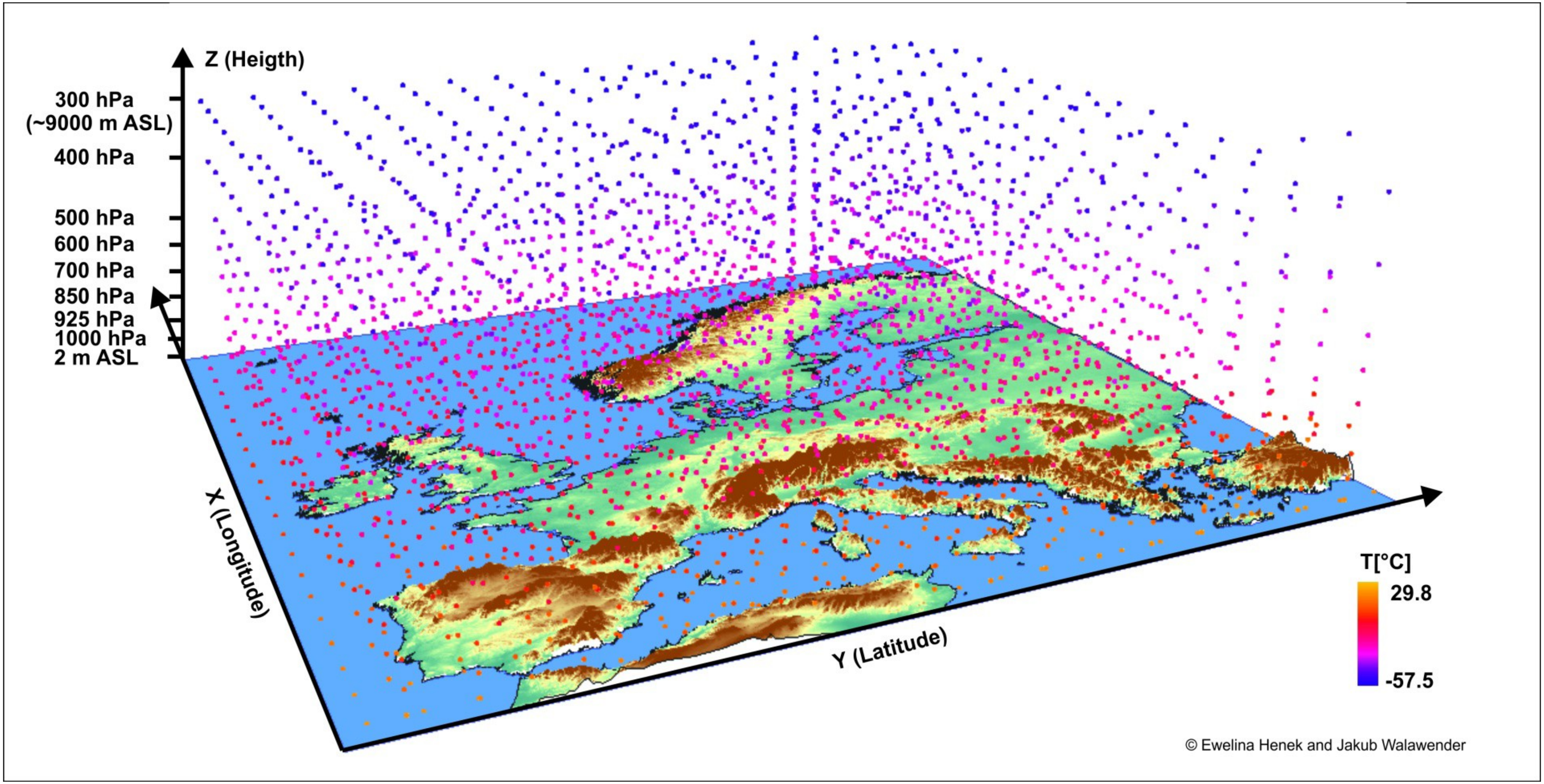
Task 4



ideas.arcgis.com/ideaView?id=08730000000btAS&returnUrl=%2Fapex%2FideaList%3Fc%3D09a300000004xET%26category%3DOther%2BProducts

Task 4 : Multidimensional Test-Building

- Real-world data structure

```
135,15
a..a...R.... m........... y........... K....sdfgs.. .......DG... .......dh...
b.....SDG... n..SDFGDFG.. z.......w... L..DGFD...sg .....f...... ..GS....fh..
c.....S..... o..T.T...... A....aXC.... M.......g.s. ............ ............
d...aS..G... p........DFG B.......w... N.s..bsd.... xcb...sdfee. ....WTE...df
e.SDFG..DFG. q....D..DFG. C.....bgh... ....g..m.... ...xcd...e.. F.JH.....ds.
f...FGSDF... r........... D...g....... .......ukui. ......b..g.. ....H.....f.
g....a..a... s...d....... E......CAS.. ....suk.g... ..DG.dfsdfg. ....GFGHJ...
h......M.G.. t......a..DF F..d..Csdf.. .........sd. ....s....... ....E...fg..
i.......C... u...D.D..... G......Cds.. .s.....dfg.. .....cdb.DFs ..SG...sSDF.
j...ZaZa.... v........... H........... .......t.... ...af.ssd.g. .D..FGHJDF..
k........... w.....SDF... I.....sdCx.. ..fghd...... .......DFGg. .........G..
l....a...SJ. x.....D..G.. J...C.C..... ............ ...DG....... n....fg.....
```

This class defines a lookup table for a simple encoding that provides approximate wind velocity in knots through trilinear interpolation on discrete altitude planes within a three-dimensional cell in the world. A cell is defined as a square with the size of one degree of latitude in our flat-earth world model. Its bottom-right corner anchors to the world by the degree component of a latitude and longitude. Six stacked altitude planes define the velocities at 0, 3000, 6000, 9000, 12000 feet, and 15000 feet. Altitudes outside this range clamp to the limits.

The definition resides in a separate text file for each cell. The format is as follows, where each dot grid is an altitude plane left to right in the order indicated above. Rows are latitude, and columns are longitude, both on six-minute intervals offset from the anchor. For simplicity, the navigation model is limited to the northern and western hemisphere, which means latitude is always degrees north and increases upward, and longitude is always degrees west and increases leftward.

```
latitude_degrees,longitude_degrees
............ ............ ............ ............ ............ ............
............ ............ ............ ............ ............ ............
............ ............ ............ ............ ............ ............
............ ............ ............ ............ ............ ............
............ ............ ............ ............ ............ ............
............ ............ ............ ............ ............ ............
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............ ............ ............ ............ ............ ............
```
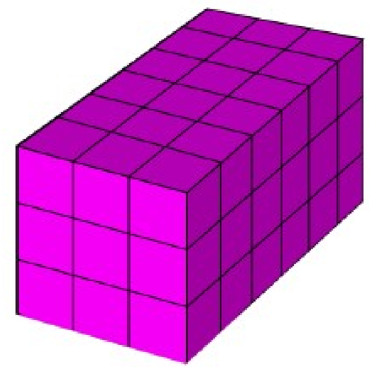



A dot indicates no wind. The encoding for the other discrete wind velocities is a single character that takes the place of a dot. It is a two-phase encoding that combines both the direction and speed. The direction component is based on the eight cardinal and intercardinal directions with the following base characters:

Char	Direction
a	0
f	45
k	90
p	135
u	180
z	225
E	270
J	315

```
135,15
a..a...R.... m........... y........... K....sdfgs.. .......DG... .......dh...
b.....SDG... n..SDFGDFG.. z.......w... L..DGFD...sg .....f...... ..GS....fh..
c.....S..... o..T.T...... A....aXC.... M.......g.s. ............ ............
d...aS..G... p........DFG B.......w... N.s..bsd.... xcb...sdfee. ....WTE...df
e.SDFG..DFG. q....D..DFG. C.....bgh... ...g..m..... ...xcd...e.. F.JH.....ds.
f...FGSDF... r........... D...g....... .......ukui. ......b..g.. ....H.....f.
g....a..a... s...d....... E......CAS.. ....suk.g... ..DG.dfsdfg. ....GFGHJ...
h......M.G.. t......a..DF F..d..Csdf.. .........sd. ....s....... ....E...fg..
i.......C... u...D.D..... G......Cds.. .s.....dfg.. .....cdb.DFs ..SG...sSDF.
j...ZaZa.... v........... H........... .......t.... ...af.ssd.g. .D..FGHJDF..
k........... w.....SDF... I.....sdCx.. ..fghd...... .......DFGg. ........G...
l....a...SJ. x.....D..G.. J...C.C..... ............ ...DG....... n....fg.....
```

The speed component is alphabetically derived from the base character, which itself indicates 10 knots in the specified direction. Adding 1 to the character (e.g., `a+1=b`) indicates 20 knots, whereas 2 is 30, 3 is 40, and 4 is 50. The complete encoding table is as follows:

Char	Direction	Speed	Char	Direction	Speed
.	0	0			
a	0	10	u	180	10
b	0	20	v	180	20
c	0	30	w	180	30
d	0	40	x	180	40
e	0	50	y	180	50
f	45	10	z	225	10
g	45	20	A	225	20
h	45	30	B	225	30
i	45	40	C	225	40
j	45	50	D	225	50
k	90	10	E	270	10
l	90	20	F	270	20
m	90	30	G	270	30
n	90	40	H	270	40
o	90	50	I	270	50
p	135	10	J	315	10
q	135	20	K	315	20
r	135	30	L	315	30
s	135	40	M	315	40
t	135	50	N	315	50

Task 4 : Multidimensional Test-Building

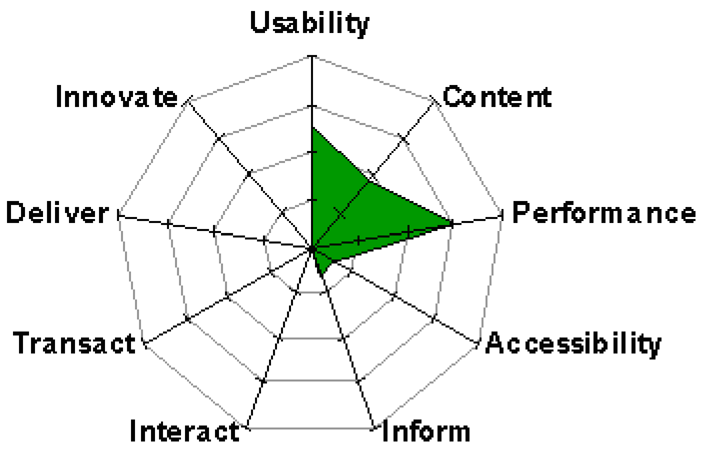
- Based on the classroom discussions for the wind model
  - build your test generator input tool however you want
    - should be generalizable to create reasonably any three-dimensional test; i.e., requires a user interface, not a hardcoded description
    - any language is fine; must output to text file as:

```
135,15
a..a...R.... m........... y........... K....sdfgs.. ........DG.. .......dh...
b.....SDG... n..SDFGDFG.. z.......w... L..DGFD...sg .....f...... ..GS....fh..
c.....S..... o..T.T...... A....aXC.... M.......g.s. ............ ............
d...aS..G... p........DFG B.......w... N.s..bsd.... xcb...sdfee. ....WTE...df
e.SDFG..DFG. q....D..DFG. C.....bgh... ...g..m..... ...xcd...e.. F.JH.....ds.
f...FGSDF... r........... D...g....... .......ukui. ......b..g.. ....H.....f.
g....a..a... s...d....... E......CAS.. ....suk.g... ..DG.dfsdfg. ....GFGHJ...
h......M.G.. t......a..DF F..d..Csdf.. .........sd. ....s....... ....E...fg..
i.......C... u...D.D..... G......Cds.. .s.....dfg.. .....cdb.DFs ..SG...sSDF.
j...ZaZa.... v........... H........... .......t.... ...af.ssd.g. .D..FGHJDF..
k........... w.....SDF... I.....sdCx.. ..fghd...... .......DFGg. ........G...
l....a...SJ. x.....D..G.. J...C.C..... ............ ...DG....... n....fg.....
```

  - write a nice report that addresses
    - how your solution works
    - how to use your solution
    - how effective your “language” is with regard to:
      - expressiveness: what can it say and not say (without undue effort, at least)?
      - simplicity: how concisely does it say what it says?
      - intuitiveness: how user-friendly is it?
      - understandability: how readable and interpretable is it?
      - scalability: how does it scale up to larger spaces? more dimensions?
      - testability: how can you verify it faithfully generates the corresponding tests?
      - one more measure of your choice; defined

Task 4 : Multidimensional Test-Building

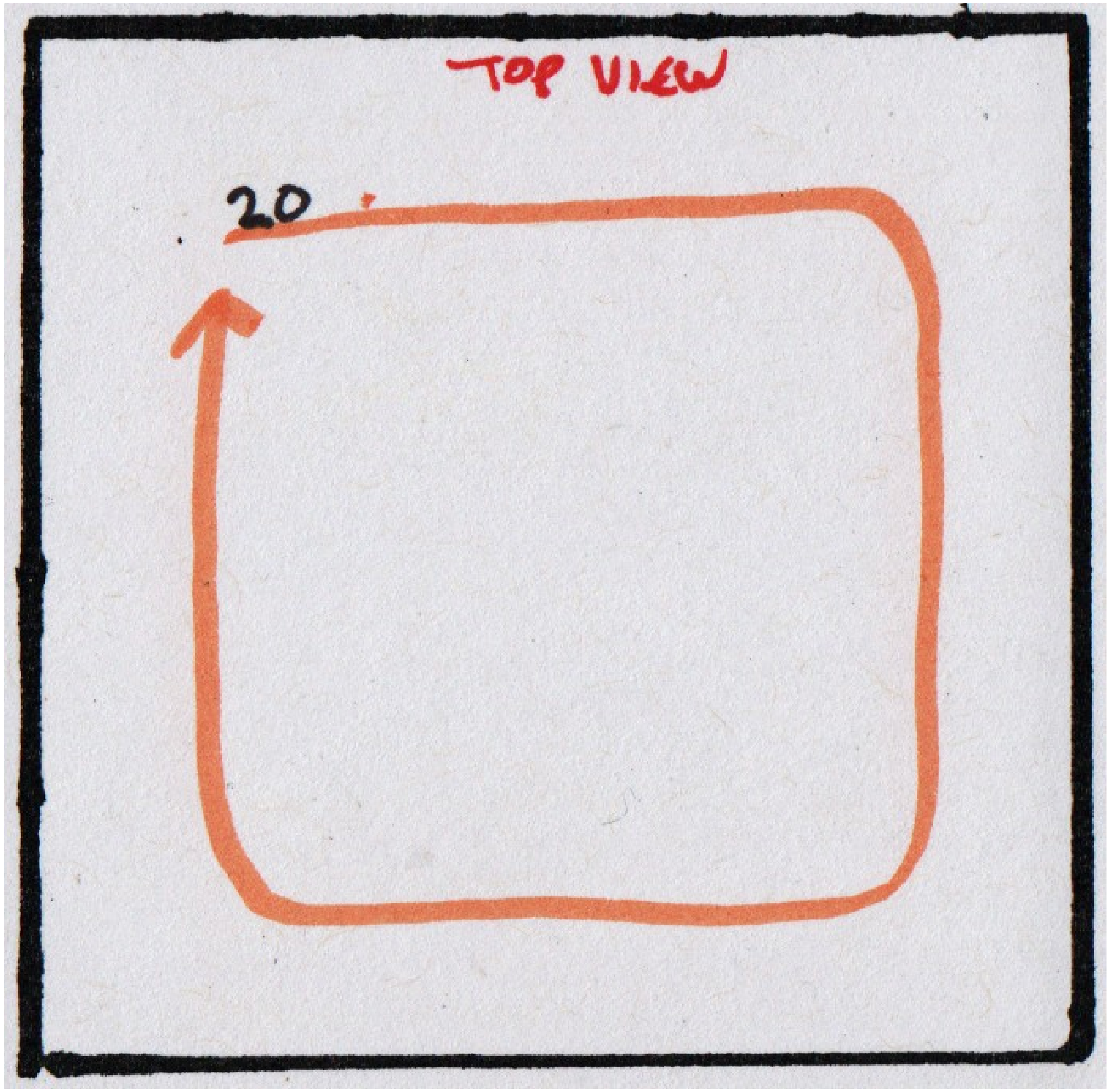
  - one more measure of your choice; defined
    - measurement is your call and subjective, but be reasonably formal; e.g.,



- submit source code with readme explaining how to compile and run
- include in report seven tests with
  - the definition description in your "language" (however makes sense)
  - the corresponding dot-grid output
  - the corresponding Gnuplot rendering through my wind model
    - include the animated GIF file named test*n*.gif
    - show representative screenshots in report

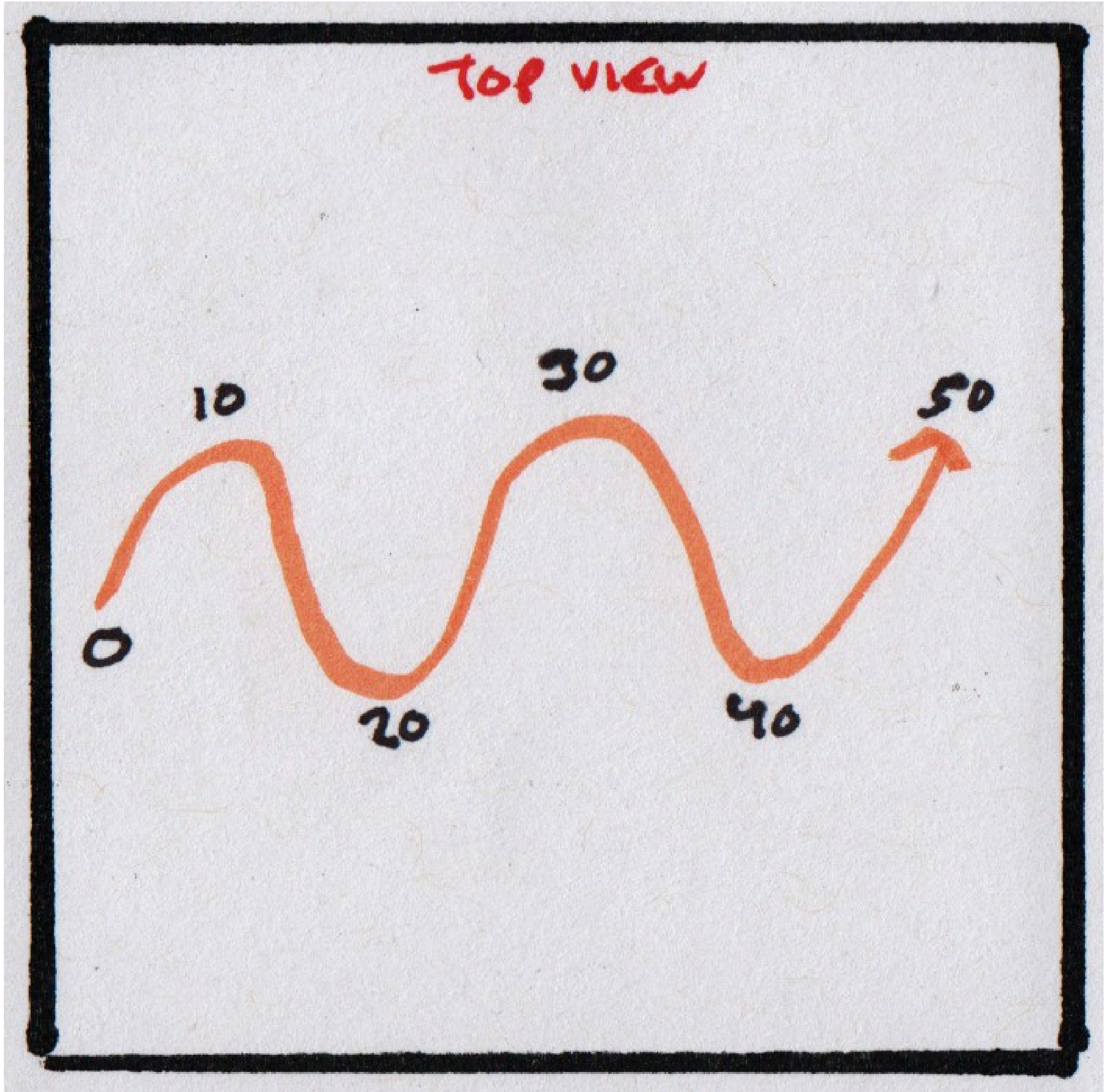
Task 4 : Multidimensional Test-Building

Test 1: clockwise box at altitude 6000, intensity 20



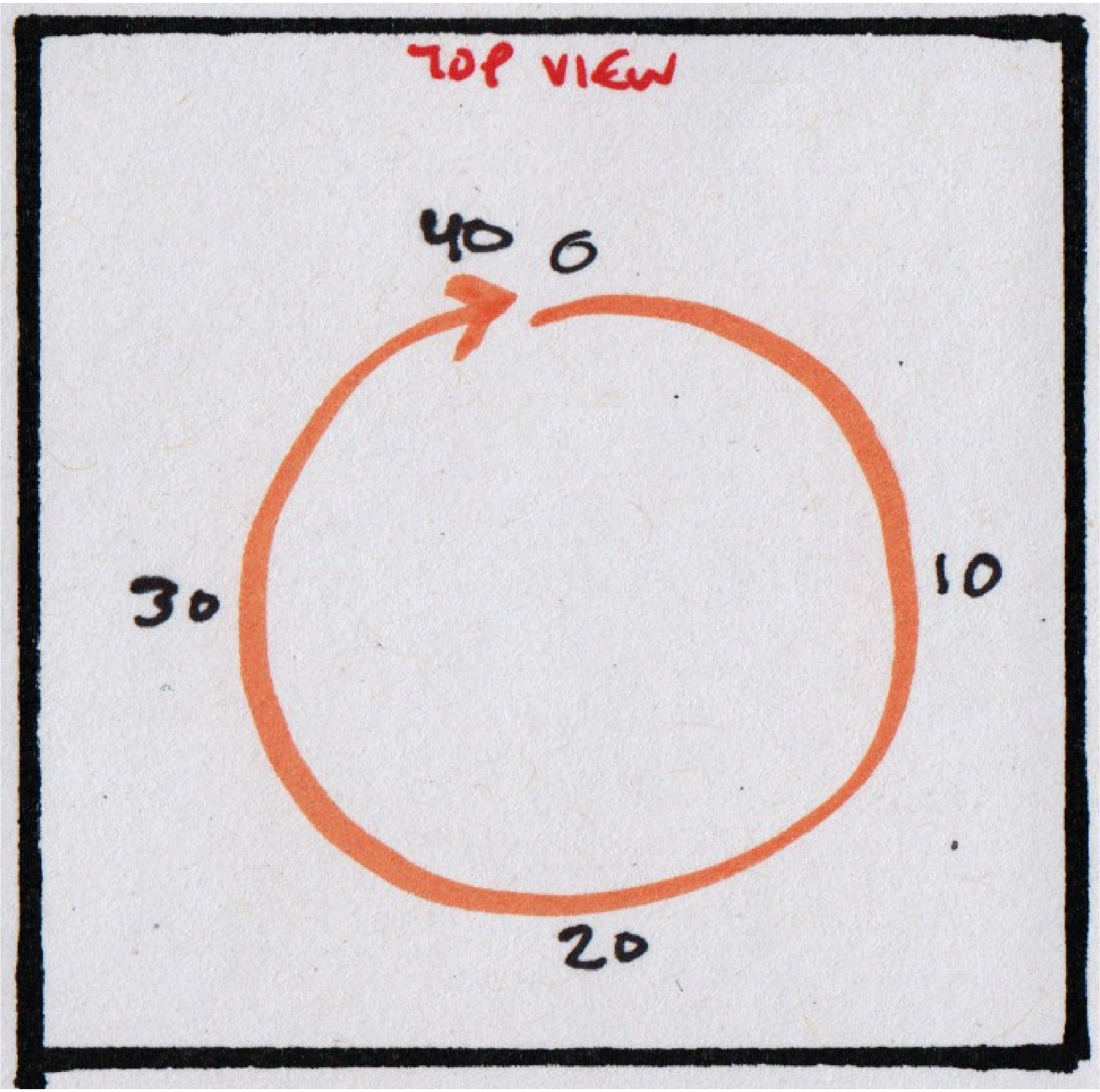
Task 4 : Multidimensional Test-Building

Test 2: snake at altitude 6000, increasing intensity



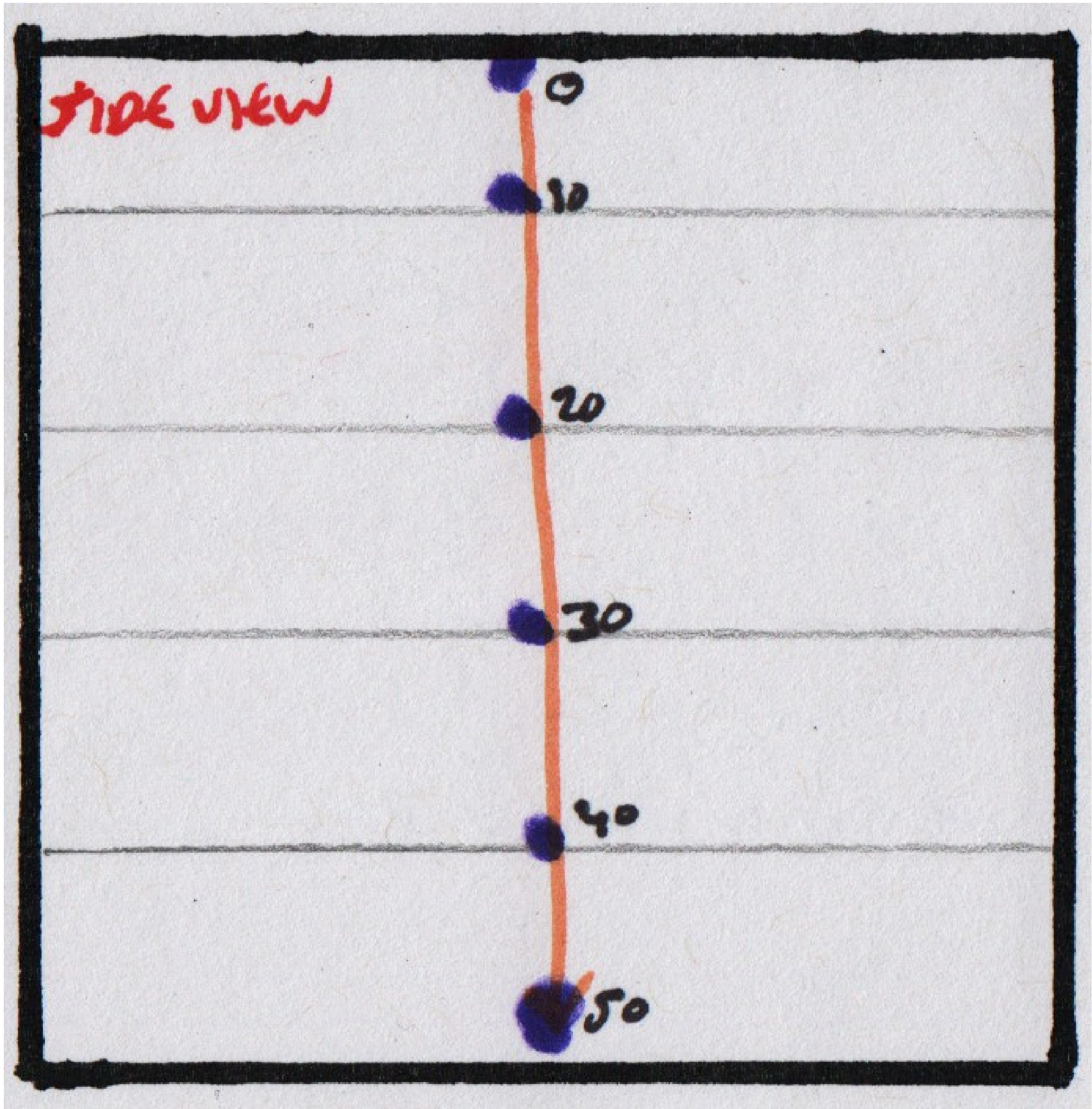
Task 4 : Multidimensional Test-Building

Test 3: horizontal swirl at altitude 6000, increasing intensity



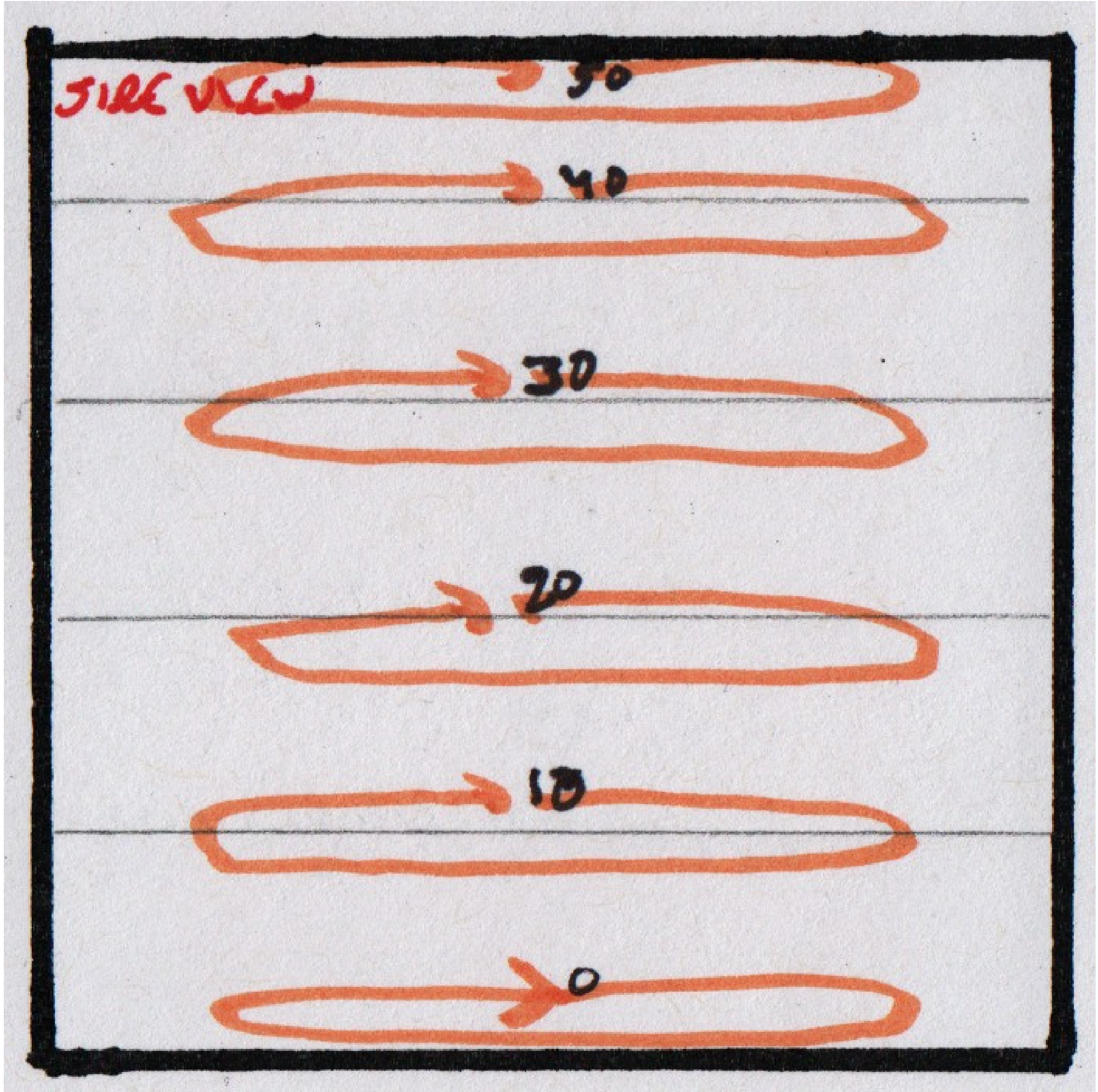
Task 4 : Multidimensional Test-Building

Test 4: vertical line at altitudes 15,000, 12, 9, 6, 3, and 0, increasing intensity at each level



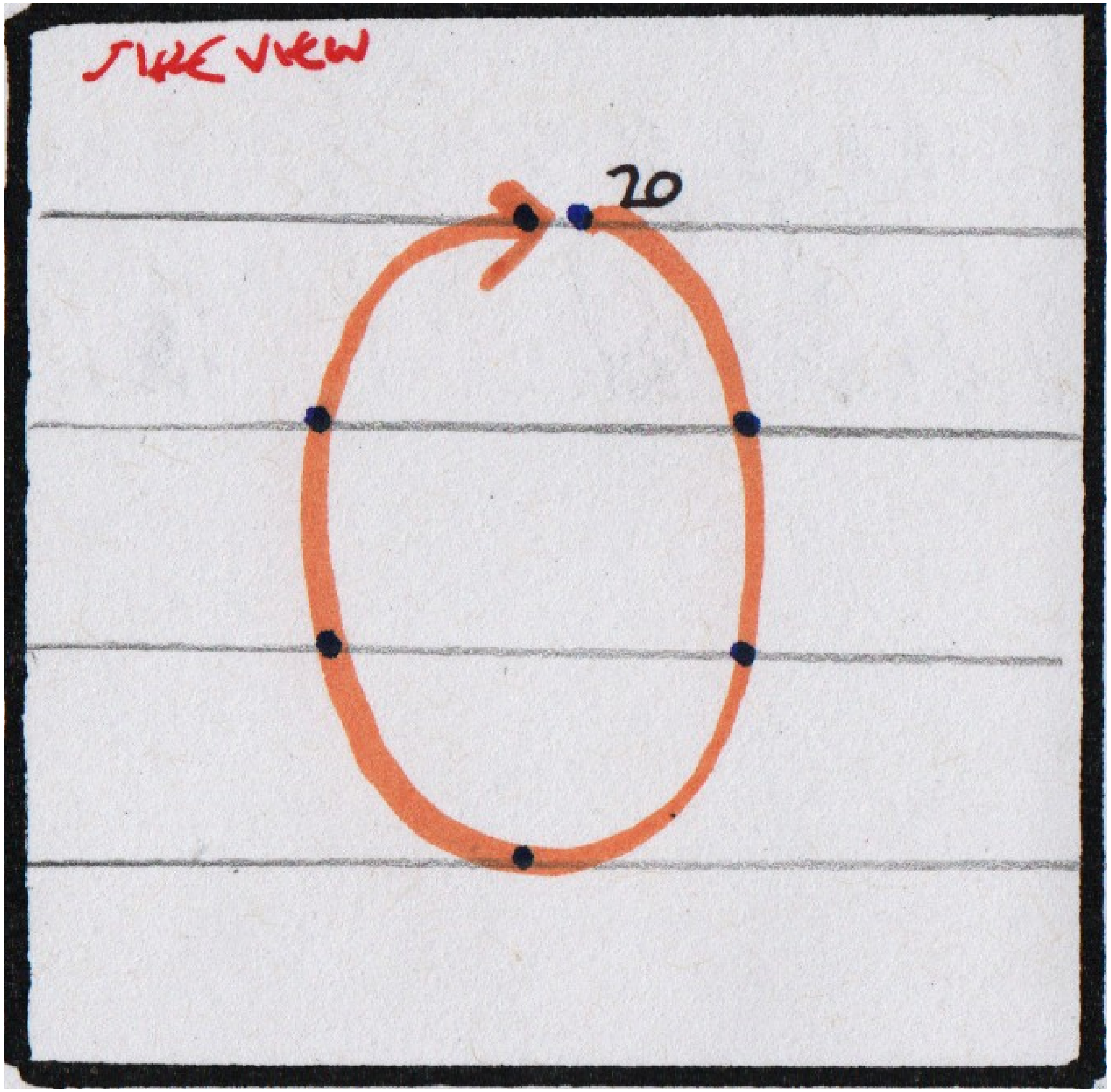
Task 4 : Multidimensional Test-Building

Test 5: horizontal swirls at altitudes 0, 3, 6, 9, 12, and 15,000, increasing intensity at each level



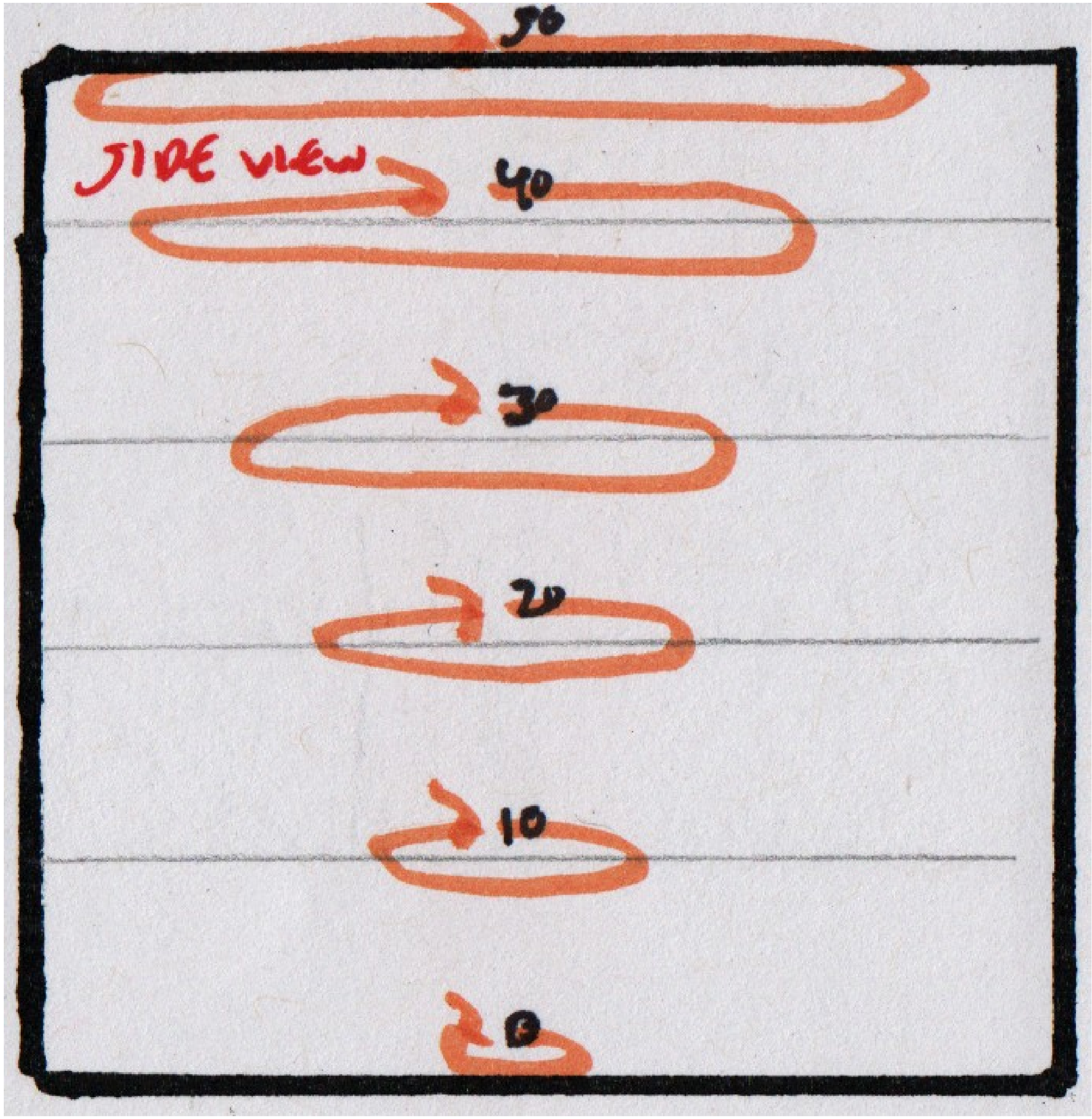
Task 4 : Multidimensional Test-Building

Test 6: vertical swirl centered at altitude 6000, intensity 20



Task 4 : Multidimensional Test-Building

Test 7: clockwise upward cone at altitudes 0, 3, 6, 9, 12, and 15,000, increasing intensity and widening circle at each level



Task 4 : Multidimensional Test-Building

- Instructions
  - create new Eclipse project `CS524WindTester`
  - right-click on project in Package Explorer
    - click Build Path
    - click Configure Building Path
    - in Libraries tab, click Add External JARS
      - point to `cs524task4.jar` (in project folder)
  - `WindModelDriver` requires two command-line arguments
    - input file (from your UI)
      - `wind_`*`n`*`.dat` are available in `/examples`
    - output path
      - for Gnuplot data files and script
  - open Gnuplot and execute script: `load 'script.txt'`