



# COLLISION PIPELINE

**IMAGINE**

Olivier Carré - Moreno Trlin

22nd October 2013

# SUMMARY

1. Collision models
2. Quick overview
3. The narrow phase
4. Collision group

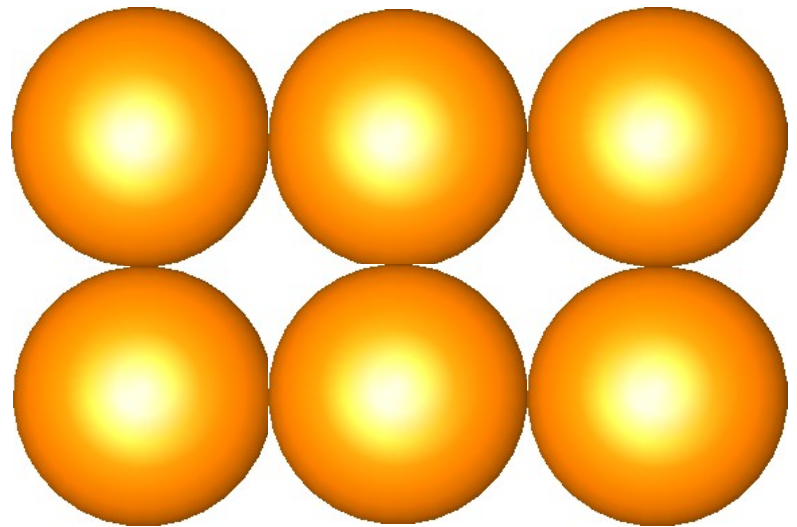
# 1

## Collision models

# Collision models

What is a collision model ?

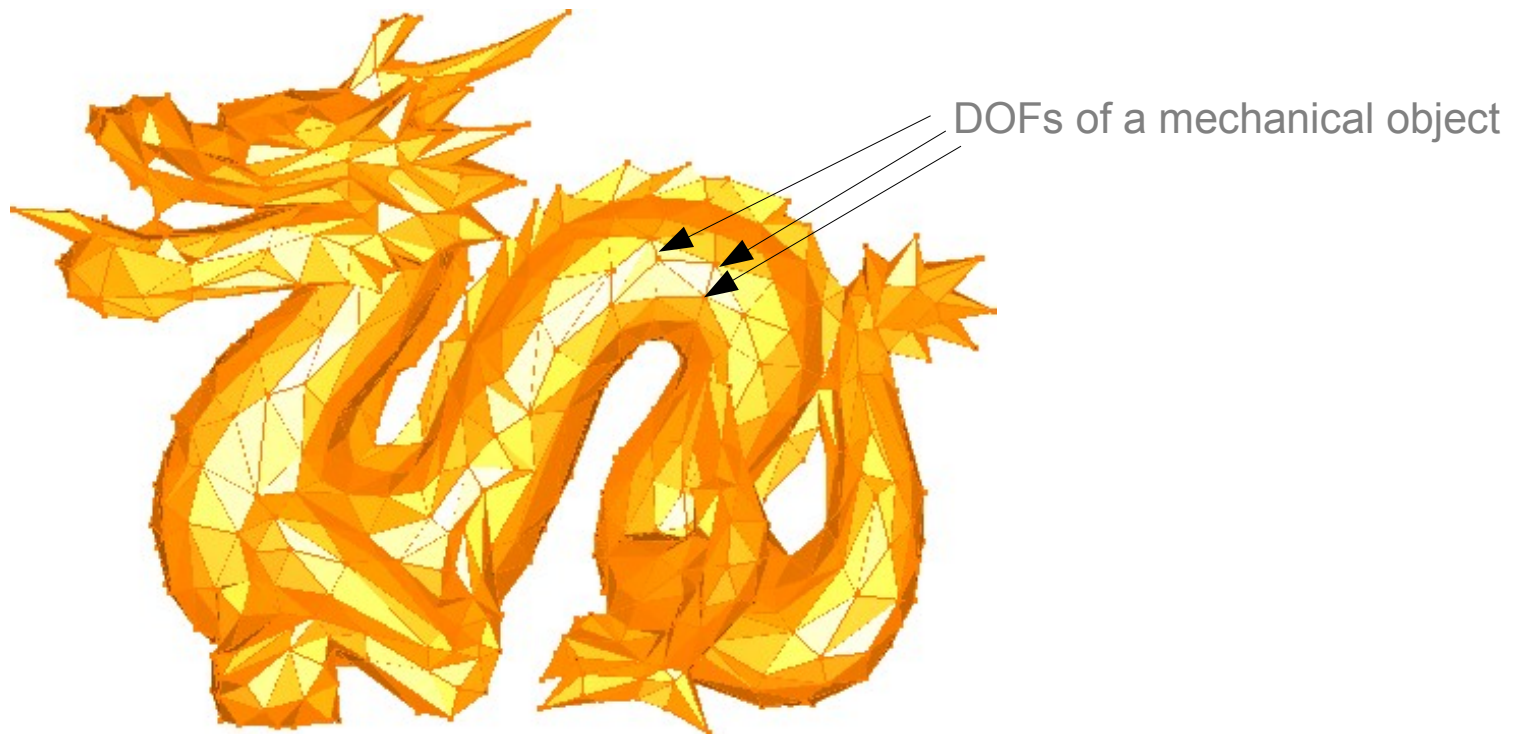
- Geometric representation of the object's surface, support of collisions.



# Collision models

What is a collision model ?

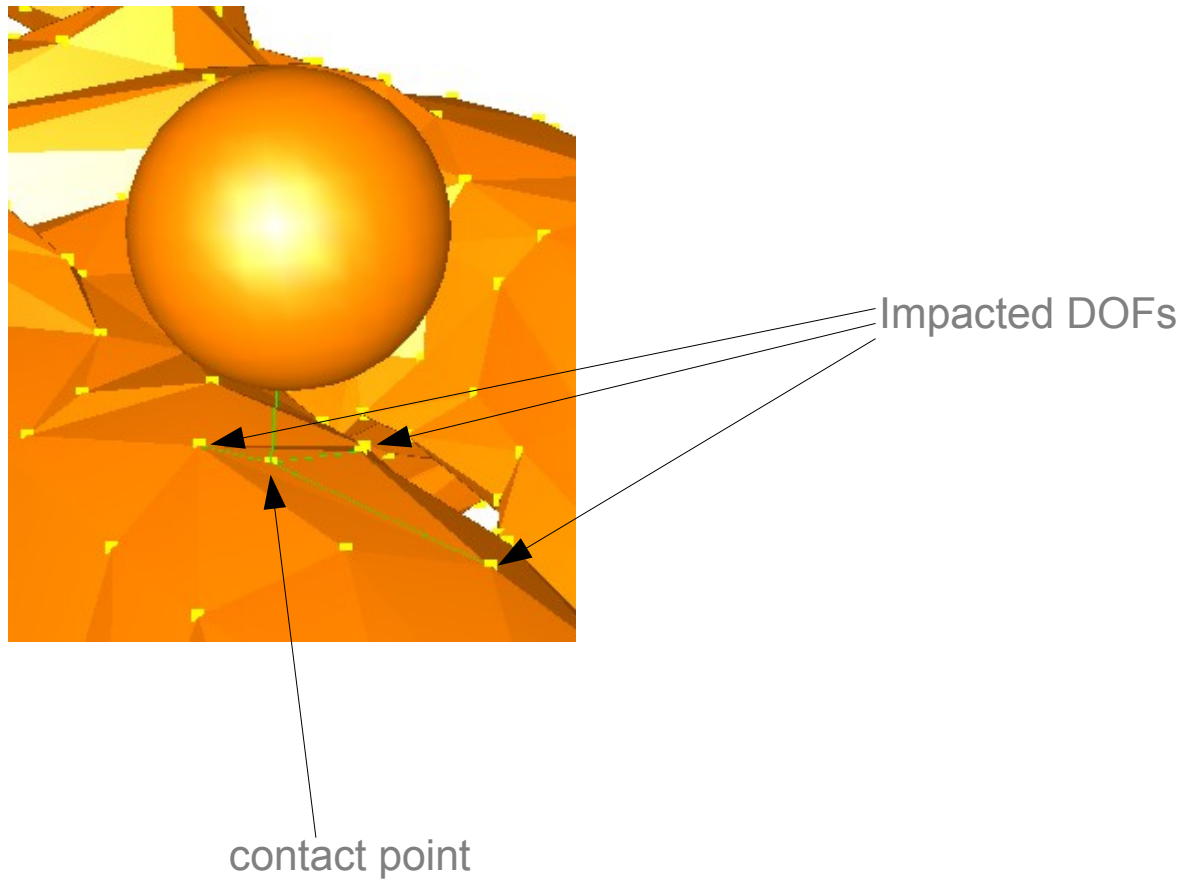
- Geometric representation of the object's surface, support of collisions



- Linked to a mechanical object

# Collision models

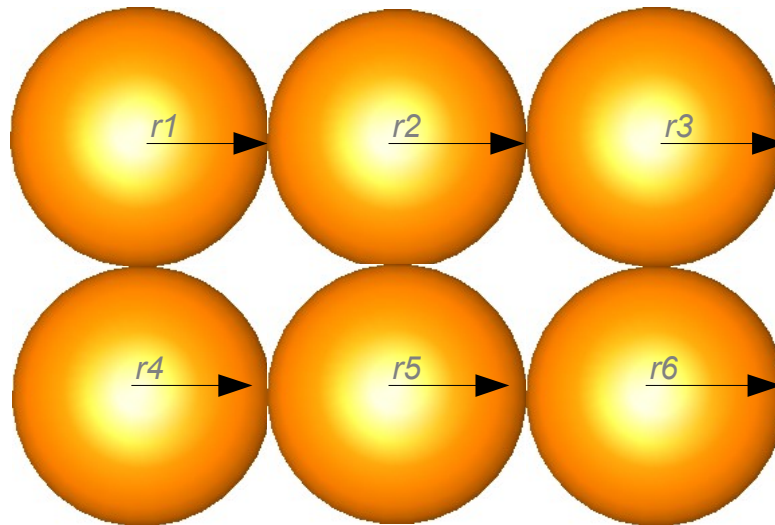
Example of a collision



# Collision models

What is a collision model ?

- Geometric representation of the object's surface, support of collisions
- Linked to a mechanical object
- Contains internal informations, like sphere radii



# Collision models

Implemented collision models :

- SphereModel
- RigidSphereModel
- TriangleModel
- LineModel
- PointModel
- CapsuleModel
- OBBModel (oriented bounding box)

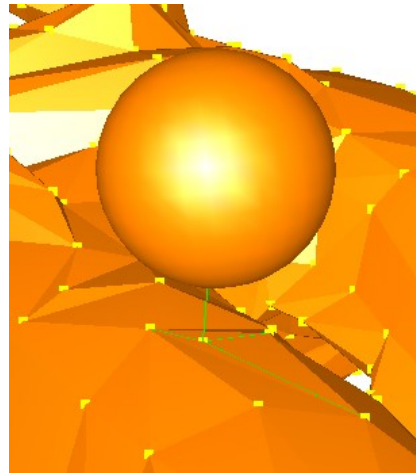
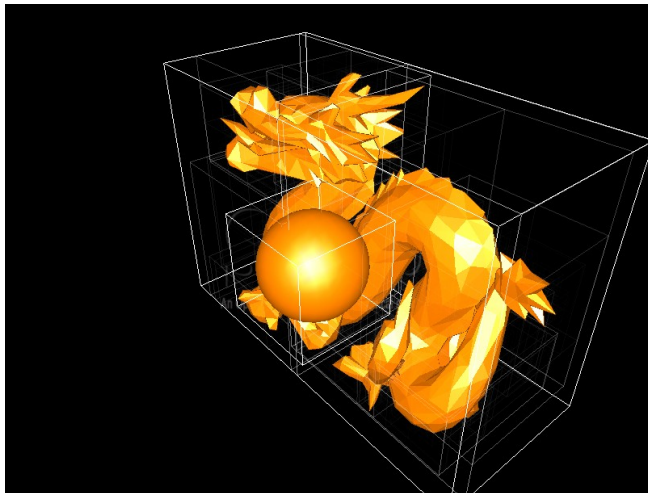
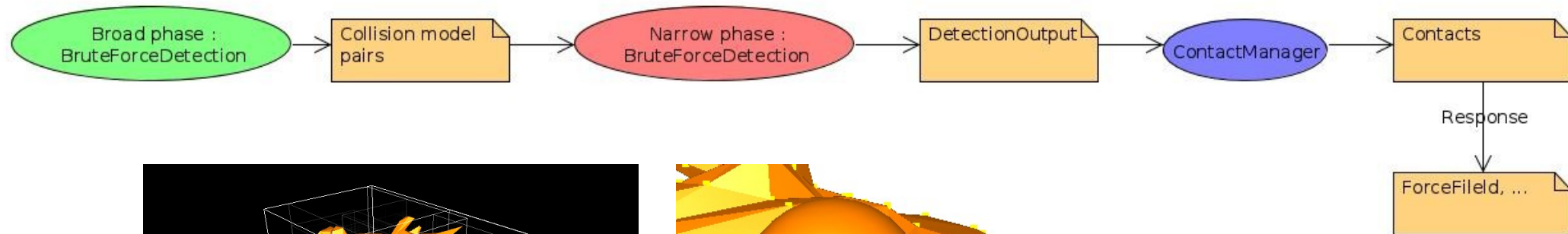




# 2

## Quick overview

# Quick overview



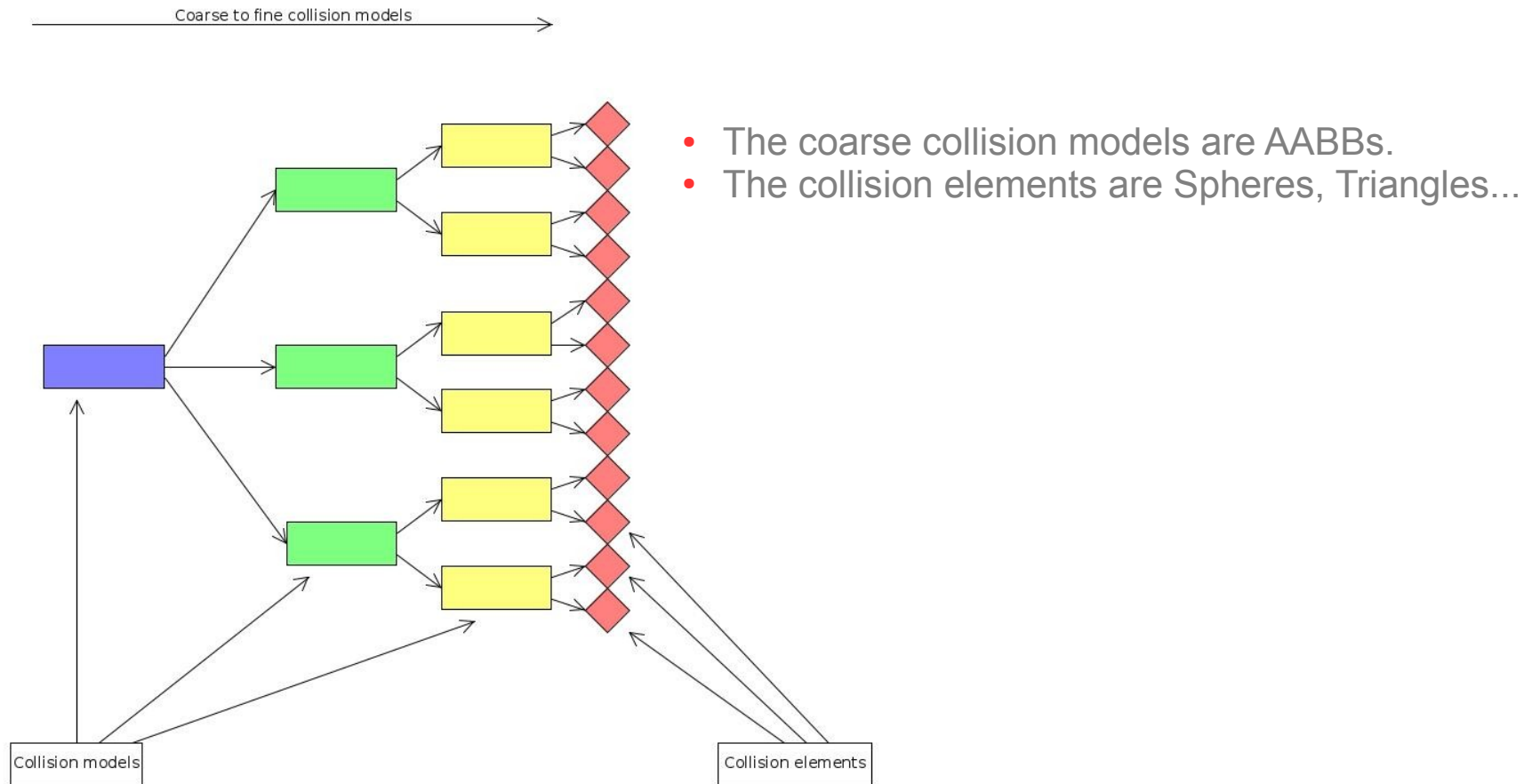
- Broad phase : intersection of collision model AABBs
- Narrow phase : descending in the AABB hierarchy and computation of intersection (if it exists), i.e. intersection points and other parameters
- BruteForceDetection implements both the narrow and the broad phase
- Broad phase implementations : BruteForceDetection, IncrSAP (SweepAndPrune)
- Response implementations : FrictionContact, BarycentricPenaltyContact...

# 3

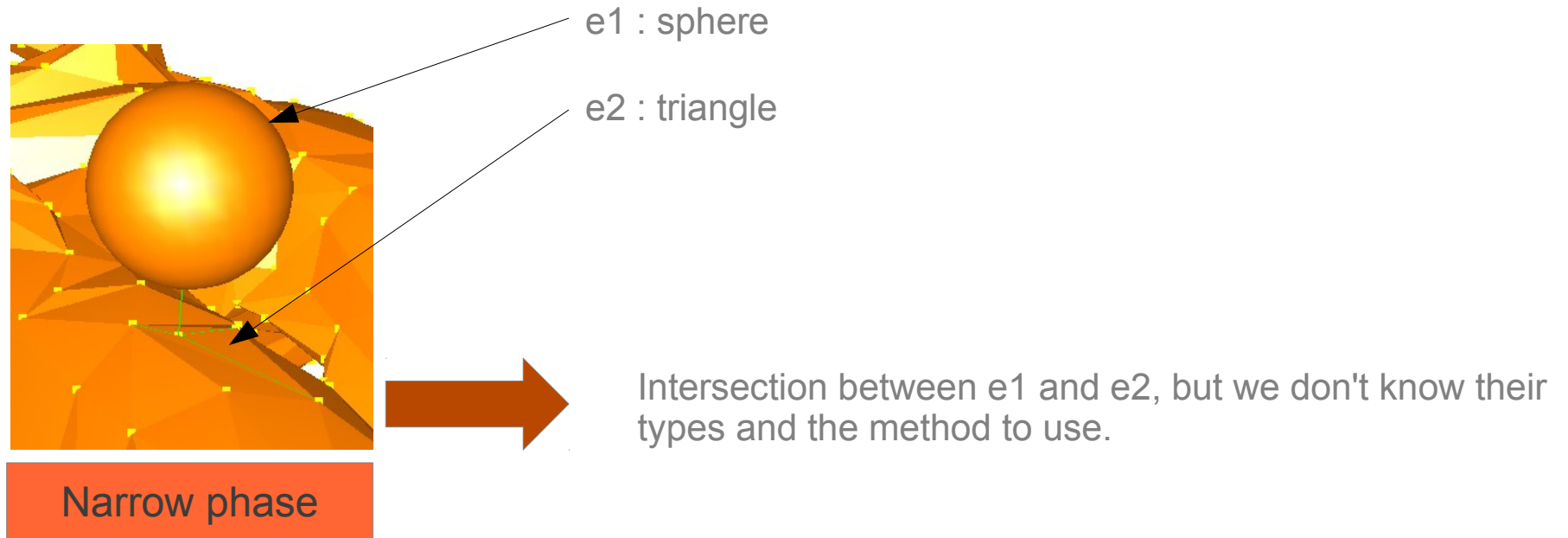
## The narrow phase

# The narrow phase

## *Descending the AAB hierarchy*

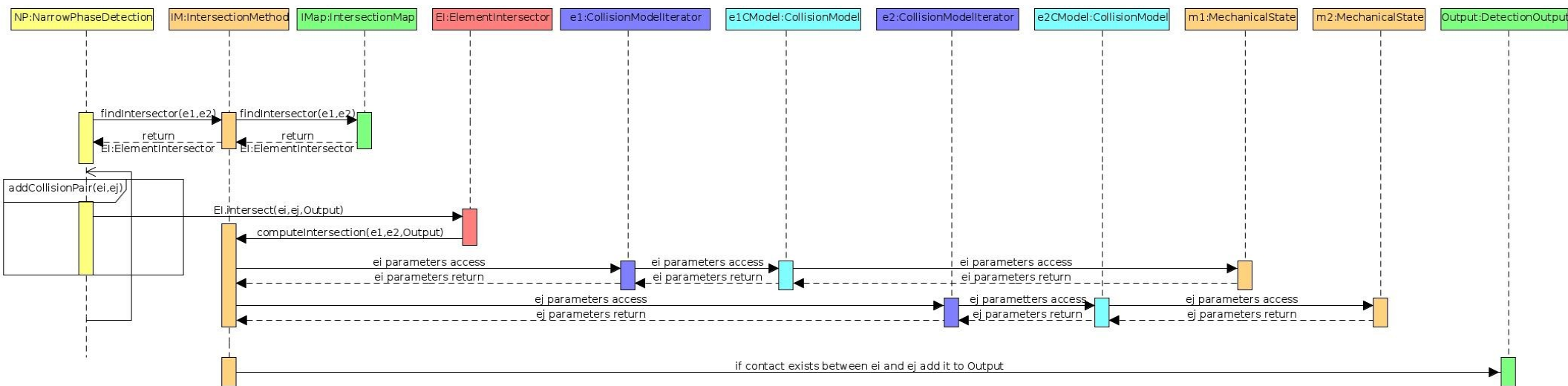


# The narrow phase



# The narrow phase

## *BruteForceDetection*



- IntersectionMethod : set of intersection functions, it is present in the scene
- IntersectionMap : given two collision elements, returns the right method to use
- DetectionOutput : result of the collision
- IntersectionMethod implementations : DiscreteIntersection, MinProximityIntersection, NewProximityIntersection

# The narrow phase

## *Intersection methods*

- alarmDistance : maximum distance between collision elements for which a contact is created
- contactDistance : parameter used in the contact creation
- DiscreteIntersection : contact created when collision elements are intersecting, not fitted to surfacic collision models
- MinProximityIntersection : contact created when collision elements are close to each other, optimized for meshes
- NewProximityIntersection : contact created when collision elements are close to each other, not optimized for meshes

## *Collision models parameters*

- proximity : enlargement of the collision model, i.e., value added to the alarmDistance and the contactDistance and also when building AABBs in the broad phase

# The narrow phase

## *Contact response*

- PenaltyContact : default response used, efficient but can have stability problems
- LMConstraint : slower but much better stability
- You can specify which one you want to use in the DefaultContactManager



# 4

## Collision group

# Collision group

CollisionGroupManager : given a set of contacts, create integration groups

- Contacts between models define a graph
- « Simply » gathers connected subgraphs
- Decide which integrator/solver will be used

# Thank you

