The "this" reference

- The reference "this" is a reserved word
- It can occur inside a normal (non-static) method
- It has a reference to the object receiving the message

Example

```
public class Movie
{
  String title, director;
  Movie(String t, String d)
  {
    title = t;
    director = d;
  }
  void print()
  {
    System.out.println(title);
    System.out.println(director);
  }
}
```

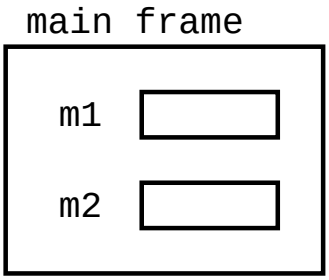
Is the same as...

```
public class Movie
{
  String title, director;
  Movie(String t, String d)
  {
    this.title = t;
    this.director = d;
  }
  void print()
  {
    System.out.println(this.title);
    System.out.println(this.director);
  }
}
```

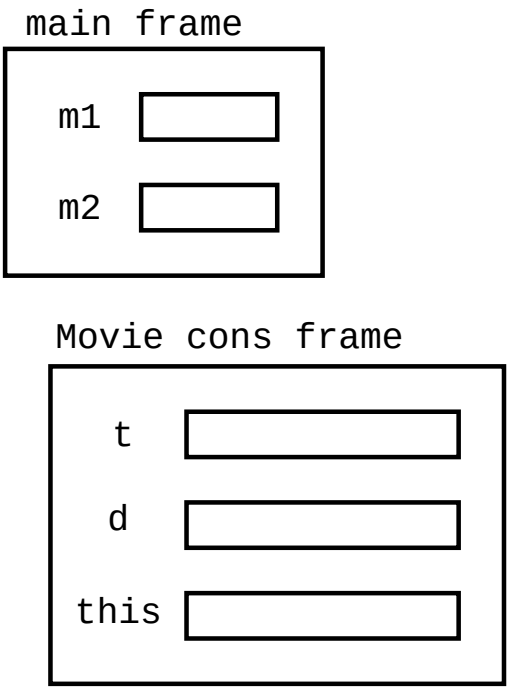
Example

```
public class MovieApplication {
  public static void main(String[] args)
  {
    Movie m1, m2;
    m1 = new Movie(“Trainspotting”, “Danny Boyle”)
    m2 = new Movie(“Pirates of the Caribbean”,
                   “Gore Verbinski”);
    m1.print();
    m2.print();
  }
}
```

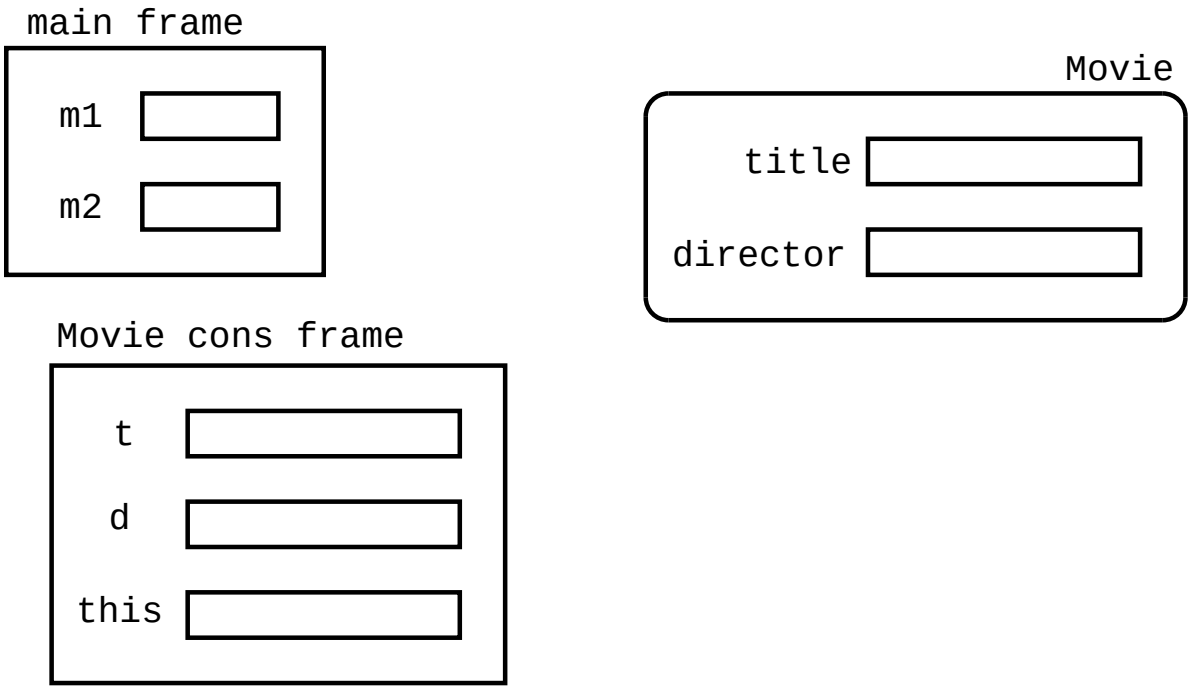
Execution



Execution



Execution


main frame
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Movie
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director
Movie cons frame
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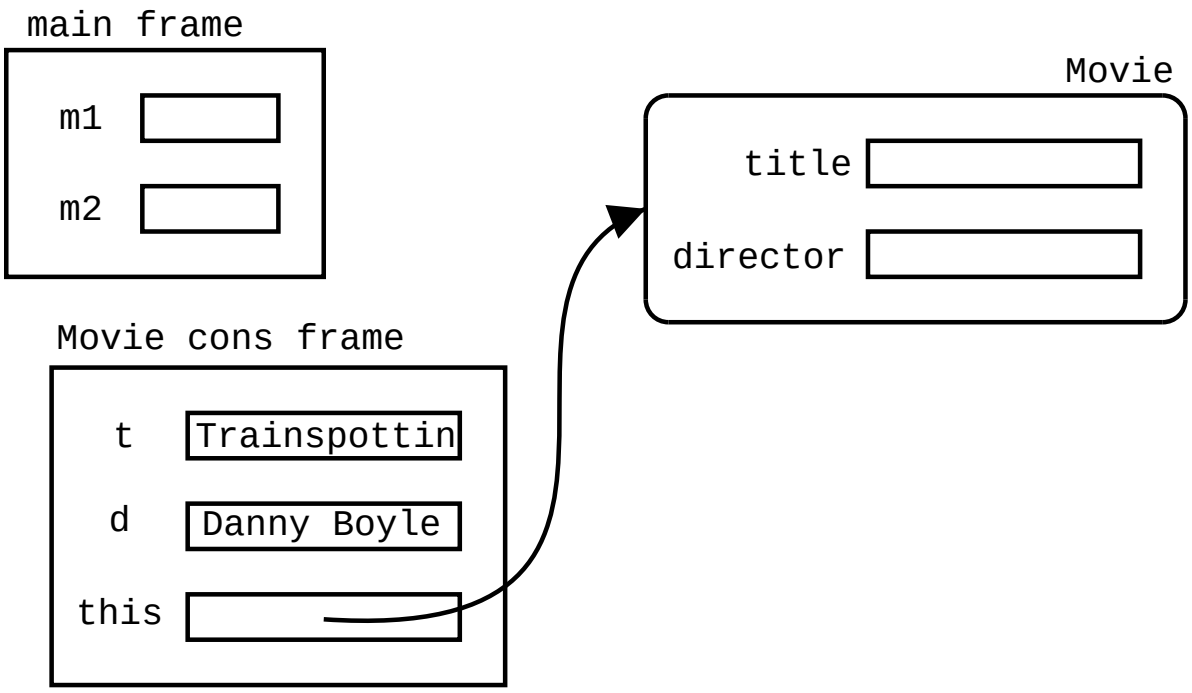
Execution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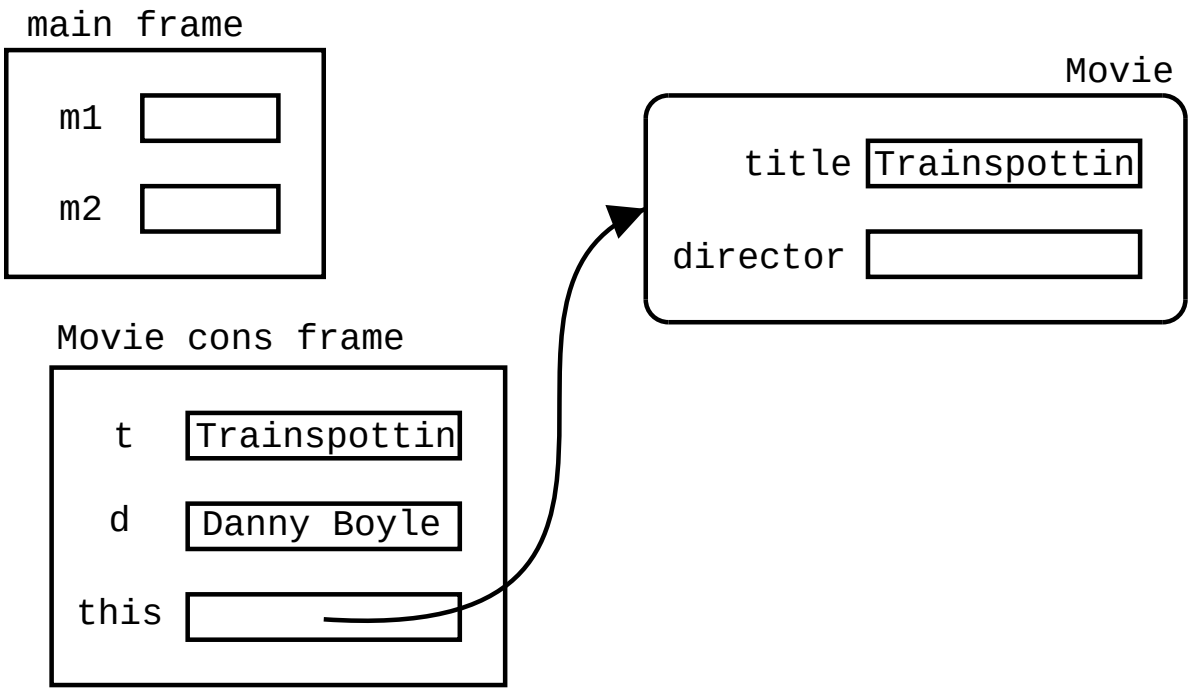
Execution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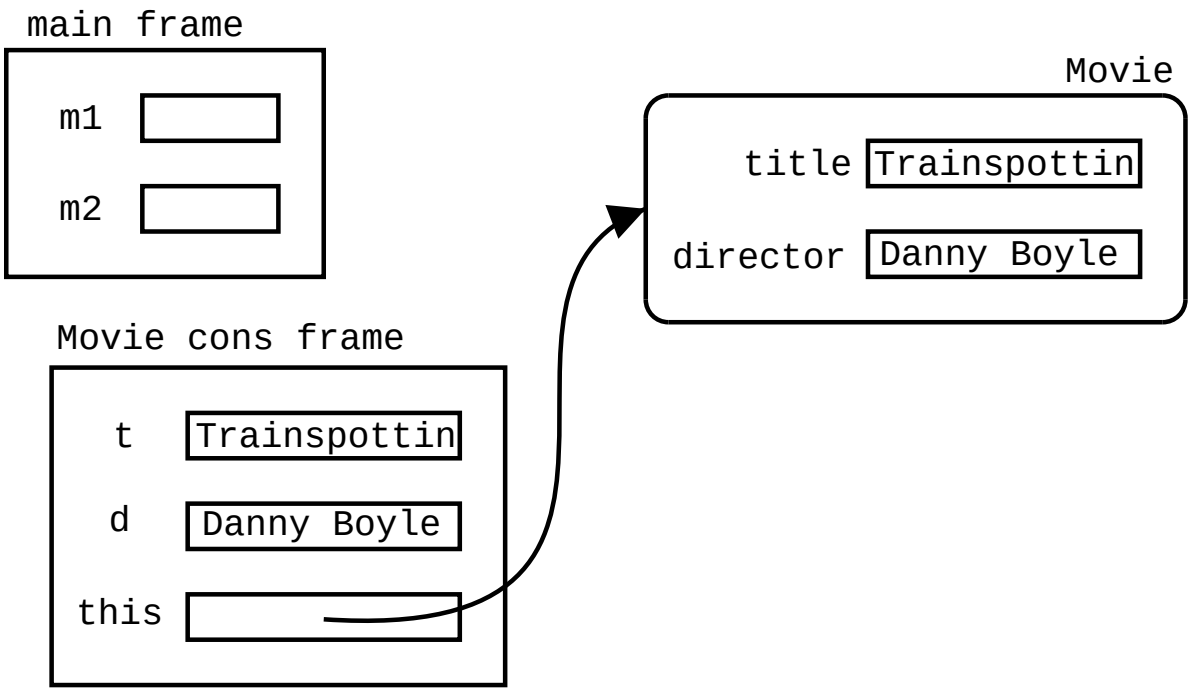
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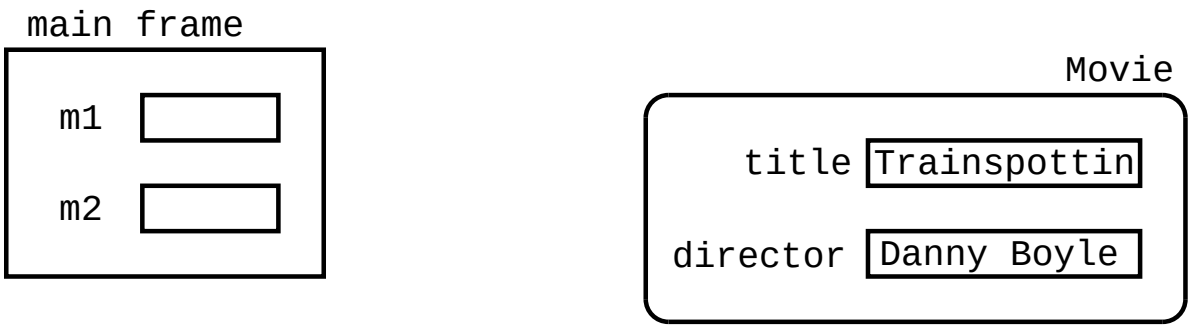
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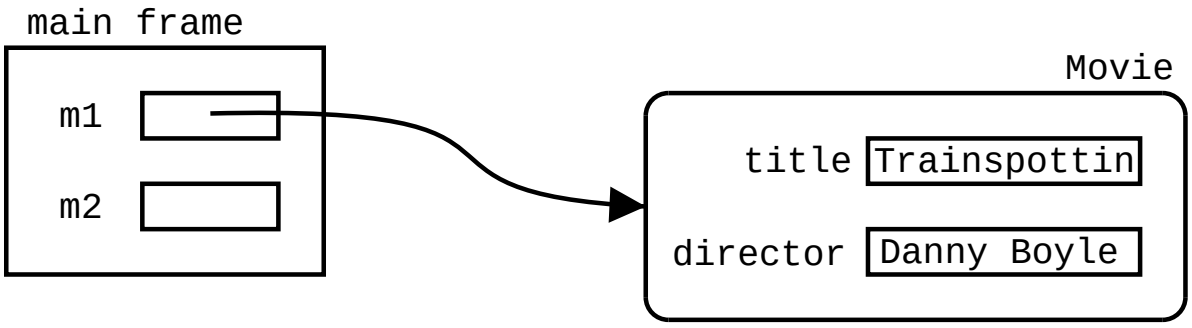
Execution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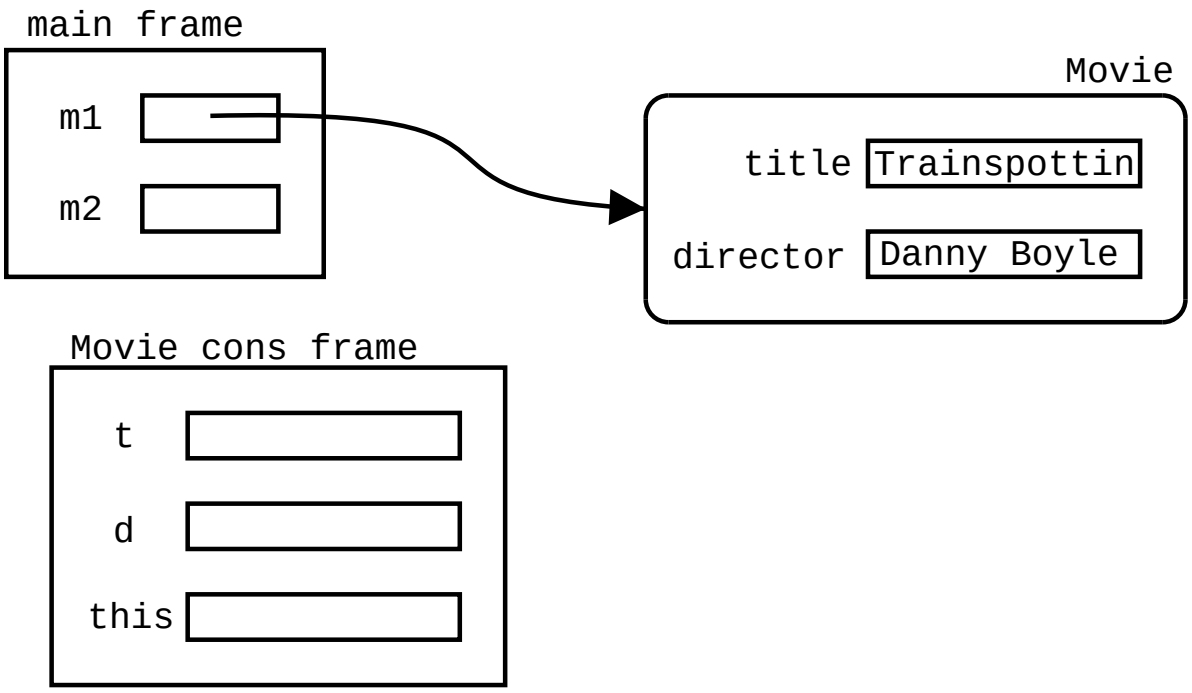
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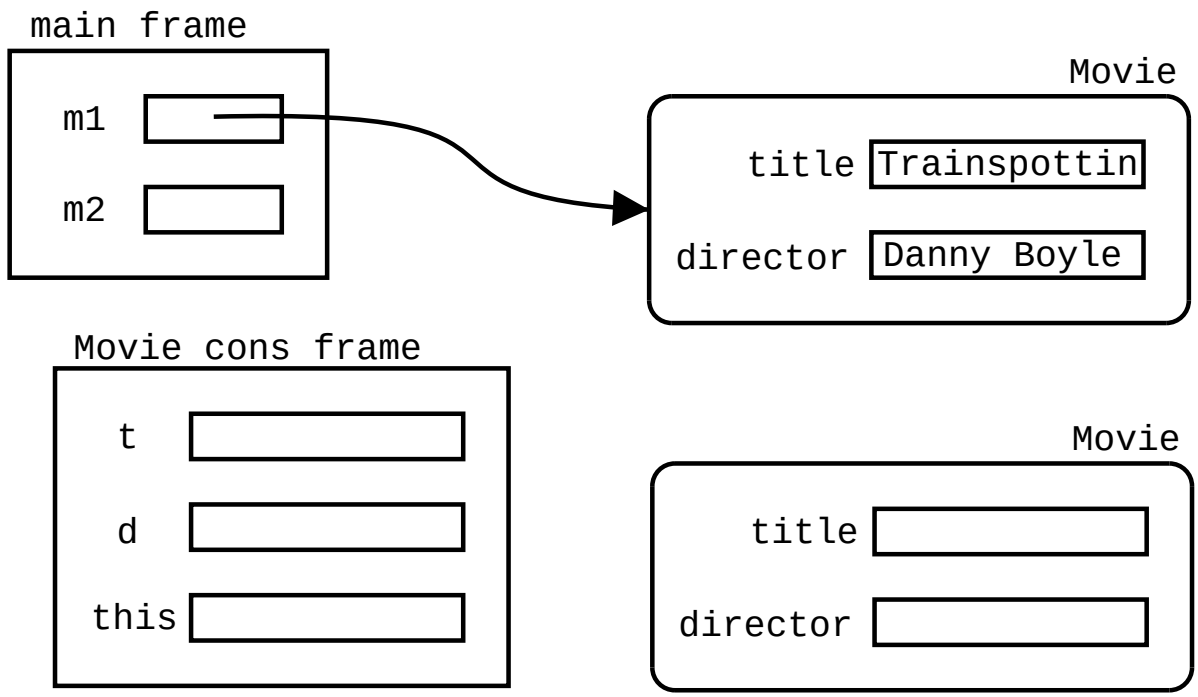
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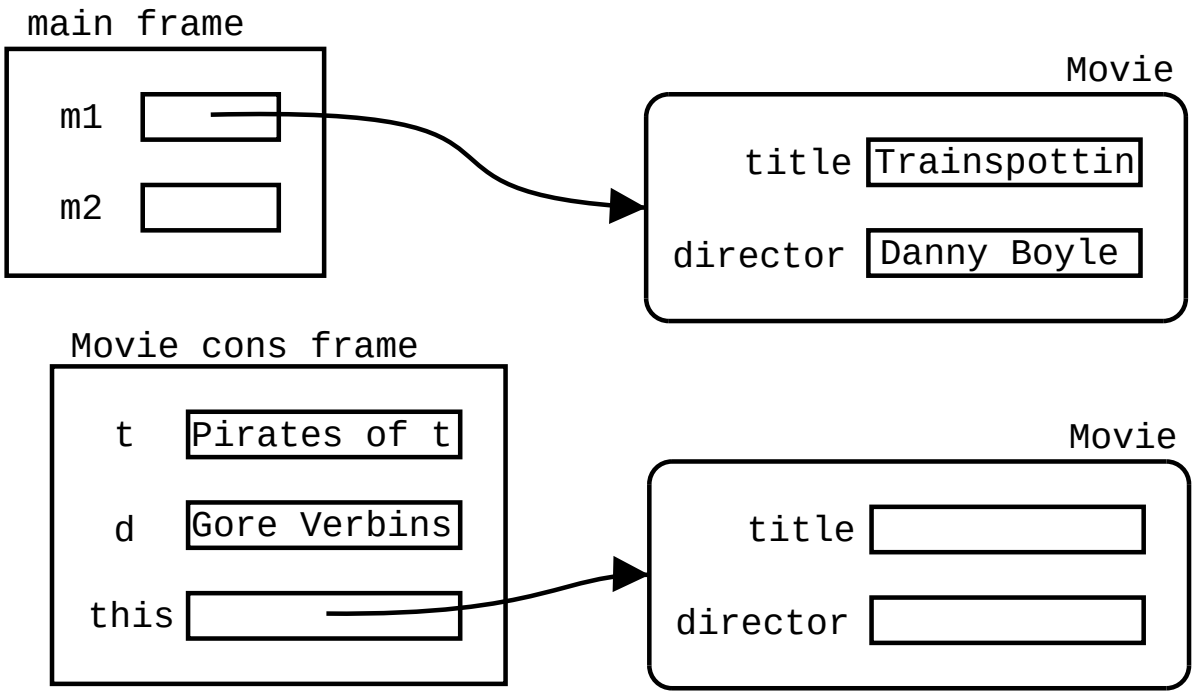
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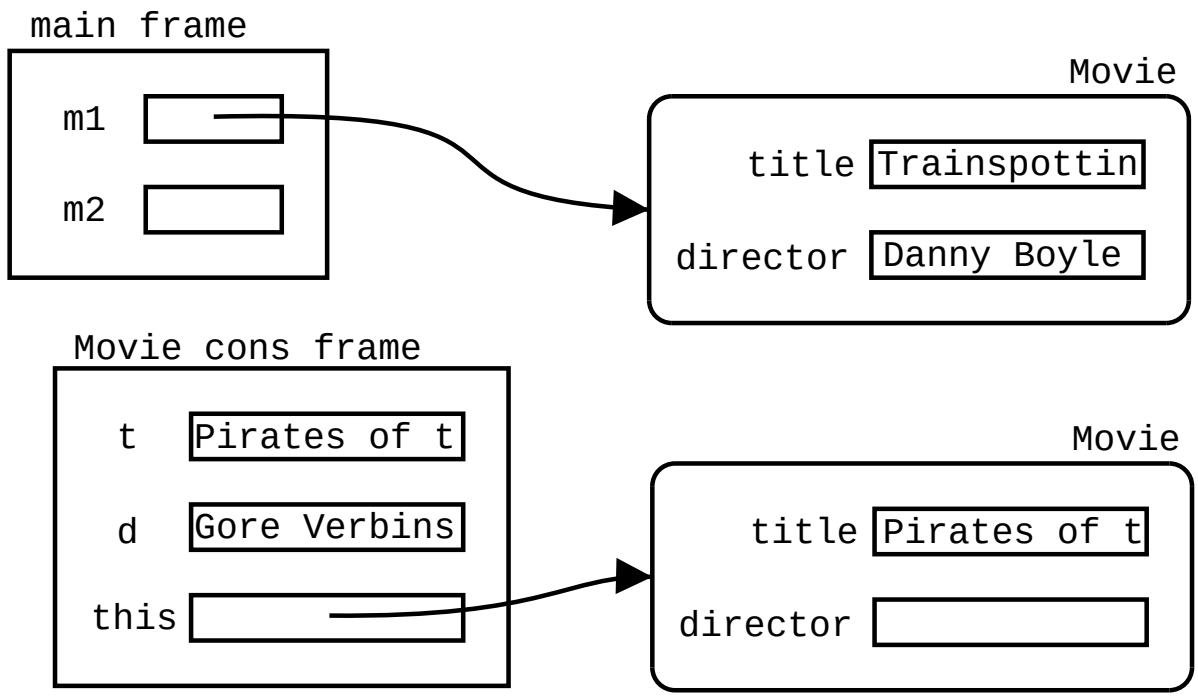
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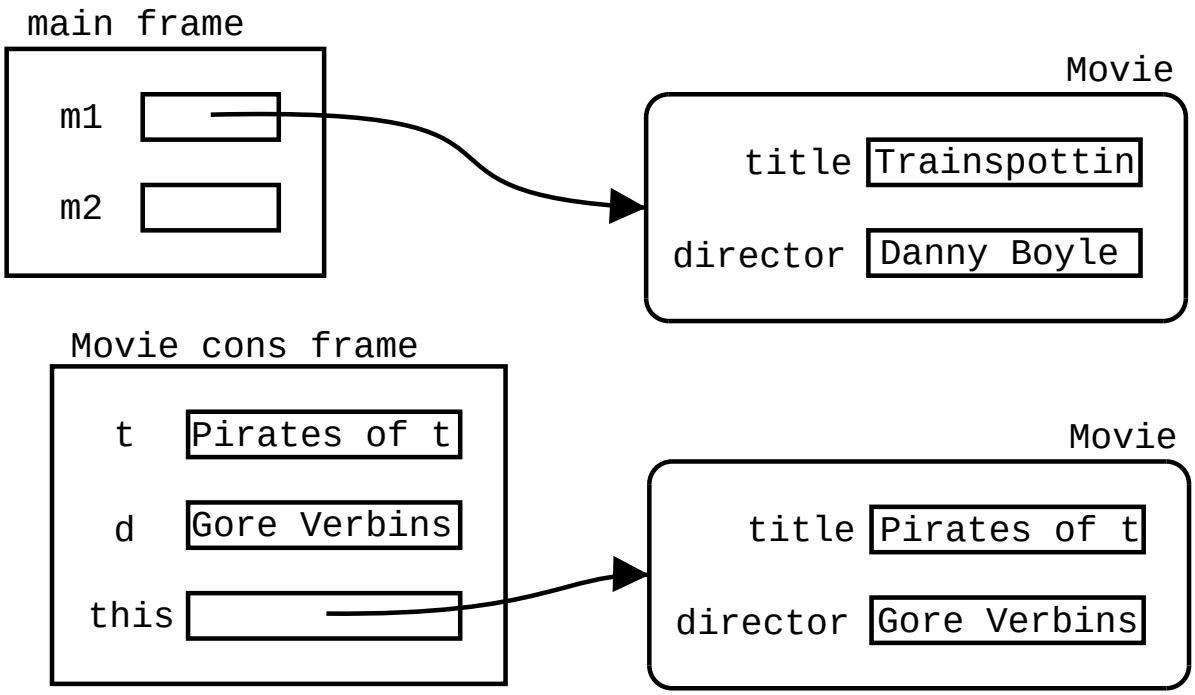
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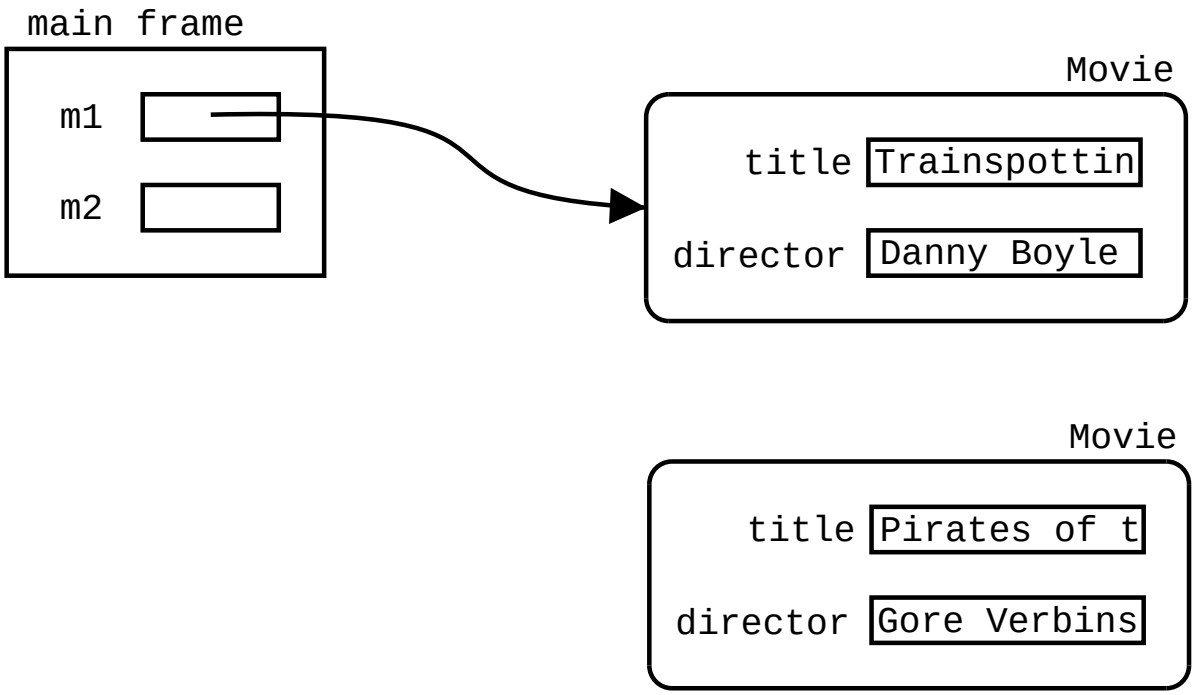
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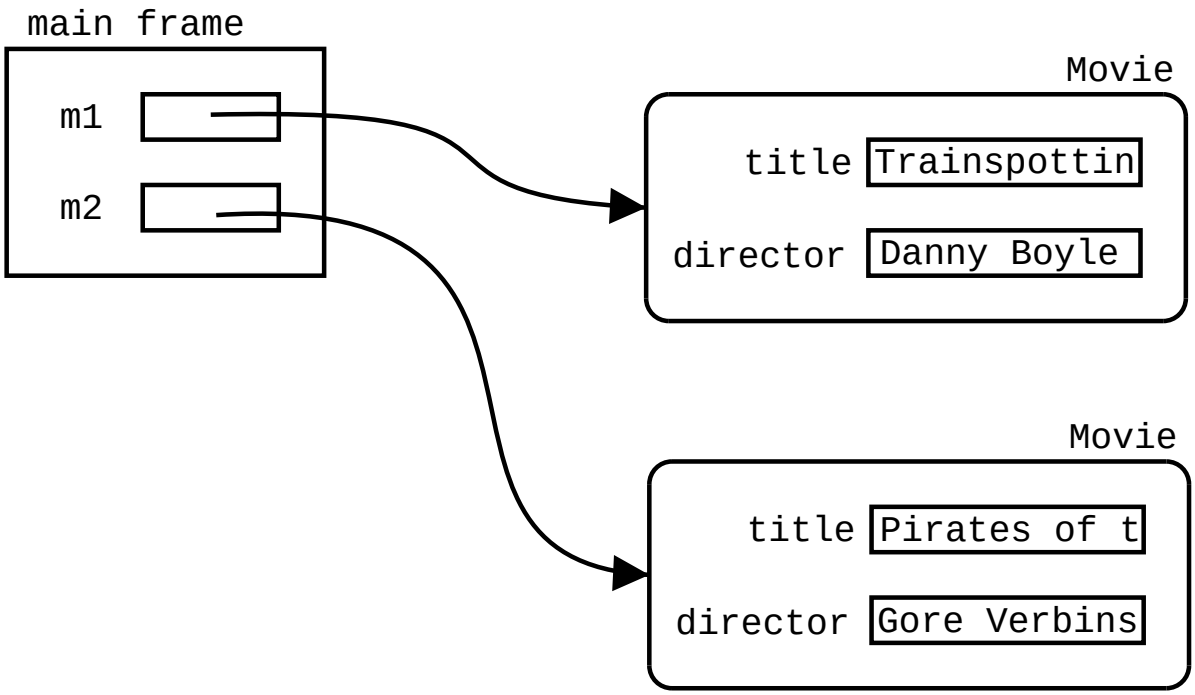
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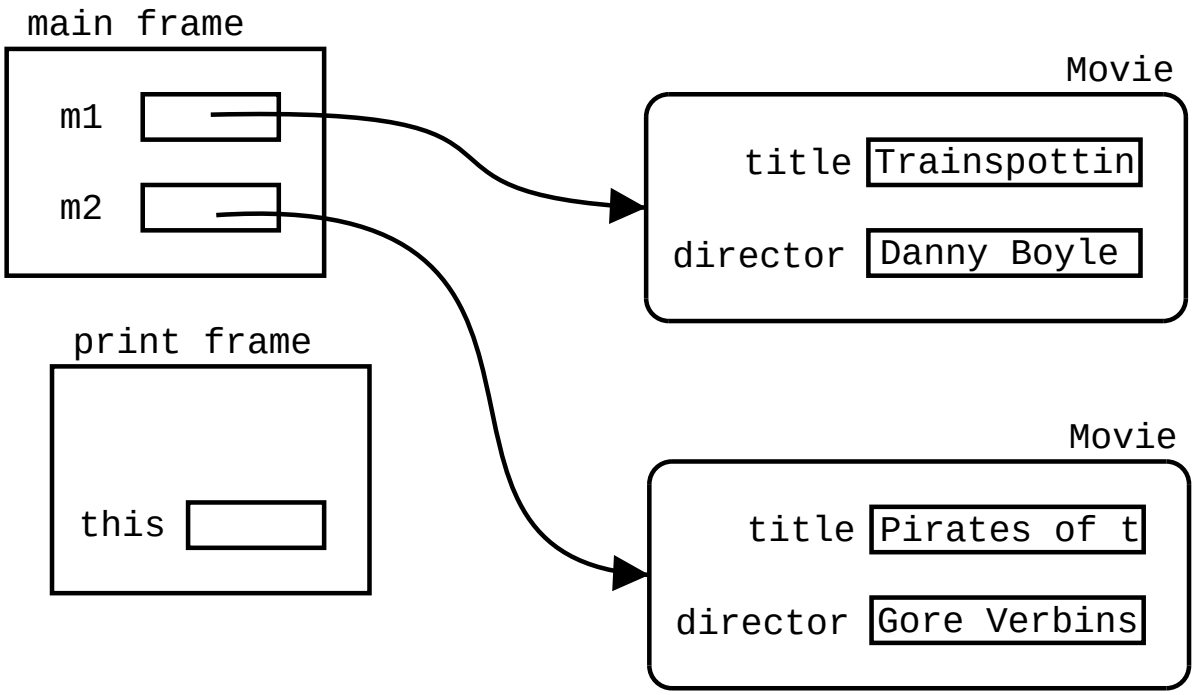
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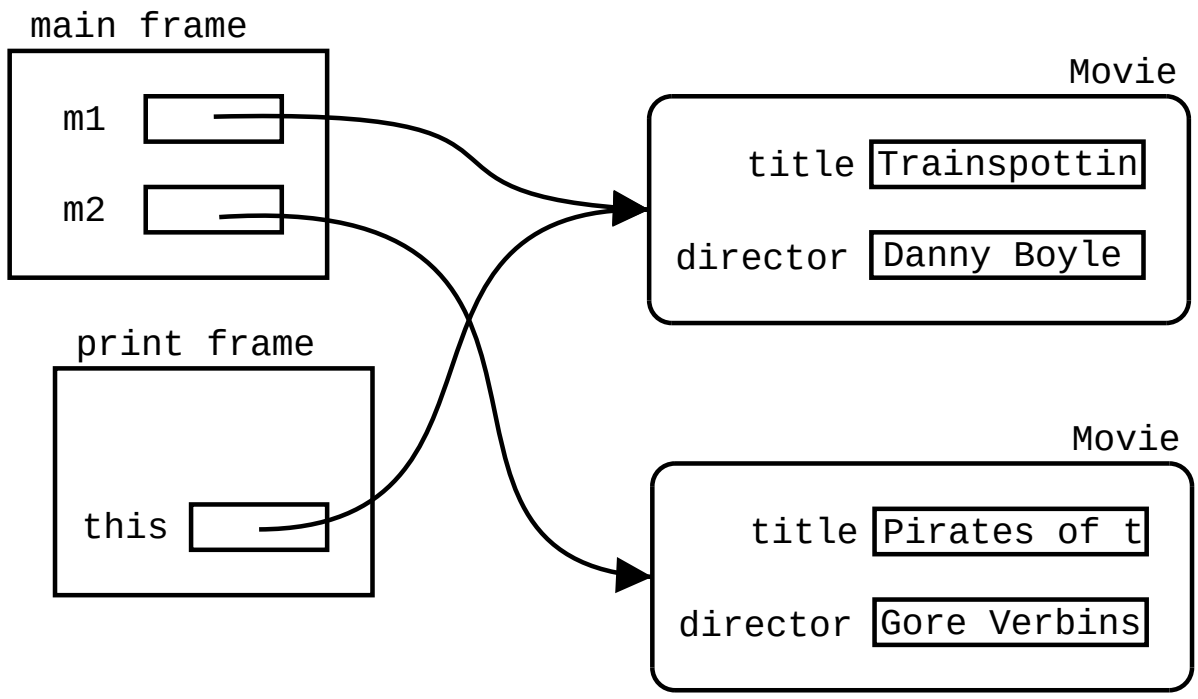
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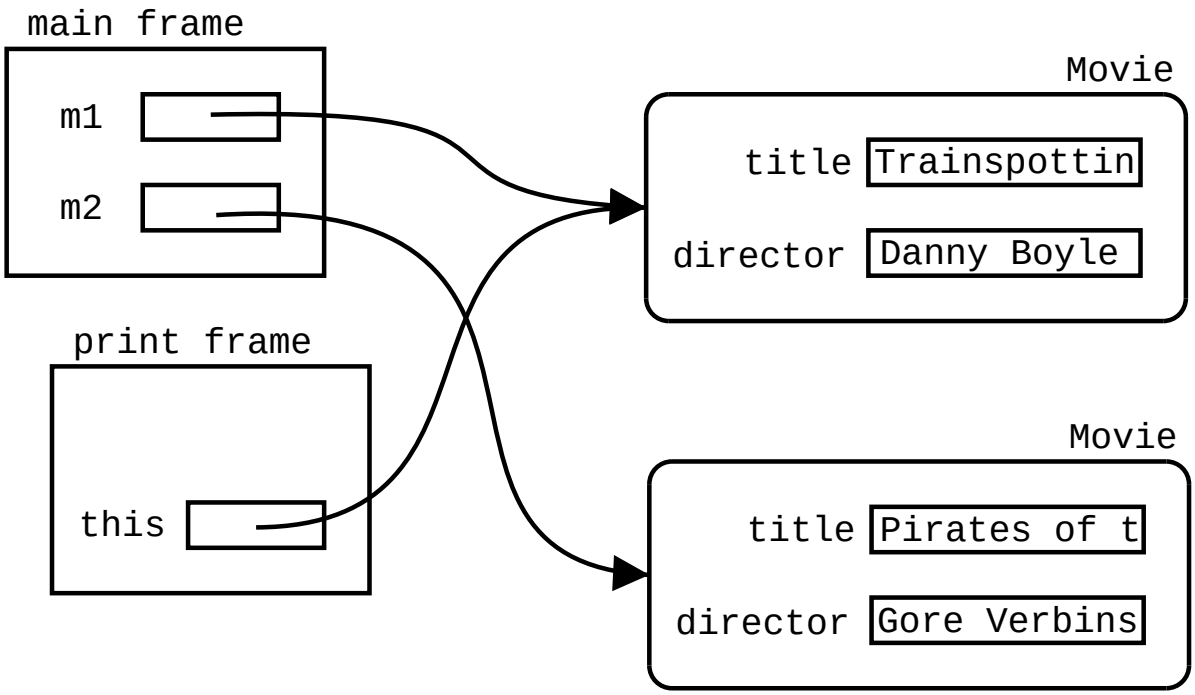
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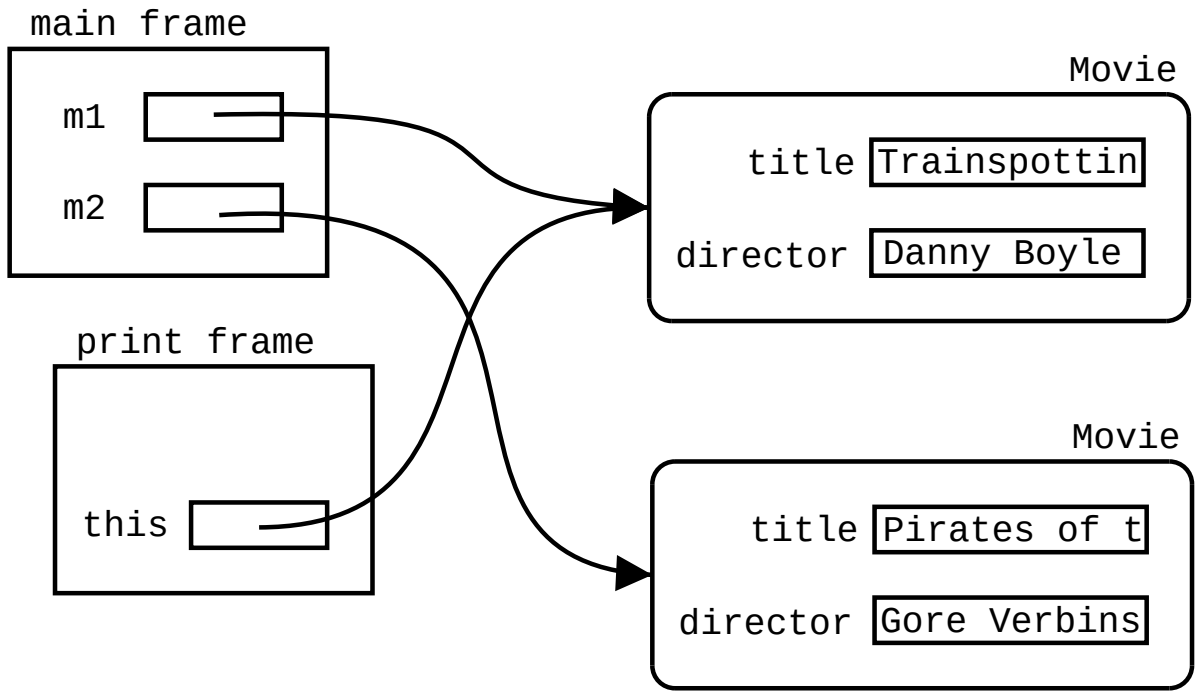
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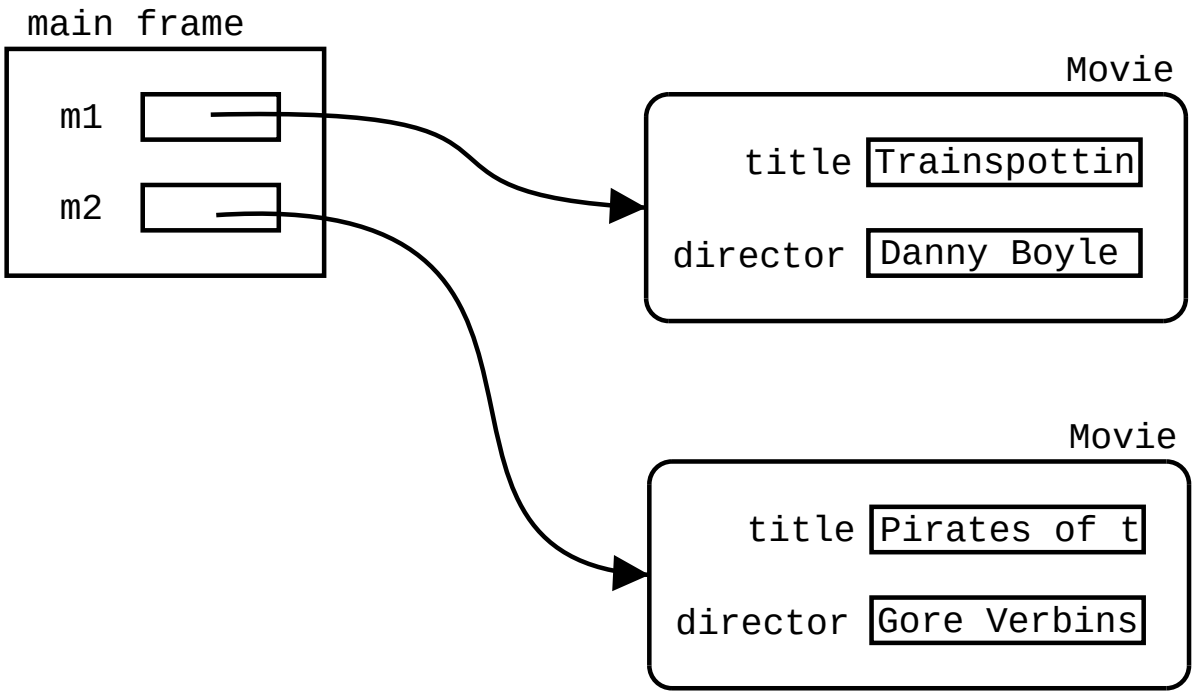
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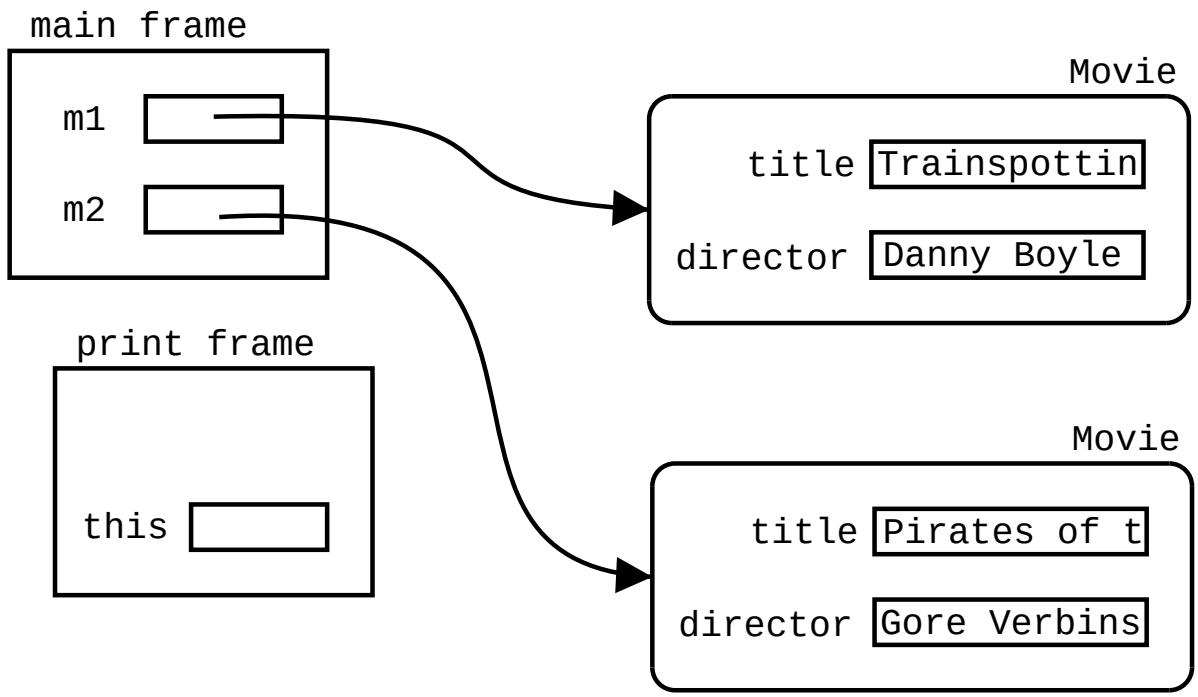
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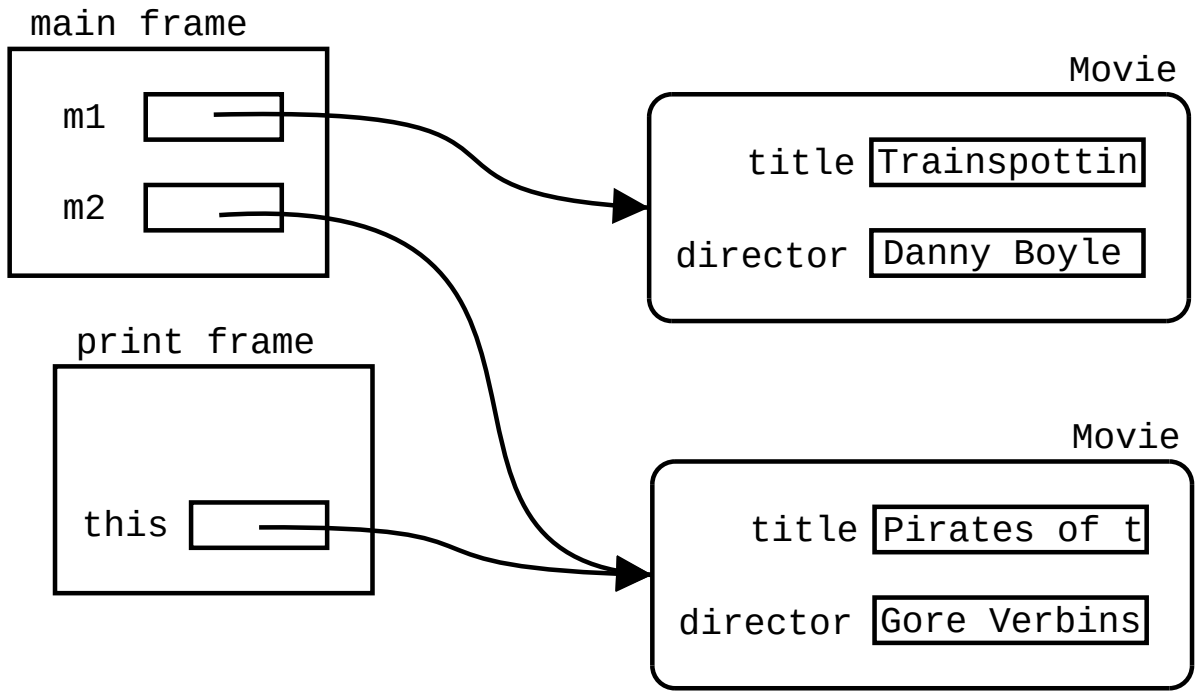
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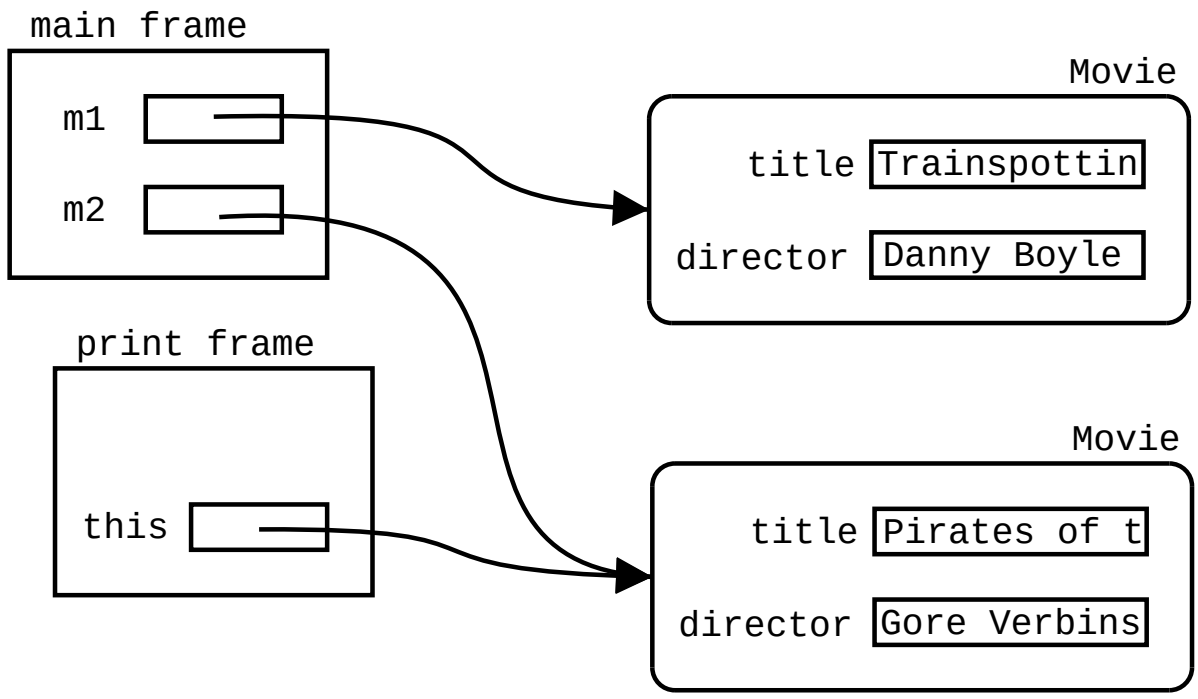
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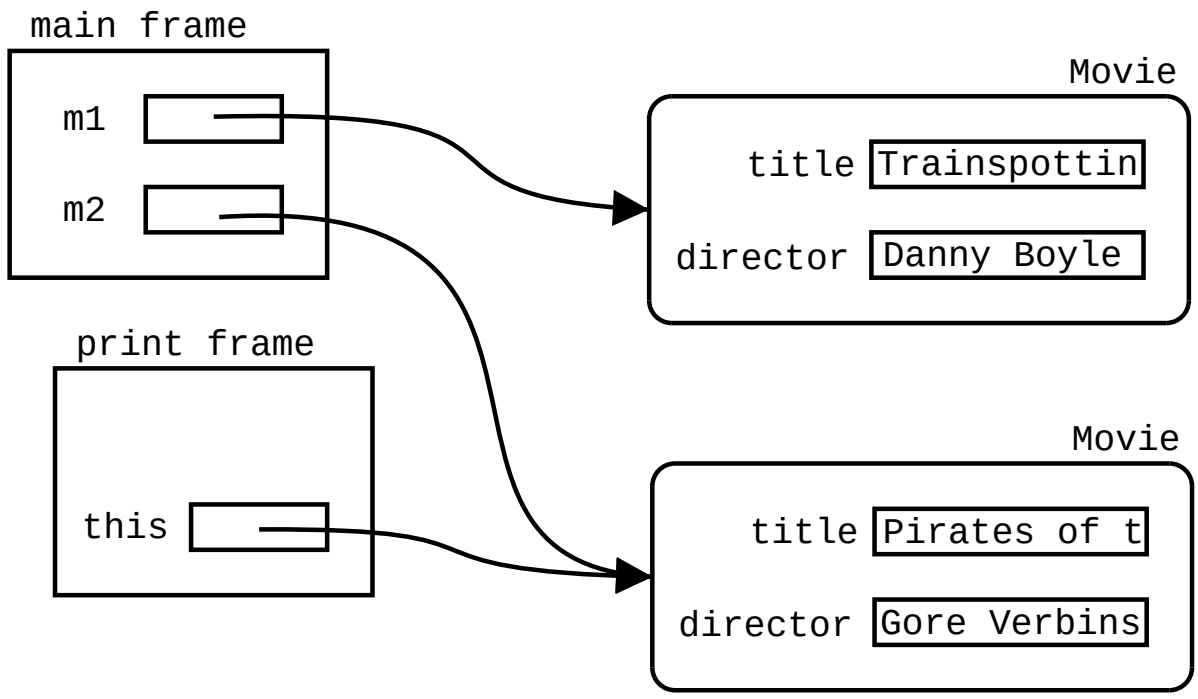
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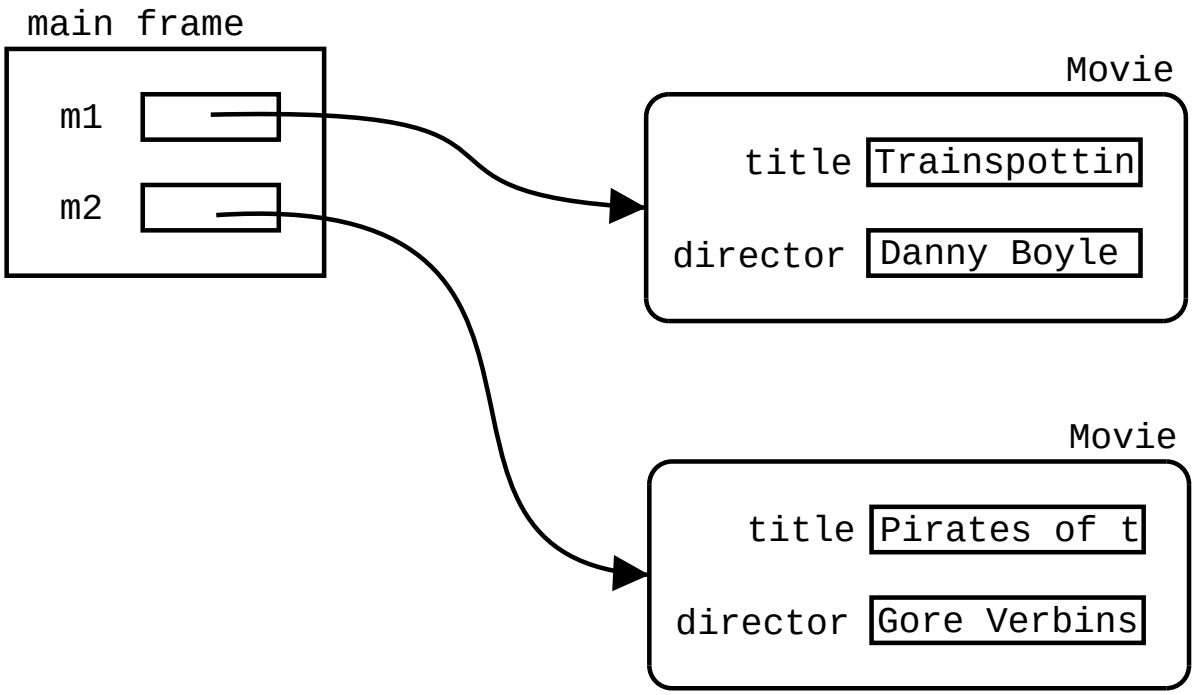
main frame
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title
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Gore Verbins

Classes are data types

```
public class Theater {
  void play(Movie m)
  {
    m.print();
  }
}

public class MovieApplication3 {
  public static void main(String[] args)
  {
    Movie m1;
    Theater t = new Theater();
    m1 = new Movie(“Les Invasions barbares”,
                   “Denys Arcand”);
    t.play(m1);
  }
}
```

Aggregation

- Analisys:
  - Identify relevant information: objects and types of objects (classe)
  - Identify relationships between objects
- Different kinds of relationships depending on the type of the objects involved
- For example:
  - Numeric relationships:
    * account balance > 0
    * car fuel > 10
    * hitPoints <= maxHitPoints
    * number of heads <= 2
    * number of fingers > 1
    * tax_payable = base + (income - cutoff)*rate
  - Structural relationships:
    * A bank account *has a* balance and an owner
    * A car *has an* engine
    * A person *has a* name and a head

Classes are data types

```
class Car
{
    double speed = 0.0;
    boolean on = false;

    void start()
    {
      on = true;
    }
}
```

Objects and Aggregation

```
public class Engine {
    // ...
}
public class Car {
    Engine engine;
    // ...
}
public class StreetSimulation {
    void p()
    {
        Car mycar = new Car();
        mycar.engine = new Engine();
    }
}
```

Classes are data types

```
class Engine
{
    void turnon() { ... }
}

class Car
{
    double speed = 0.0;
    boolean on = false;
    Engine my_engine;

    Car()
    {
        my_engine = new Engine();
    }
    void start()
    {
      on = true;
      my_engine.turnon();
    }
}
```

Objects as first class values

- Objects can be attibutes of other objects

```
public class Rabbit {
  void jump() { ... }
}
public class Cage {
  Rabbit my_rabbit;
  void put(Rabbit a)
  {
    my_rabbit = a;
  }
  Rabbit get()
  {
    return my_rabbit;
  }
}
```

...elsewhere...

```
Rabbit bugs = new Rabbit();
Cage c = new Cage();
c.put(bugs);
Rabbit wester = c.get();
```

Classes are data types

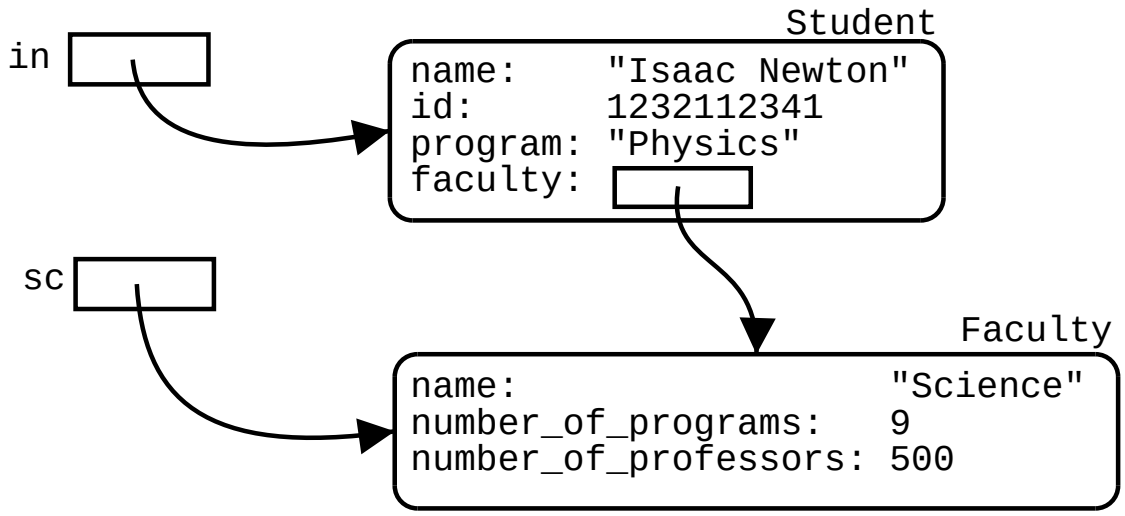
```
public class Student
{
    String name;
    long id;
    String program;
    String faculty;
    //...
    void set_prog_and_faculty(String p, String f)
    {
        program = p;
        faculty = f;
    }
    //...
}
```

Classes are data types

```
public class Faculty
{
    String name;
    int number_of_programs, number_of_professors;
    //...
}

public class Student
{
    String name;
    long id;
    String program;
    Faculty faculty;
    //...
    void set_prog_and_faculty(String p, Faculty f)
    {
        program = p;
        faculty = f;
    }
    //...
}
```

```
public class StudentDatabase
{
  public static void main(String[] args)
  {
    Faculty sc = new Faculty();

    sc.name = "Science";

    Student in = new Student("Isaac Newton",
                             1232112341);

    in.set_prog_and_faculty("Physics", sc);

    //...
    System.out.println(sc.name);
    System.out.println(in.name);
  }
}
```

Object structure in memory




```
in.set_prog_and_faculty("Physics", new Faculty());
```

doesn't create the variable `sc`, but then, the `Faculty` object cannot be shared between different `Student` objects.

The end