

Poicent

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github.com/shengtanmao/Poicent

Introduction

Poicent adds C-style pointers to MicroC

Goal: expand general usability of MicroC

Motivation:

- quicker to get started from an established codebase
- pointers have versatile use cases
- small external library

Features

Retains MicroC features

Basic features:

- pointer type
- malloc and free

Core features:

- reference and dereference
- pointer arrays and subscript
- pointer arithmetic

Pointer Type

Can declare pointer to non-pointers

```
int *p; \* pointer to int *\
```

```
float *p; \* pointer to float *\
```

Can declare pointer to pointer

```
int **p; \* pointer to (pointer to int) *\
```

```
int ***p; \* pointer to (pointer to (pointer to int)) *\
```

Setting Dereferenced Pointer

Allocate memory for pointer with `malloc`, deallocate with `free`

* to dereference

```
int *a;  
  
a = malloc(4);  
  
*a = 5;  
  
print(*a); /* prints 5 */  
  
free(a);
```

Referencing & Dereferencing

& to reference, * to dereference

```
int *a;  
  
int b;  
  
b = 5;  
  
a = &b;  
  
print(*a); /* prints 5 */
```

Pointer Arrays

Access element with []

```
int *a;  
a = malloc(12);  
a[2] = 4115;  
print(a[2]); /* prints 4115 */  
free(a);
```

Pointer Arithmetic

Add / subtract integers to pointers

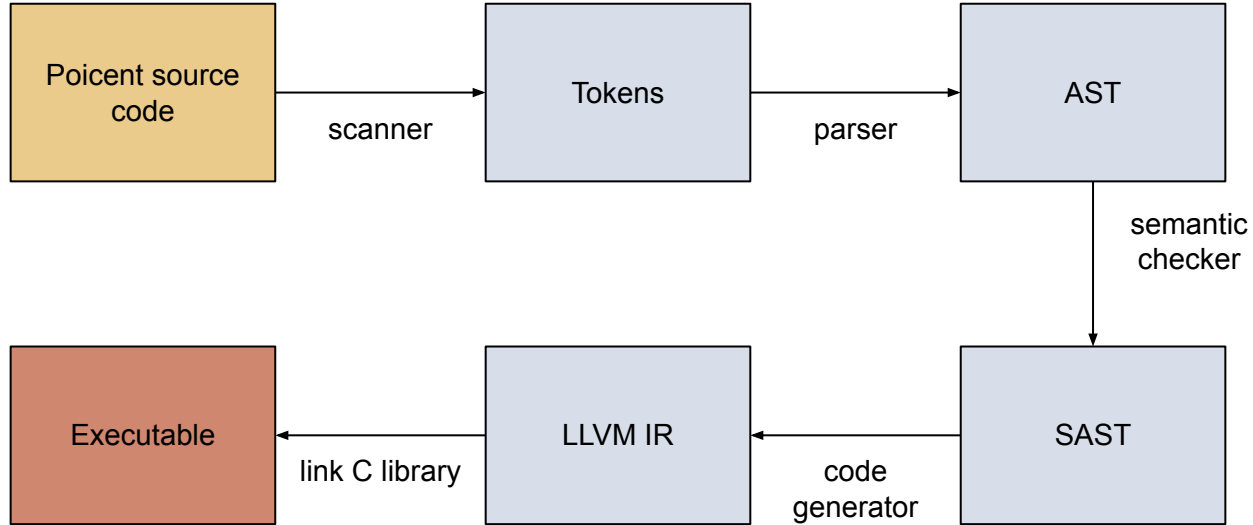
```
int *a;  
  
a = a + 3; /* shifts by the size of 3 int */
```

Compare pointer addresses

```
if (a < b) /* a, b pointers */  
    print(1);
```


Architectural Design

Compiler files: scanner.mly, parser.mly, semant.ml, ast.ml, sast.ml, codegen.ml



Future Work

Test memory leaks: malloc and free

Pointer increment / decrement (`++p`, `--p`, `p++`, `p--`)

`sizeof()`

Type casting

Demo

Demo 1: setting pointer to a reference

Demo 2: creating an 1D pointer array using pointer arithmetic

Demo 3: creating a 2D pointer array using subscript

Demo 4: real-time example

Questions

Poicent git repository: github.com/shengtanmao/Poicent

MicroC source code:

<http://www.cs.columbia.edu/~sedwards/classes/2021/4115-spring/microc.tar.gz>

Thank you