Method

"LDYN" is always a program of calculation and simulation implemented under Matlab. It decomposes into three parts:

- Rigid mode: one first program allows to make the detection of contact points as well as their parameters. A file results which will be afterward used. This method allows to avoid long useless calculations.

- Contact force modelling according to the formulae of Hertz.

- Dynamic study: by means of the file result of the first sub-program, the second sub-program carries out the dynamic calculations, creates a matrix “MM” and draws nine curves. These calculations consist in using the differential equations of the second order binding acceleration to the forces acting on the axle. The numerical solution is made by a method of integration step by step explicit (Algorithm of integration with fixed step of type development of Taylor in the third order).

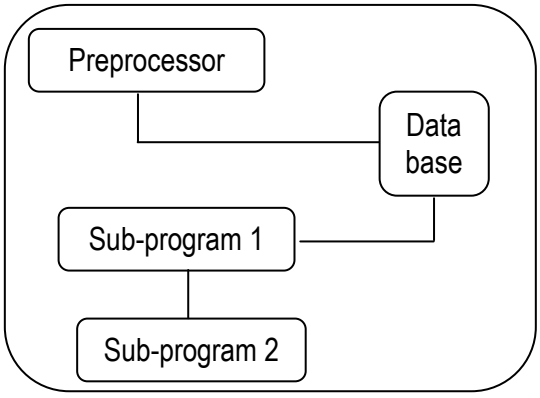

Figure 1 : Program LDYN

Preprocessor : Rigid mode
Sub-program 1 : Formulae of Hertz
Sub-program 2 : Contact of Hertz in hypothesis small disturbances with regard to rigid reference

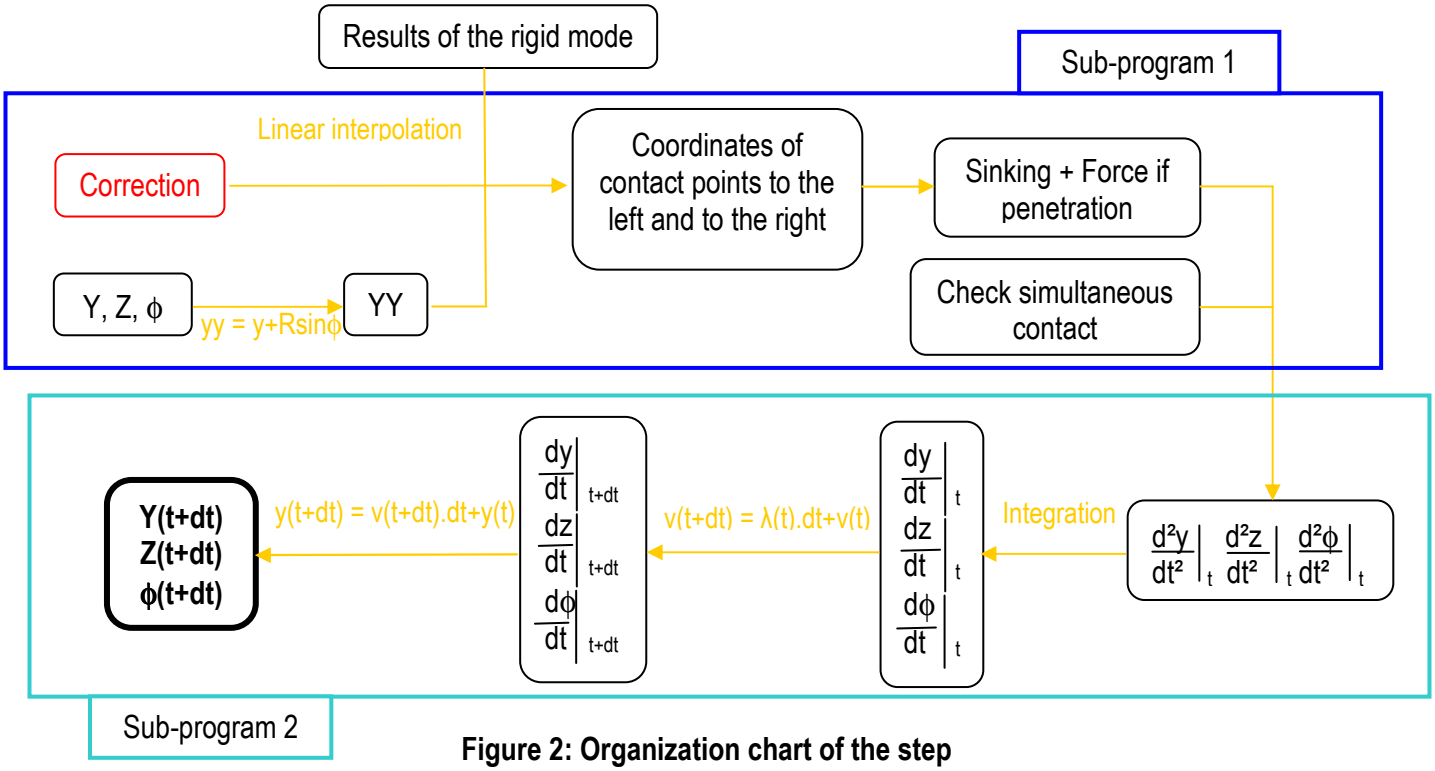

Figure 2: Organization chart of the step

These new results result from the program LDYN with correction. The used method is recommended by the Dr Jean-Pierre Pascal. It consists, during the estimation of the contact points, to take into account the depth of penetration of the wheel on the rail.

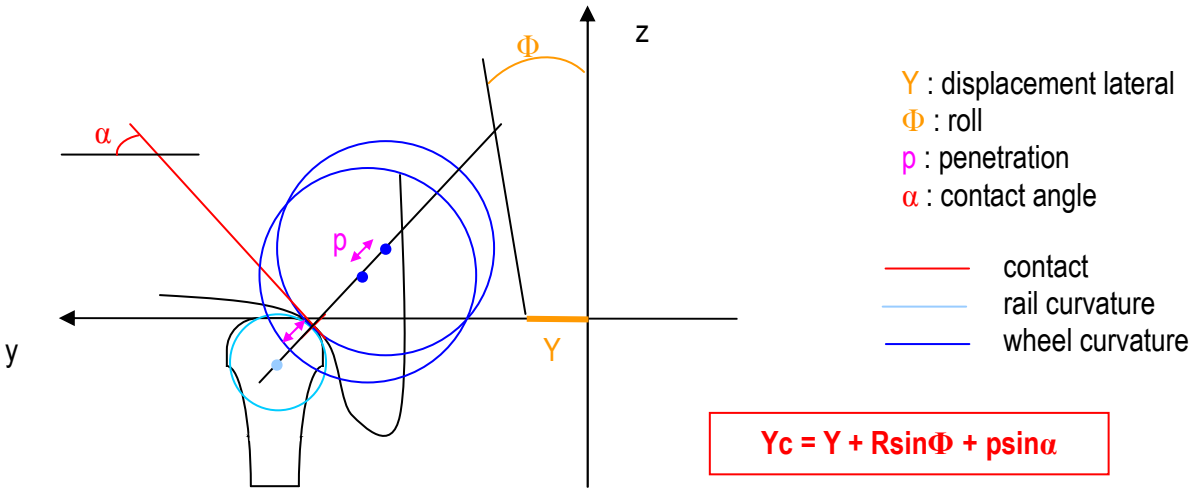

Figure 3 : Correction on depth of penetration

To carry out our calculations, we based ourselves on profiles of wheel and rail defined in LDBenchmark.

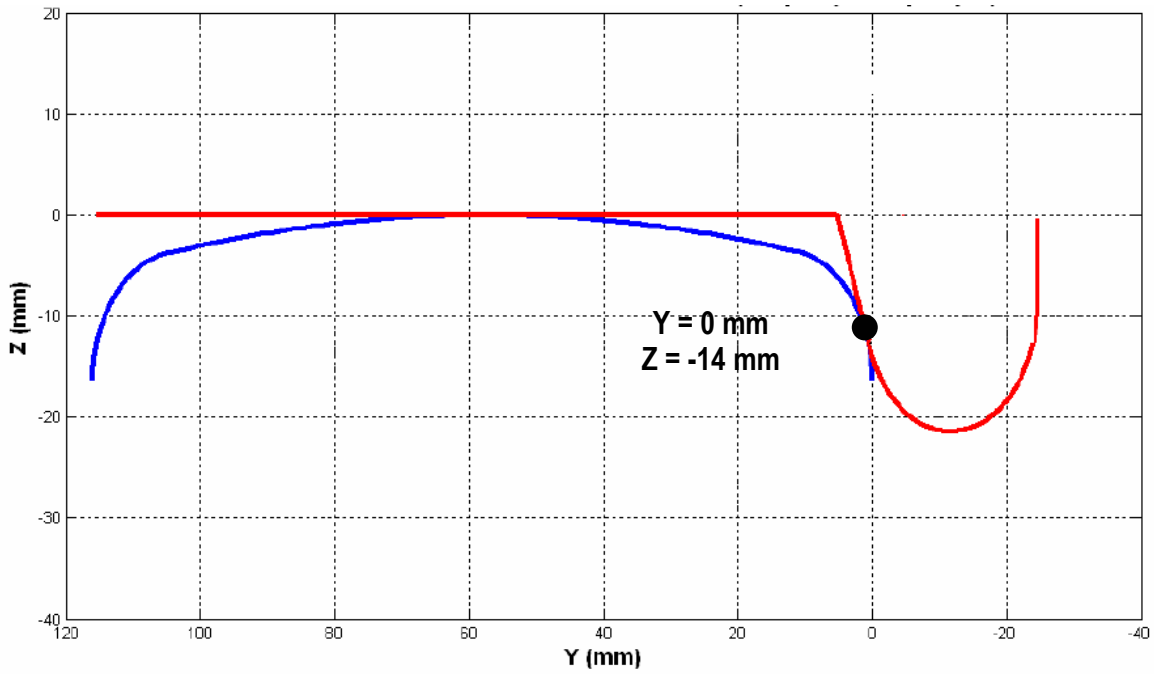

Figure 4 : Simplified profiles
Using benchmark data, rigid axle clearance results at 2x16.70mm