



B-MAT-100

102architect

Home planning and homogeneous plan coordinates



Discover matrix

Home planning and homogeneous plan coordinates

binary name: 102architect
repository name: 102architect_\$ACADEMICYEAR
repository rights: ramassage-tek
language: C, C++, perl 5, python 3 (≥ 3.5), ruby 2 (≥ 2.2), php 5.6, bash 4
group size: 1 to 2
compilation: via Makefile, including re, clean and fclean rules



- Your repository must contain the totality of your source files, but no useless files (binary, temp files, obj files,...).
- All the bonus files (including a potential specific Makefile) should be in a directory named *bonus*.
- Error messages have to be written on the error output, and the program should then exit with the 84 error code (0 if there is no error).

Subject

You are working on a homeplanning software for an firm of architects.

The software should allow a simplification of the plan drawing process, and integrate various features, such as scale management, changing the point of view, moving doors and windows along walls,...

You are in charge of the part concerning geometric transformations (rotations to change point of view, translations to move an object, homotheties to zoom in and out, symmetries and any combination of these transformations).

So, the goal of this project is to develop an application to compute points images in the plan after several transformations.

To make it nice and clean, you chose to use homogeneous coordinates. How clever of you.

O being the origin of both axis, here are the transformations to be implemented :

1. any translation,
2. homtheties centered at O,
3. rotations centered at O,
4. symmetries about any axis that passes through O,
5. many combination of the previous transformations.



Usage

```
Terminal
~/B-MAT-100> ./102architect x y transfo1 arg11 [arg12] [transfo2 arg12 [arg22]] ...
```

x abscissa of the original point

y ordinate of the original point

transfo arg1 [arg2]

-t $i\ j$: translation along the coordinate vector (i, j)

-h $m\ n$: homothety with center O and scale factors m along x-axis and n along y-axis,

-r α : rotation centered in O at angle α degrees,

-s α : symmetry about the axis passing by O and inclined with an α -degree angle.



The use of library including matrix calculus (such as numpy) is prohibited !

Bonus

- adding other transformations,
- graphical interface showing the transformations applied on several points / figures,

Examples

```
Terminal
~/B-MAT-100> ./102architect 5 0 -t -1 1
Translation by the vector (-1, 1)
1.00      0.00     -1.00
0.00      1.00      1.00
0.00      0.00      1.00
(5,0) => (4.00,1.00)
```

```
Terminal
~/B-MAT-100> ./102architect 2 2 -h -1 1
Homothety by the ratios -1 and 1
-1.00     0.00     0.00
0.00      1.00     0.00
0.00      0.00     1.00
(2,2) => (-2.00,2.00)
```

```
Terminal
~/B-MAT-100> ./102architect 1 0 -r 90
Rotation at a 90 degree angle
0.00     -1.00     0.00
1.00      0.00     0.00
0.00      0.00     1.00
(1,0) => (0.00,1.00)
```



```
Terminal
~/B-MAT-100> ./102architect 3 -1 -s 270
Symmetry about an axis inclined with an angle of 270 degrees
-1.00      0.00      0.00
0.00       1.00      0.00
0.00       0.00      1.00
(3,-1) => (-3.00,-1.00)
```

```
Terminal
~/B-MAT-100> ./102architect 1 2 -t 2 3 -h 1 -2 -r 45 -s 30
Translation by the vector (2, 3)
Homothety by the ratios 1 and -2
Rotation at a 45 degree angle
Symmetry about an axis inclined with an angle of 30 degrees
0.97      -0.52      0.38
0.26       1.93      6.31
0.00       0.00      1.00
(1,2) => (0.31,10.44)
```