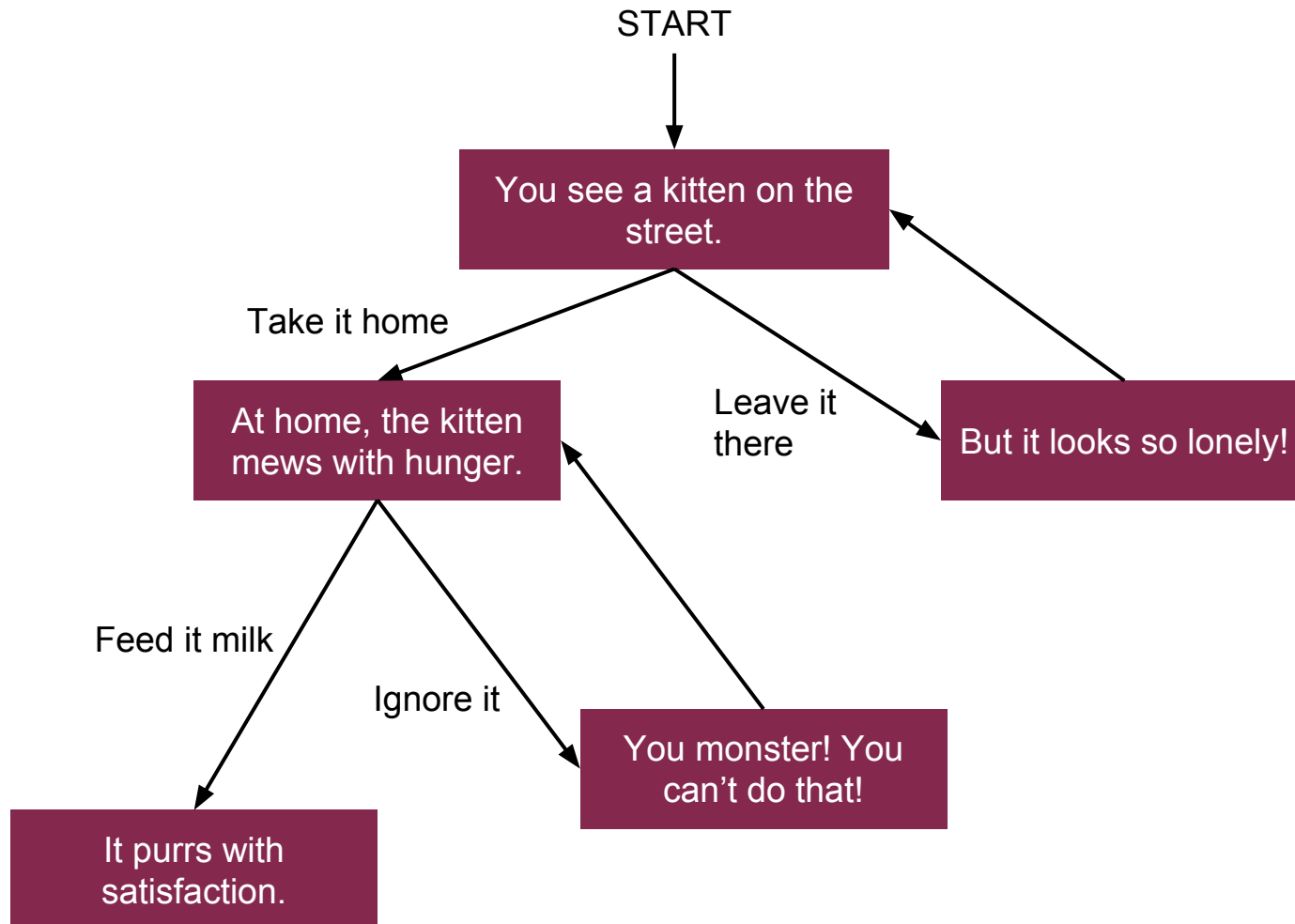


Stage (Null) Language

James Lin, Alex Liu, Daniel Maxson, Andre Paiva

Motivation



SNL

is...

- imperative
- dynamically typed
- garbage collected

but not...

- free-form
- object-oriented

SNL

has...

- int, float, bool, string, and list types
- stages and a `next` keyword
- functions (called “recipes”)

but not...

- pointers
- objects or structs
- for/while loops

Example: GCD

```
start main:
```

```
  x is do gcd to 5, 10
```

```
  do show to x
```

```
done
```

constants

library recipes

stage, variable, and user-defined recipe names

assignment

recipe application

stage and recipe keywords

Example: GCD

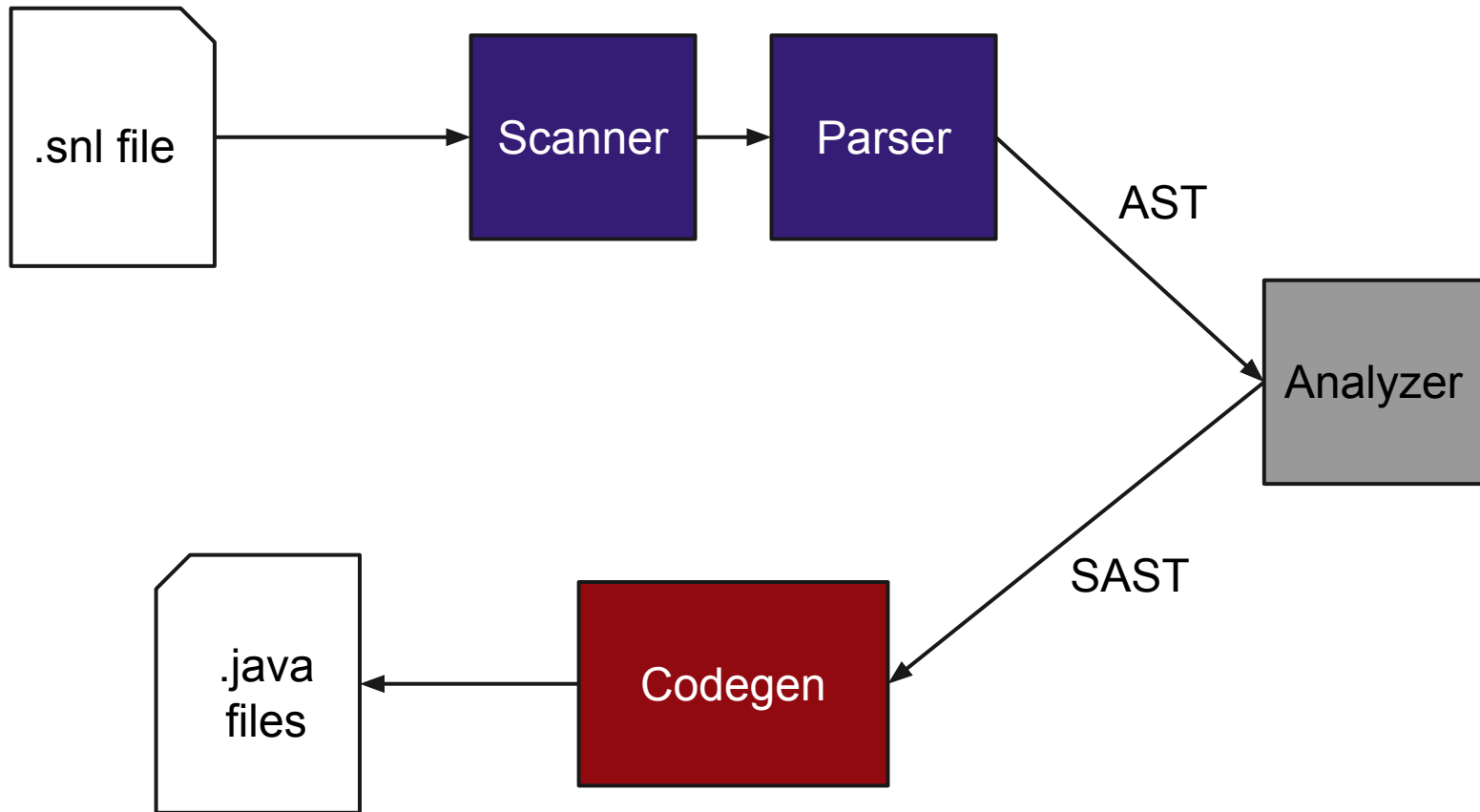
```
recipe gcd to x, y:
```

```
start begin:  
  if x != y  
    (next loop)  
  else  
    (return x)  
done
```

```
loop:  
  if x > y  
    (x is x - y)  
  else  
    (y is y - x)  
  next begin  
done
```

```
done
```

Implementation



Scanning and Parsing

- Standard ocamllex and ocamlyacc
- Challenges:
 - Whitespace whitespace everywhere!
 - Creating an unambiguous grammar for a language that looks ambiguous

```
if y > 15.9
(y is y + 7
z is z - 53.8)
else
(local x is false)
```

VS.

```
if y > 15.9
(y is y + 7
z is z - 53.8)
```


Java Generation

- Walk SAST and convert each element to a string that is written to a Java file
- Challenges
 - Compiling from a dynamically-typed language to a statically-typed language
 - Modularizing Java generation and Java files
- No IR used, but instead SNLObject, a class that acts as an abstraction of type in our language

Tests

- Exhaustive regression testing suite
- Interactive testing script
 - Allows for assurance of quality for each compiler component
- Specific tests for each stage of the compiler
- Over 50 tests for final compiled code
 - Run compiled Java code and compare with expected output
- Prevented many subtle errors in the generation of Java code

Conclusion

SNL is a simple language designed to teach programming (and we tested this!).

Lessons learned:

- Use github!
- OCaml is actually AMAZING!
- Use regression testing!
- Pair program!
- **Unresolved: To procrastinate or not?**