
easel

— transforming math into art —

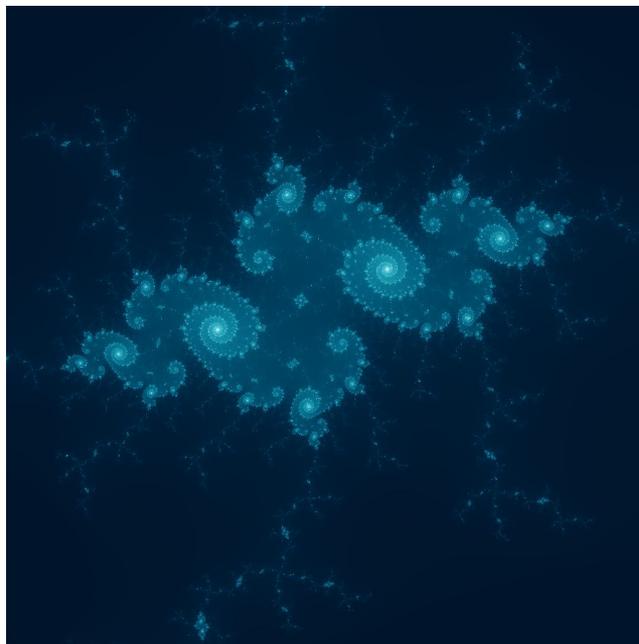
The Team

- Danielle Crosswell - Manager
- Tyrus Cukavac - Language Guru
- Yuan-Chao (Oswin) Chou - System Architect
- Xiaofei (Sophie) Chen - Tester

The Goal

Take mathematical functions and turn them into images

```
unsigned char RD(int i,int j){
    double a=0,b=0,c,d,n=0;
    while((c=a*a)+(d=b*b)<4&& n++<880)
        {b=2*a*b+j*8e-9-.645411;a=c-d+i*8e-9+.356888;}
    return 255*pow((n-80)/800,3.);
}
unsigned char GR(int i,int j){
    double a=0,b=0,c,d,n=0;
    while((c=a*a)+(d=b*b)<4&& n++<880)
        {b=2*a*b+j*8e-9-.645411;a=c-d+i*8e-9+.356888;}
    return 255*pow((n-80)/800,.7);
}
unsigned char BL(int i,int j){
    double a=0,b=0,c,d,n=0;
    while((c=a*a)+(d=b*b)<4&& n++<880)
        {b=2*a*b+j*8e-9-.645411;a=c-d+i*8e-9+.356888;}
    return 255*pow((n-80)/800,.5);
}
```



Language Syntax

```
/* Types */  
int  
float  
bool  
pix  
array  
matrix  
function
```

```
/* Operators */  
+ - * / ^ %  
< > <= >= == !=  
++ ! ++ --  
&& ||
```

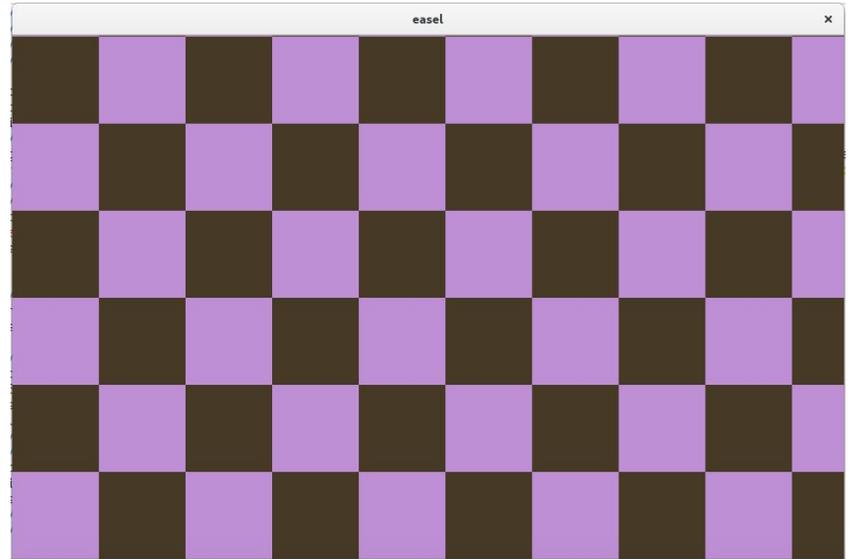
```
/* Control Flow */  
if (true) {  
    do something;  
}  
else {  
    do something else;  
}  
  
int x;  
for (x = 0; x < 10; x++) {  
    do something;  
}  
  
while (true) {  
    do something;  
}
```

```
/* Function declaration */  
function int test(int a) {  
    do something;  
    return a;  
}  
function pix (bool b) { return !b; }
```

```
/* Built-in Functions */  
draw(canvas[ ][ ], x, y);  
draw_size(canvas[ ][ ], x, y, a, b)  
sin(float f);  
cos(float f);  
tan(float f);  
log(float b, float v);  
rando();  
randos(int s);
```

Introduction to easel - Hello World

```
1  /* squares.es */
2  /* sample easel program to return a checkered pattern */
3  pix col1 = #BF8FD600;
4  pix col2 = {70, 58, 39, 170};
5  pix canvas[960][720];
6  int W = 960;
7  int H = 720;
8
9  function void plaid(int p_w) {
10     int x,y;
11     for (y = 0; y < H; y++) {
12         for (x = 0; x < W; x++) {
13             if (((x / p_w) % 2) == ((y / p_w) % 2))
14                 canvas[x][y] = col1;
15             else
16                 canvas[x][y] = col2;
17         }
18     }
19 }
20
21 plaid(100);
22 draw(canvas, 0, 0);
```



DEMO

Beautiful equations...?

```
float a = 0., b = 0., c, d, n = 0.;
while ((c = a * a) + (d = b * b) < 4. && n++ < 880.) {
    b = 2. * a * b + y * 8e-9 - .645411;
    a = c - d + x * 8e-9 + .356888;
}
return 255 * (((n - 80.)/800.) ^ 3.);
```

```
float a = 0., b = 0., c, d, n = 0.;
while ((c = a * a) + (d = b * b) < 4. && n++ < 880.) {
    b = 2. * a * b + y * 8e-9 - .645411;
    a = c - d + x * 8e-9 + .356888;
}
return 255 * (((n - 80.)/800.) ^ .7);
```

```
float a = 0., b = 0., c, d, n = 0.;
while ((c = a * a) + (d = b * b) < 4. && n++ < 880.) {
    b = 2. * a * b + y * 8e-9 - .645411;
    a = c - d + x * 8e-9 + .356888;
}
return 255 * (((n - 80.)/800.) ^ .5);
```

easel's got you covered!

```
function void graph(pix[960][960] canv, int w, int h, function pix (int, int) painter) {
    int x, y;
    for (y = 0; y < h; y++) {
        for (x = 0; x < w; x++) {
            canv[x][y] = painter(x, y);
        }
    }
}
```

```
function pix paint_mandelbrot(int x, int y) {
    return { red(x, y), green(x, y), blue(x, y), 0 };
}

graph(canvas, W, H, paint_mandelbrot);

draw(canvas, 0, 0);
```

Test Suite

- Work through LRM
- Shell script to test all files in test suite (autotest.sh)

```
int i, j, a[3][3];

function int foo(function int (int, int) fp, int x, int y) {
x = x * 10;
y = y + 1;
return fp(x, y);}

for (i = 0; i < a.size; i++){
  for (j = 0; j < a[0].size; j++){
    print(foo(function int (int x, int y) {
      return a[i][j] = 100 + x + y;}, i, j));
  }
}
```



101
102
103
111
112
113
121
122
123

```
test-anonfunc1...OK
test-arith-difftype1...OK
test-arith...OK
test-arith2...OK
test-arr-args1...OK
test-arr-args2...OK
test-array1...OK
test-cirfun...OK
test-const...OK
test-fib1...OK
test-floatlit1...OK
test-for1...OK
test-fun-add...OK
test-fun-ptr...OK
test-global1...OK
test-global2...OK
test-if1...OK
test-if2...OK
```

The Process

- Weekly meetings initially
 - Turned into bi-weekly later into the process
- GitHub Repo
 - All forked from Oswin (he managed pull requests)
- Constant communication
- Prioritize certain tasks for deadlines

Takeaways

- Choose a project you are excited about
- Just because you hit a milestone doesn't mean you're done
- Create small goals
- Work together
- Understand the fundamentals of your language

QUESTIONS?