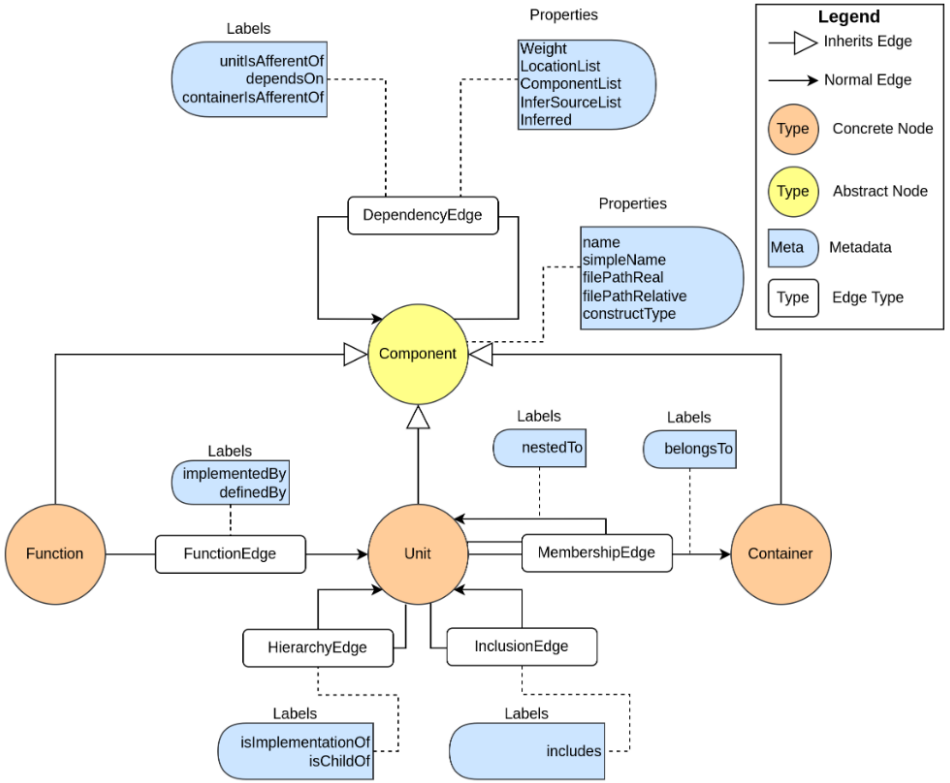
Un framework multi-linguaggio per l'identificazione delle dipendenze del codice sorgente

Relatore: Prof.ssa Arcelli Fontana Francesca
Correlatore: Sas Darius

Candidato: Refolli Francesco
Matricola: 865955

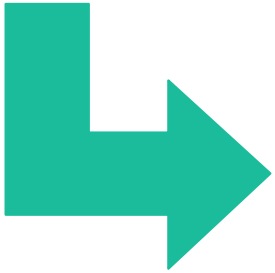
Anno Accademico 2022/2023

Arcan


Labels
unitIsAfferentOf
dependsOn
containerIsAfferentOf
Properties
Weight
LocationList
ComponentList
InferSourceList
Inferred
Legend
Inherits Edge
Normal Edge
Type
Concrete Node
Type
Abstract Node
Meta
Metadata
Type
Edge Type
DependencyEdge
Properties
name
simpleName
filePathReal
filePathRelative
constructType
Component
Labels
nestedTo
Labels
belongsTo
Labels
implementedBy
definedBy
Function
FunctionEdge
Unit
MembershipEdge
Container
HierarchyEdge
InclusionEdge
Labels
isImplementationOf
isChildOf
Labels
includes

Tree Sitter

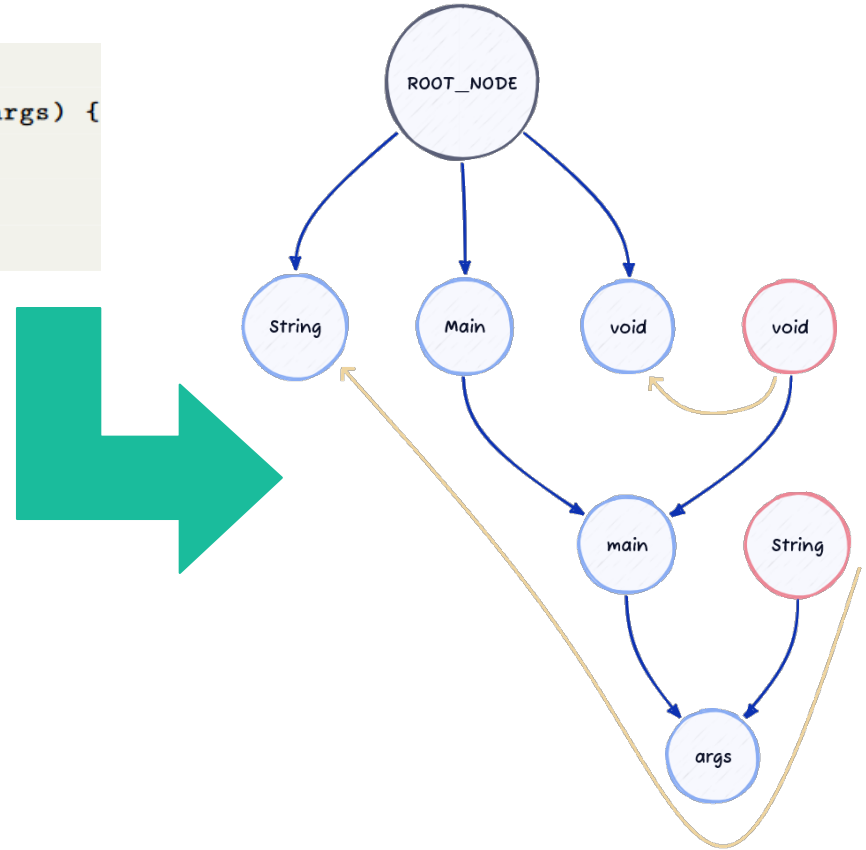
```
class Main {
  public static void main(String[] args) {
      // comment
    }
}
```



```
(program
  (class_declaration
    name: (identifier)
    body: (class_body
            (method_declaration
              (modifiers)
              type: (void_type)
              name: (identifier)
              parameters: (formal_parameters
                           (formal_parameter
                             type: (array_type
                                     element: (type_identifier)
                                     dimensions: (dimensions))
                             name: (identifier)))
              body: (block
                      (line_comment))))))
```

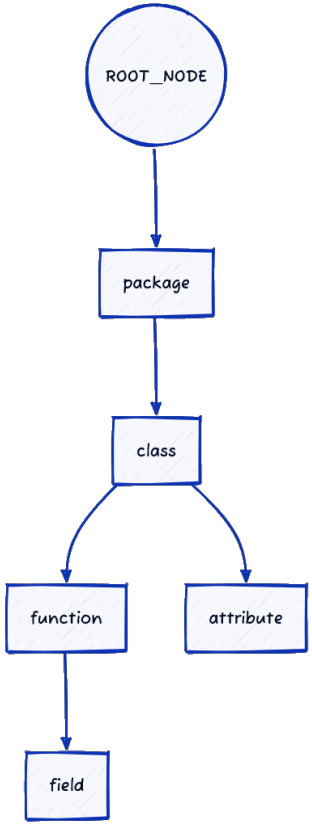
Stack Graph

```
class Main {
  public static void main(String[] args) {
      // comment
    }
}
```



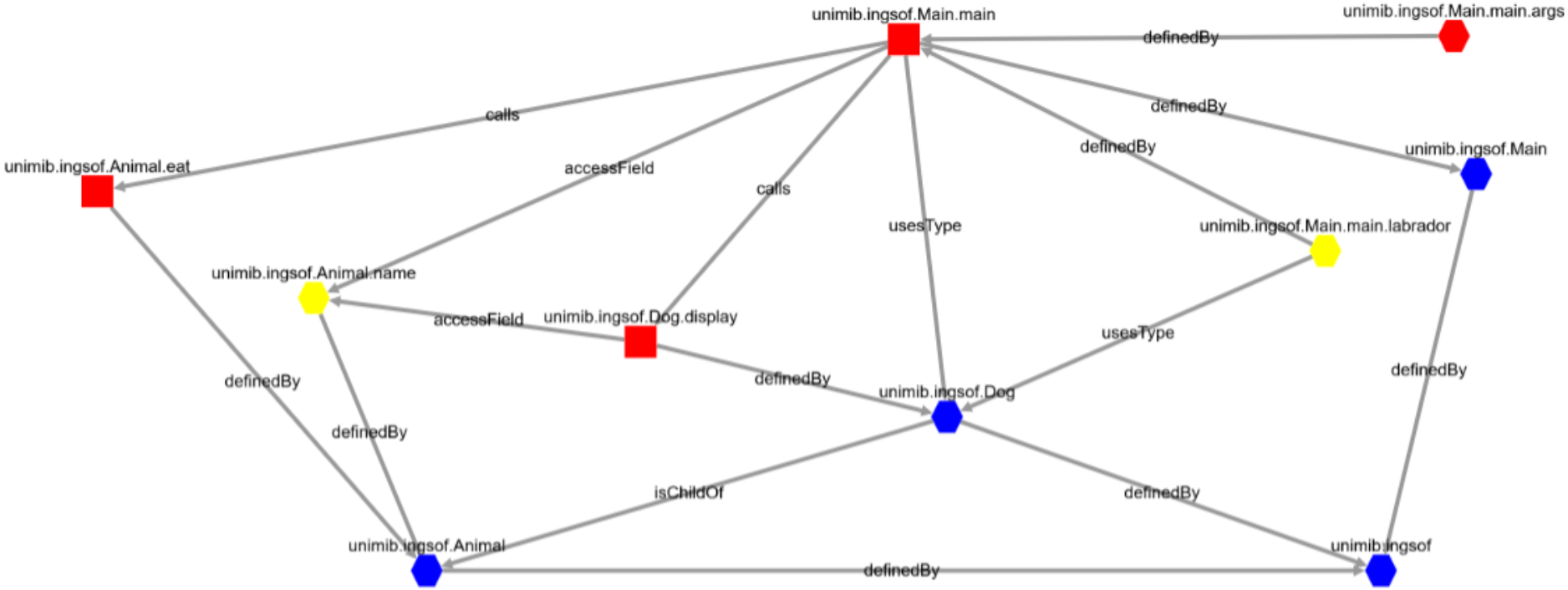
Grammatica TSG

```
(identifier)@this {
    node push
    node pop
    node scope
    let @this.push_start = push
    let @this.push_end = push
    let @this.pop_start = pop
    let @this.pop_end = pop
    let @this.scope = scope
    push -> scope
}
```



Unit
+ scope
+ push_start
+ pop_start
+ push_end
+ pop_end

Dependency Graph



Validazione

Sorgente	Destinazione	Relazione	Prototipo	Arcan
Access				
AccessClassVariable	CheckInDAO	accessField	✓	✓
AccessClassVariableConstant	UserDAO	accessField	✓	✓
AccessClassVariableInterface	ISierraDAO	accessField	✓	✓
AccessEnumeration	TipDAO	accessField	✓	✓
AccessInstanceVariableRead	ProfileDAO	accessField	✗	✓
AccessInstanceVariableWrite	ProfileDAO	accessField	✗	✓
AccessInstanceVariableConstant	UserDAO	accessField	✗	✓
AccessInstanceVariableSuperClass	CallInstanceSuperClassDAO	accessField	✗	✗
AccessInstanceVariableSuperSuperClass	CallInstanceSuperClassDAO	accessField	✗	✗
AccessObjectReferenceAsParameter	Base	accessField	✓	✗
AccessObjectReferenceWithinIfStatement	Base	accessField	✓	✗
Annotations				
AnnotationDependency	SettingsAnnotation	usesType	✓	✓
Call				
CallClassMethod	BadgesDAO	calls	✓	✓
CallConstructor	AccountDAO	usesType	✓	✓
CallInstance	ProfileDAO	calls	✗	✗
CallInstanceInnerClass	CallInstanceOuterClassDAO	calls	✗	✗
CallInstanceInterface	CallInstanceInterfaceDAO	calls	✗	✗
CallInstanceSuperClass	CallInstanceSuperClassDAO	calls	✗	✓
CallInstanceSuperSuperClass	CallInstanceSuperClassDAO	calls	✗	✓
Declaration				
DeclarationExceptionThrows	StaticsException	throwsType	✓	✓
DeclarationParameter	ProfileDAO	usesType	✓	✓
DeclarationReturnType	VenueDAO	usesType	✓	✓
DeclarationTypeCast	ProfileDAO	castsType	✓	✓
DeclarationTypeCastOfArgument	ProfileDAO	castsType	✓	✓
DeclarationVariableInstance	ProfileDAO	usesType	✓	✓
DeclarationVariableLocal	ProfileDAO	usesType	✓	✓
DeclarationVariableLocal_Initialized	ProfileDAO	usesType	✓	✓
DeclarationVariableStatic	ProfileDAO	usesType	✓	✓
Import				
domain.direct.violating	AccountDAO	includes	✓	✗
Inheritance				
InheritanceExtends	HistoryDAO	isChildOf	✓	✓
InheritanceExtendsAbstractClass	FriendsDAO	isChildOf	✓	✓
InheritanceImplementsInterface	IMapDAO	isImplementationOf	✓	✓

Test	Relazioni	Risultato
implementation_bridge	calls	✓
class_methods_with_parameters	definedBy	✓
class_implementation	isImplementationOf	✓
class_with_attributes	definedBy	✓
class_methods_with_attributes	definedBy	✓
class_method_call	calls	✓
type_inference	calls, accessField	✓
enums	definedBy, accessField	✓
class_inheritance	isChildOf, nestedTo	✓
object_creation	usesType	✓
class_type_usage_nested_packages	definedBy, usesType	✓
nested_classes	nestedTo	✓
casts_type	castsType	✓
class_type_usage	definedBy, usesType	✓
throws_type	throwsType	✓
imports	definedBy, includes, usesType	✓
interface_inheritance	isChildOf	✓
type_inference_with_packages	calls, accessField	✓
extension_bridge	calls	✓
class_constructors	definedBy	✓
class_field_access	accessField	✓
class_packages	definedBy, includes	✓
annotation	usesType	✓
array_creation	usesType	✓
class_inheritance_with_packages	isChildOf	✓
class_methods	definedBy	✓

Comparazione con Arcan

progetto	software	tempo minimo	tempo massimo	tempo medio
guava	Prototipo	N/A	N/A	N/A
guava	Arcan	N/A	N/A	120~
junit4	Prototipo	65,82	69,07	65,88
junit4	Arcan	13,850	17,079	14,611
junit5	Prototipo	132,87	134,75	134,44
junit5	Arcan	42,542	47,613	44,186
antlr4	Prototipo	171,65	175,49	172,64
antlr4	Arcan	19,222	20,140	19,691
fastjson	Prototipo	N/A	N/A	N/A
fastjson	Arcan	66,932	71,094	69,071

Comparazione con Arcan

progetto	Jaccard(nodi)	Jaccard(archi)	Jaccard(grafi)
junit4	37,26%	23,19%	25,42%
junit5	47,41%	15,13%	19,73%
antlr4	82,18%	44,25%	48,43%

Conclusioni

- Parallelizzazione
- Grammatiche TSG ad hoc
- Conflitti di reference
- Librerie standard e di terze parti
- Dimensioni dello Stack Graph
- Analisi Differenziali

GRAZIE PER L'ATTENZIONE

Refolli Francesco. 865955