Chapter 11
Conclusion

The theory for collisions we have built and illustrated has only one mandatory assumption: the duration of the collision is short compare to the whole duration of the motion. As shown by the examples, this subjective assumption is less restrictive than it may look at first glance.

Because the predictive theory is founded on the very basis of mechanics, it is reliable and flexible. The innovative concept is that a system made of two solids is deformable because their relative position changes. The definition of the velocities of deformation of the system introduced in the classical developments of mechanics:

- principle of the virtual work giving the equations of motion;
- constitutive laws derived with the laws of thermodynamics and observation;

allows a large range of applications.

The scope of the applications is even larger than it could be expected: social sciences and mechanics are united to predict the motion of crowds with application to transport management and evacuation of theaters management.

The classical problem which is to predict the motion of crowds of solids, i.e., the motion of granular materials, has been explored with the motion of three balls. The results show how sophisticated and versatile are the challenging results due to interactions at a distance.

This collision theory may also help to design protections of civil engineering structures collided by debris flows.

Thermal effects are inseparably linked to mechanical effects in collisions which are always dissipative. Experiments exhibiting temperature jumps up to 7 °C and the shape memory alloy example show how important this aspect of collisions can be.

Multiple openings may be foreseen for further applications in different domains, for instance in bio-mechanics.

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M. Frémond, *Collisions Engineering: Theory and Applications*,
Springer Series in Solid and Structural Mechanics 6,
DOI 10.1007/978-3-662-52696-5_11