Floor Plan Language (FPL)

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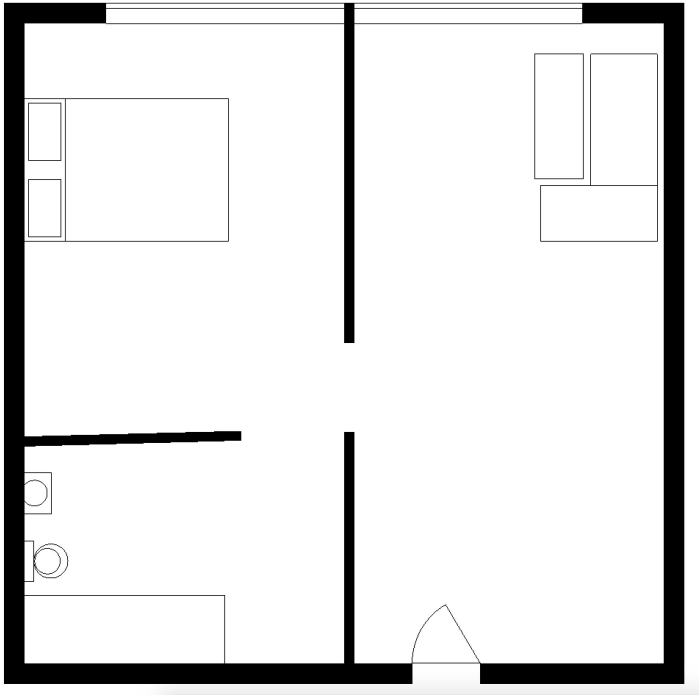
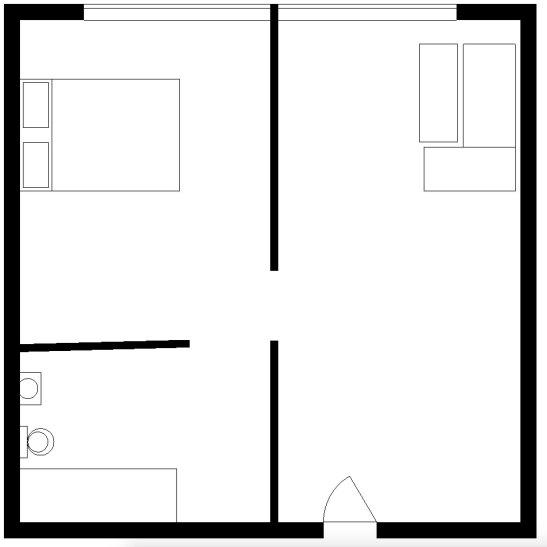
Introduction

- Replace AutoCAD
- C-like language using OpenGL



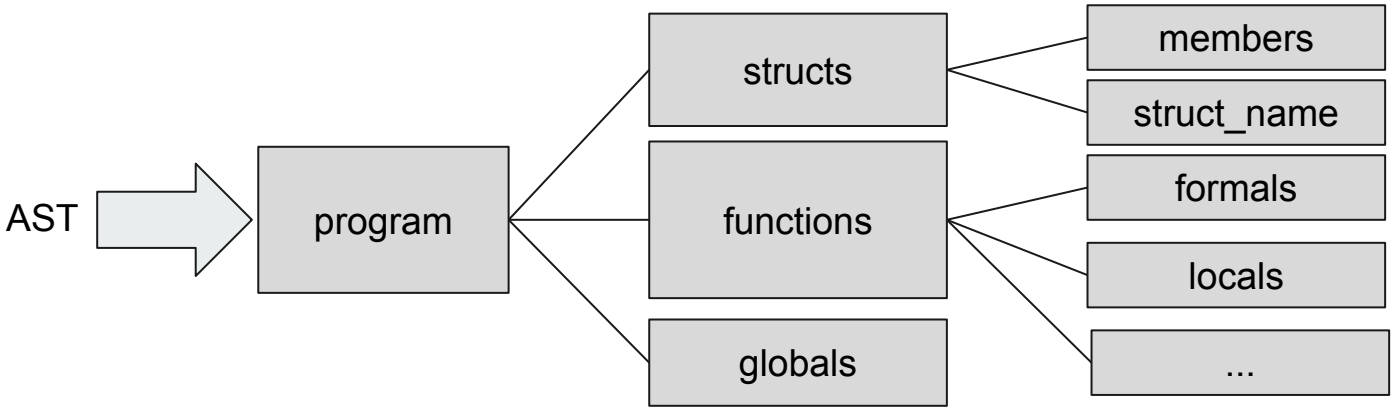
Scanner and Parser

- Built on the top of microC
- Built in data types: bed, door, desk, window, wall, circle and rectangle
- User-defined struct and function: Bedroom, MakeBedroom
- Built in functions: put, rotate, render



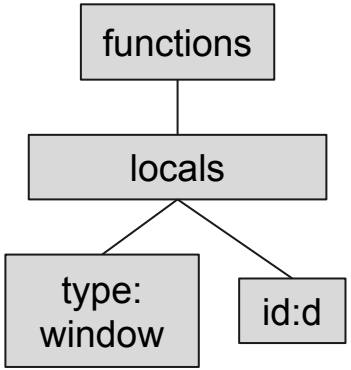
Semantic Checker

- Continue the design of MicroC Semantic Checker
- Built-in Types: wall, bed, door, desk, window, rectangle, circle
- User-defined Struct



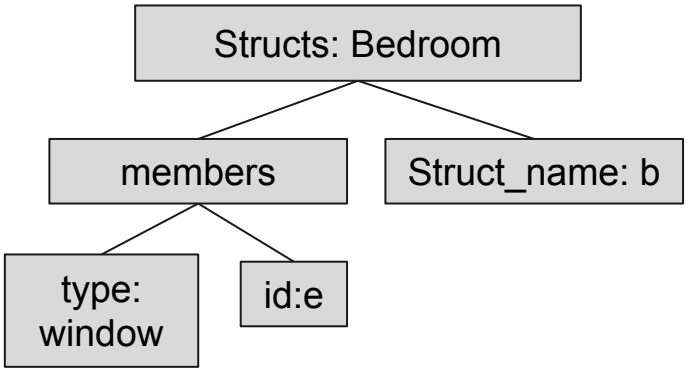
Semantic Checker

```
int main()
{
  window d;
  door e;
  d = window(0.7, 0.8);
  d = window(0.8);
  e = desk(0.9, 1.0);
  put(d, 5.0, 5.0);
}
```



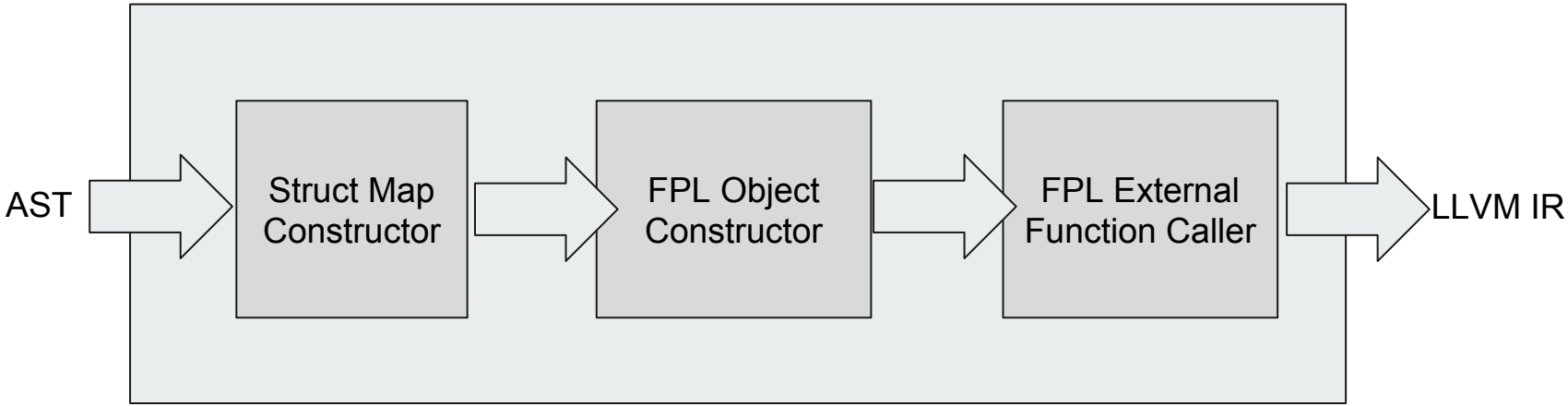

```
struct Bedroom {
    window e;
    rectangle f;
    circle g;
};

int main()
{
  Bedroom b;
  door e;
  b.e = window(0.7, 0.8);
  b.f = desk(0.9, 1.0);
  b.t = 1;
}
```



Code Generator

- FPL object (6-tuple): “wall”, “bed”, “door”, “desk”, “window”, “rectangle”, “circle”
- External function: put, rotate, render



Struct Map Constructor

```
struct Bedroom {
    window e;
    rectangle f;
    circle g;
};

void foo(){
    Bedroom r;
    ….
}

int main(){
    Bedroom r;
    desk k;

    foo();
    …
}
```

Struct Map @ main	
key	value
r	r.e
	r.f
	r.g
k	k

Struct Map @ foo	
key	value
r	r.e
	r.f
	r.g

FPL Object Constructor

- FPL object: object with built-in type like “wall”, “bed”, “door”, “desk”, “window”, “rectangle”, “circle”
- 6-tuple: (type, degree, x of region, y of region, x of position, y of position)

```
int main(){
    desk k;
    wall w;

    k = desk(1.0, 1.0);
   w = wall(1.0, 4.0);
   ....
}
```

FPL Object Map @ main						
key	value					
FPL object	type	degree	x (region)	y (region)	x (position)	y (position)
k	3	0	1.0	1.0	0.0	0.0
w	0	0	1.0	4.0	0.0	0.0

FPL External Function Caller

- put: set the position of FPL object
  a. Find the members from Struct Map, and iterate the 6-tuples in FPL Object Map
  b. Change “x (position)” and “y (position)” fields
  c. Invoke the external “put”, with the 6-tuple as parameters
- rotate: set the degree of rotation
  a. Find the members from Struct Map, and iterate the 6-tuples in FPL Object Map
  b. Change “degree” field
- render: Invoke the external “render”

```
int main(){
  ….
  k = desk(1.0, 1.0);
  w = wall(1.0, 4.0);

  put(k, 1.0, 2.0);
  rotate(w, 90);
```

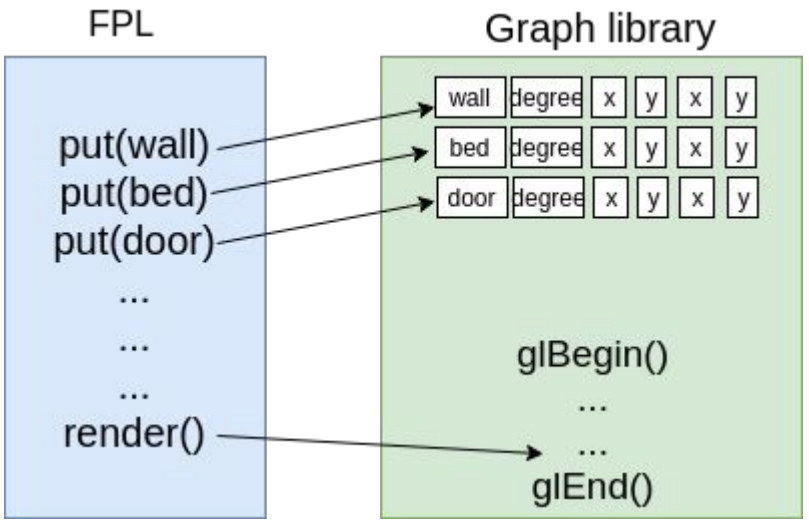
key	value					
FPL object	type	degree	x (region)	y (region)	x (position)	y (position)
k	4	0	1.0	1.0	1.0	2.0
w	0	90	1.0	4.0	0.0	0.0

Graph generator

- A native graph library based on OpenGL in C
- Handle most of heavy work of drawing task
- Take in parameters from FPL and perform corresponding task

Graph library design

- Use ancient OpenGL in C
- Parameters handling
- Drawing implementation



Drawing implementation

1. Basic support for primitive graph such as line, rectangle

```
glBegin(GL_LINE);                //starts drawing of line
glVertex2f(1.0f,1.0f);           //use coordinate to define right point
glVertex2f(-1.0f,-1.0f);         //use coordinate to define left corner
glEnd();                         //end drawing of line
```

2. Implement a special graph circle using approximation of polygon

```
glBegin(GL_LINE_GROUP);    //draw a polygon of 600 angle to approximate a circle
for(ii = 0; ii < 600; ii++)
 {
    float theta =  2 * 3.1415926f * ii / 600;        //get the current angle
    float x = r * cosf(theta);                       //calculate the x component
    float y = r * sinf(theta);                       //calculate the y component
    glVertex2f(x , y);                               //output vertex
}
glEnd();                          //End quadrilateral coordinates
```

Demo