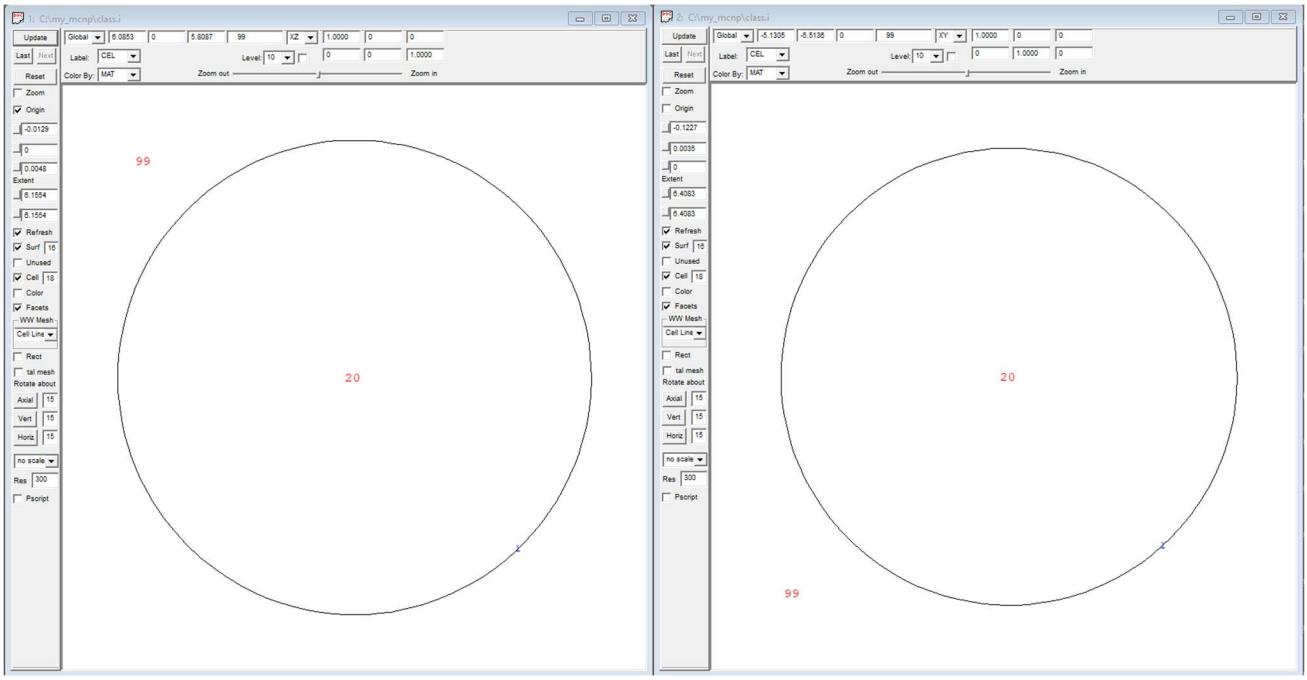

Figure 1 Visual Editor 2 D representation of input file

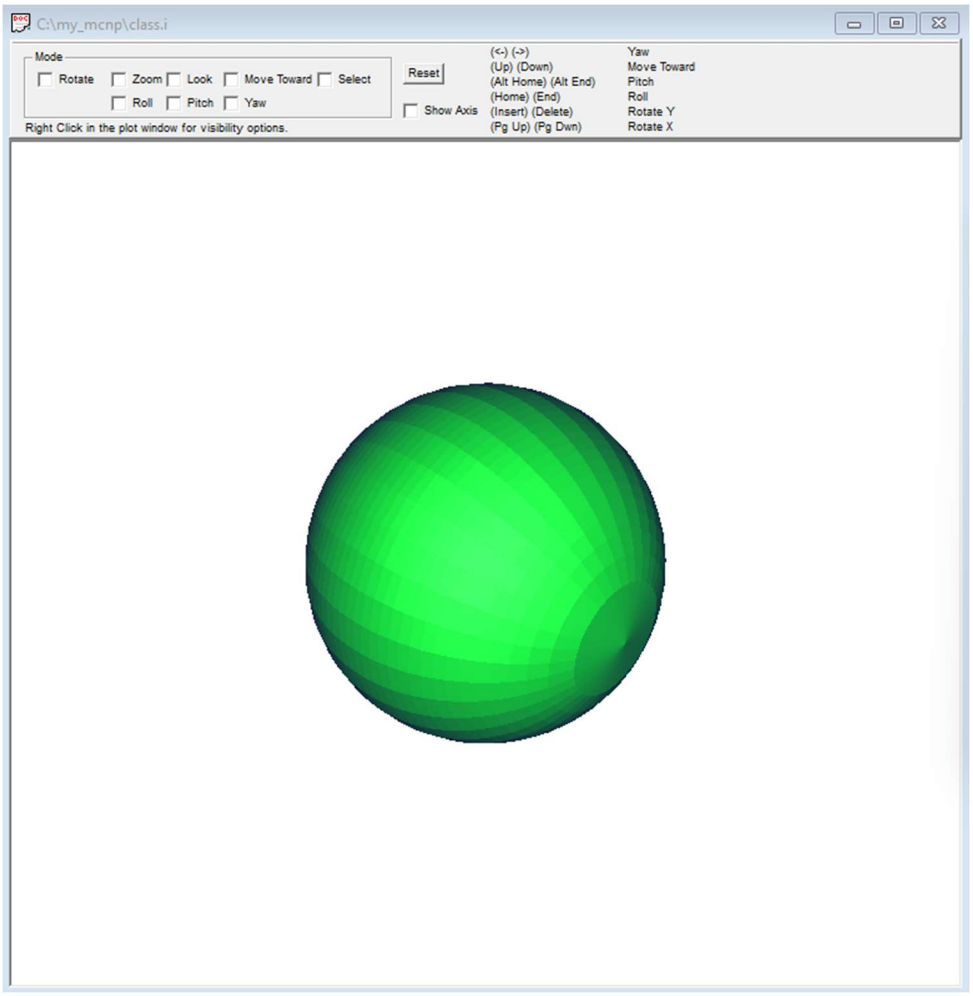

Figure 2 Visual Editor 3 D representation of input file

```
1   Example geometry with sphere not centered at zero
2   c notice nothing about the cells changes, just the surface definition
3   C Cells
4   99 0   1     imp:p=0 $ graveyard, universe, outside world
5   20 0  -1     imp:p=1 $ this is three dimentional object defined by the surface number 1
6
7   C Surfaces
8   c s is for sphere, x y z, then radius
9   1 s 5 2 7  5              $ sphere centered at point (5,2,7) of radius 5 cm
10
11  C Physics
12  c we won't focus on this for now
13  mode p
14  nps 1000
15  sdef erg=1  par=p
16
```

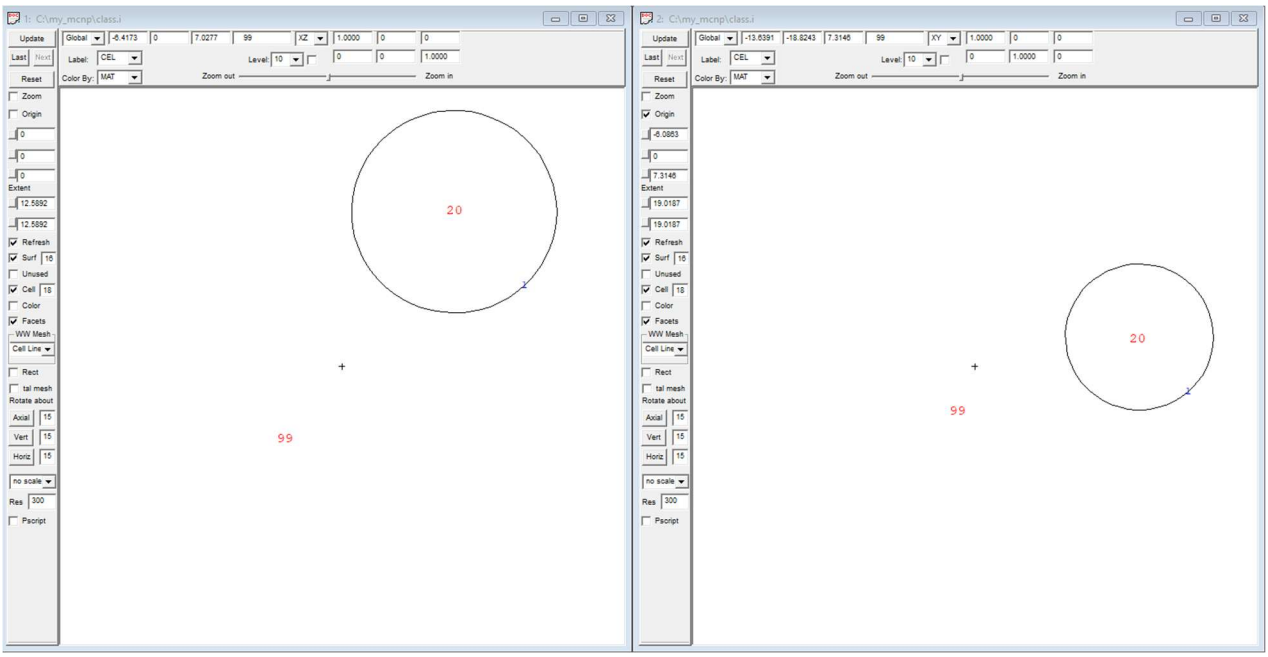

Figure 3 Visual Editor 2 D representation of input file

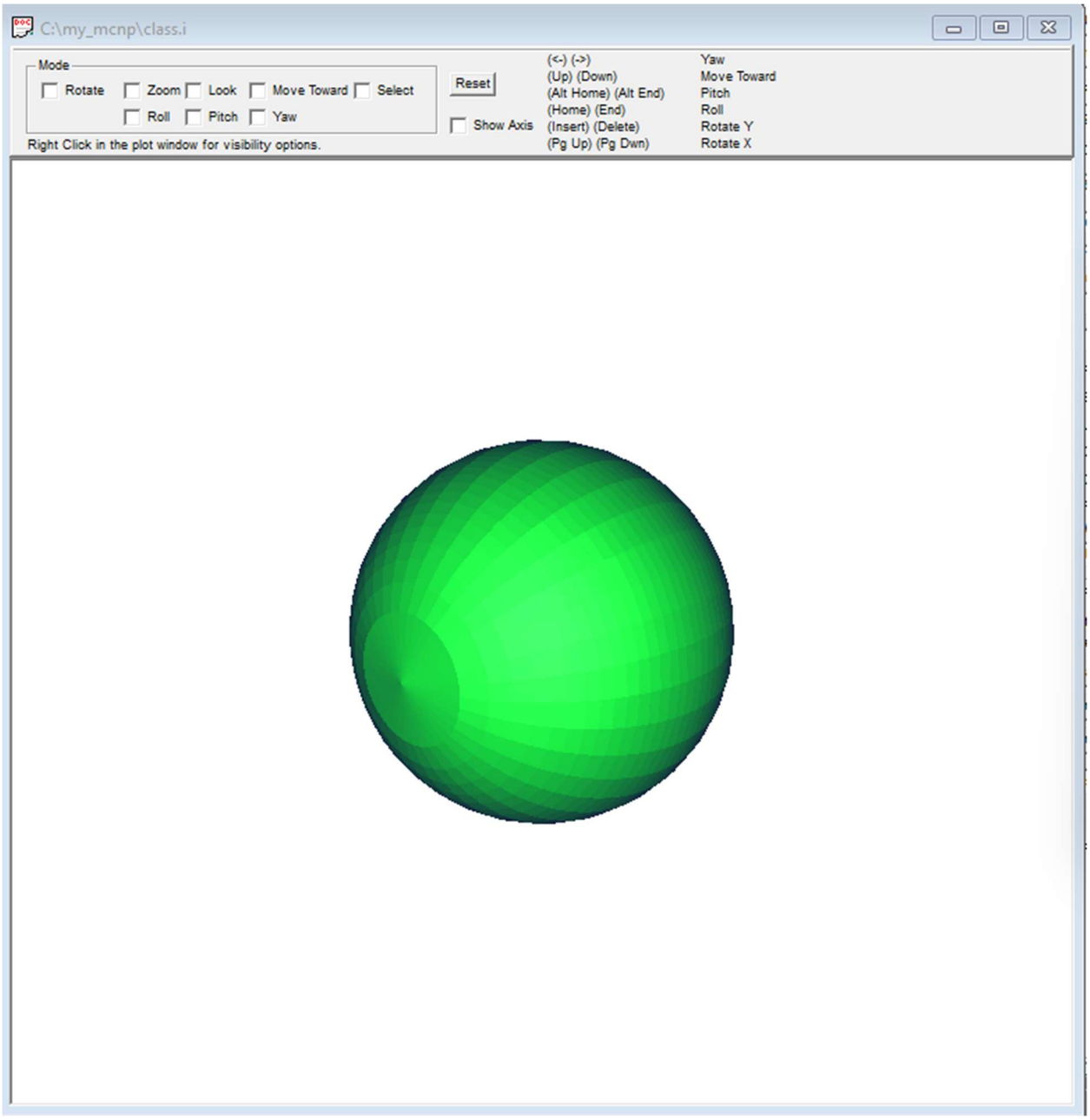

Figure 4 Visual Editor 3 D representation of input file

The following 2 examples are identical cubes (2 cm x 2 cm x 2 cm, centered at origin). The first example defines the surface as a macrobody, while the second example defines the 6 surfaces of the cube individually. You will notice the surface legends on the Visual editor are different; the clue that a macrobody was used is that the surface numbers are decimals; indicating the macrobody surface number and the facet number.

```
1   Example geometry cube with macrobody
2   C Cells
3   99 0   1     imp:p=0 $ graveyard, universe, outside world
4   20 0  -1     imp:p=1 $ this is three dimentional object defined by the surface number 1
5
6   C Surfaces
7   1 RPP -1 1  -1 1  -1 1    $ cube centered at origin (0,0,0) 2 cm x 2 cm x 2 cm
8
9   C Physics
10  c we won't focus on this for now
11  mode p
12  nps 1000
13  sdef erg=1  par=p
14
```

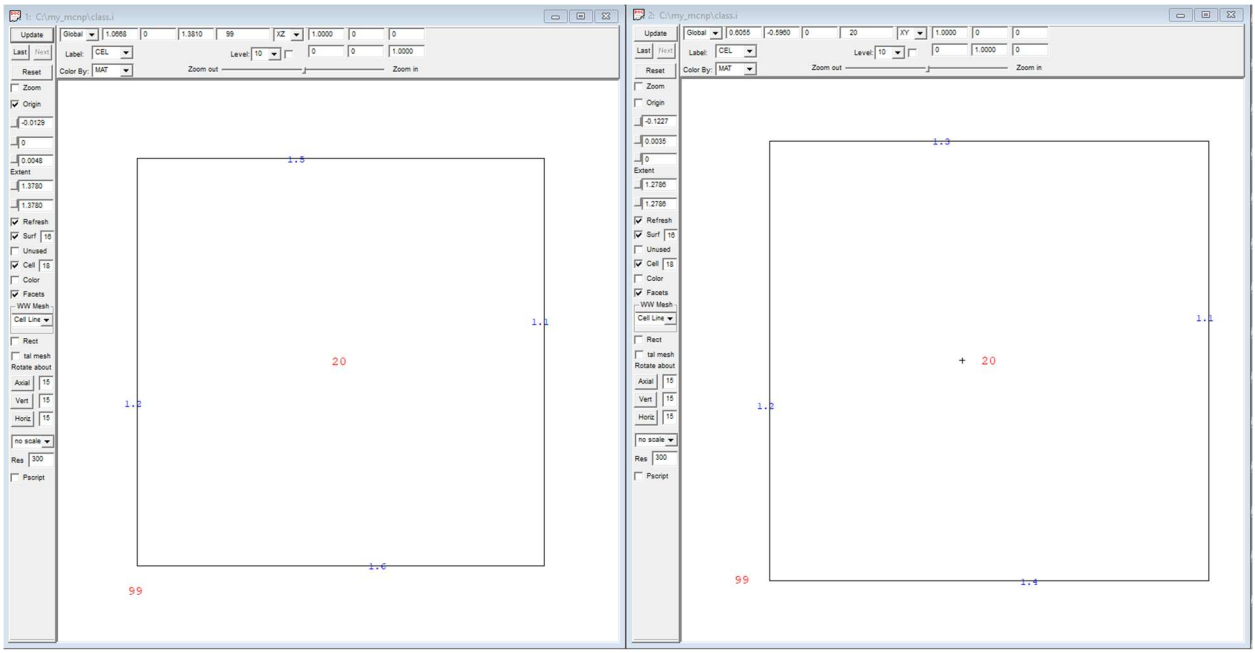

Figure 5 Visual Editor 2 D representation of input file

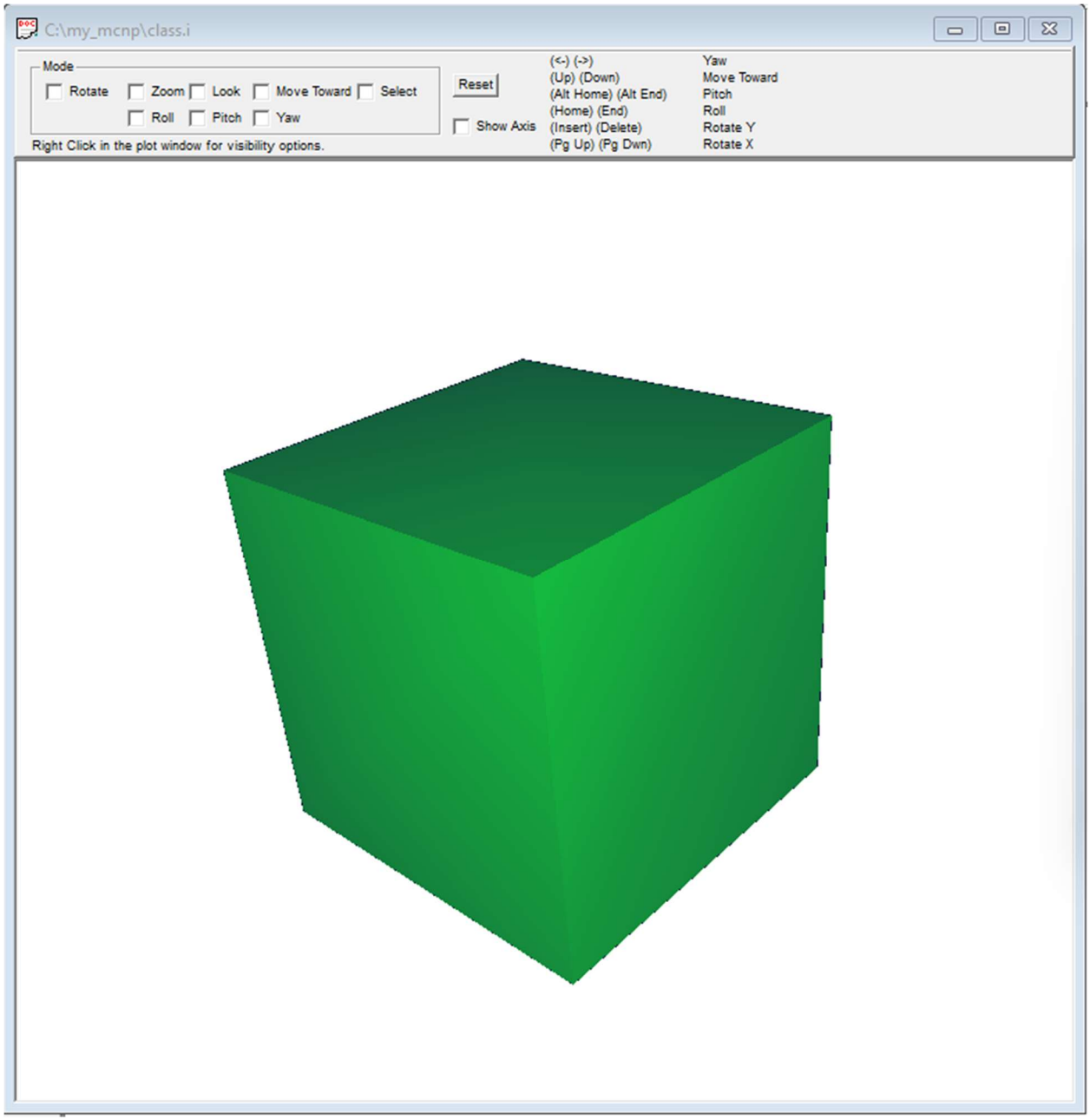

Figure 6 Visual Editor 3 D representation of input file

In addition to the different surface numbers, notice that the outside world is defined very differently. The union operator (":" in MCNP™ syntax) is used to include all areas outside of the planes.

```
Example geometry cube with surfaces
C Cells
99 0   -1:2:-3:4:-5:6    imp:p=0 $ graveyard, universe, outside world
20 0  1 -2 3 -4 5 -6     imp:p=1 $ this is three dimentional object defined by the surface numbers 1-6

C Surfaces
1 px -1
2 px  1
3 py -1
4 py  1
5 pz -1
6 pz  1

C Physics
c we won't focus on this for now
mode p
nps 1000
sdef erg=1  par=p
```

Alternately, we can define the outside world as follows:

```
1   Example geometry cube with surfaces and cell exclusion defining outside world
2   C Cells
3   99 0   #20              imp:p=0 $ graveyard, universe, outside world
4   20 0  1 -2 3 -4 5 -6     imp:p=1 $ this is three dimentional object defined by the surface number 1
5
6   C Surfaces
7   1 px -1
8   2 px  1
9   3 py -1
10  4 py  1
11  5 pz -1
12  6 pz  1
13
14  C Physics
15  c we won't focus on this for now
16  mode p
17  nps 1000
18  sdef erg=1  par=p
19
```

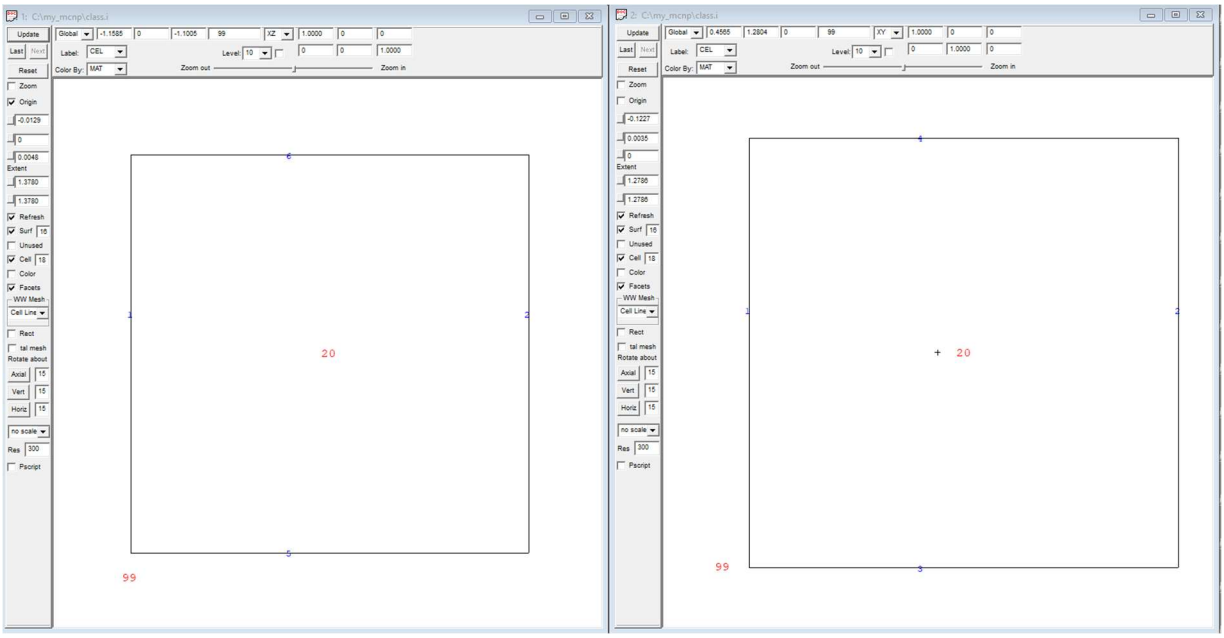

Figure 7 Visual Editor 2 D representation of input file

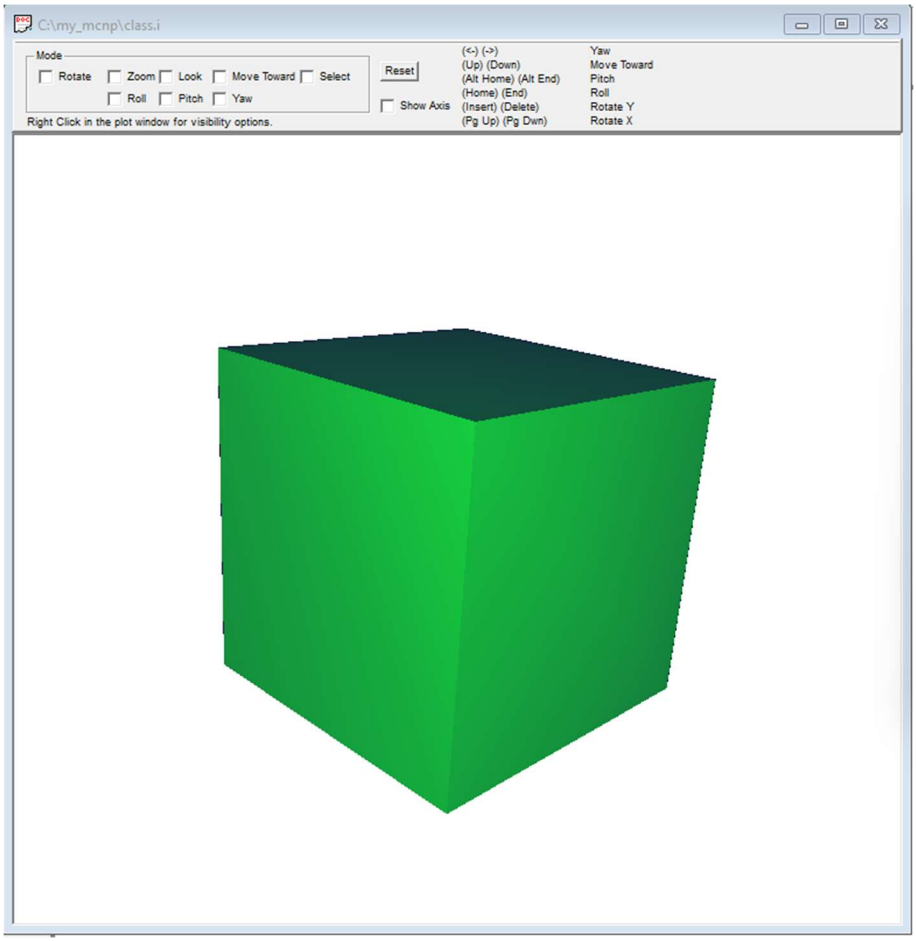

Figure 8 Visual Editor 3 D representation of input file

For additional help or reference, refer to either the MCNP™ Manual (located in the MY_MCNP > MCNP_DOCS > la-cp-13-00634, or a quick reference guide is the Schultis and Faw MCNP primer (Shultis, J. Kenneth and Richard E. Faw. “An MCNP primer.” (2011).) Below is a list of the Macrobody and surface types we reviewed from the MCNP manual:

Table 3-8. Macrobody Rectangular Parallelepiped (RPP)

Input Parameter	Description
x_{min} x_{max}	Termini of box sides normal to the x-axis.
y_{min} y_{max}	Termini of box sides normal to the y-axis.
z_{min} z_{max}	Termini of box sides normal to the z-axis.

Table 3-4. MCNP6 Surface Cards

Mnemonic	Type	Description	Equation	Card Entries
P	Plane	General	$Ax+By+Cz-D=0$	A B C D
PX		Normal to x-axis	$x-D=0$	D
PY		Normal to y-axis	$y-D=0$	D
PZ		Normal to z-axis	$z-D=0$	D
SO	Sphere	Centered at Origin	$x^2+y^2+z^2-R^2=0$	R
S		General	$(x-\bar{x})^2+(y-\bar{y})^2+(z-\bar{z})^2-R^2=0$	$\bar{x}$ $\bar{y}$ $\bar{z}$ R
SX		Centered on x-axis	$(x-\bar{x})^2+y^2+z^2-R^2=0$	$\bar{x}$ R
SY		Centered on y-axis	$x^2+(y-\bar{y})^2+z^2-R^2=0$	$\bar{y}$ R
SZ		Centered on z-axis	$x^2+y^2+(z-\bar{z})^2-R^2=0$	$\bar{z}$ R