**Quarter Car Suspension Model**

The suspension system is one of the most important parts of the vehicles, which can reduce the impact loads from the road to improve the automotive ride comfort and stability. If we assume a car going through a random surface, which causes the car to jump up and cause discomfort to the passengers. The quantities Zs and Zu are vertical displacements in car body and car wheel respectively due to displacement Zr induced by an uneven road. The quality of interest here becomes Zs-Zu the displacement which we can see here, and in this diagram shown we can get step input responses of them. Anyway these responses are not good for the practical application as we can see in this page that it is having overshoot which causes the discomfort to the passenger, so we remodel the system and make it as shown in the figure and adding a compensator here, will alter the overshoot and the settling time of the step response. Ideally we would want systems which have lower overshoot and lower settling time. And assuming here R(s) = 0 in here the block diagram further simplifies as shown. And for all different compensators the final plot is this. We had added all types of compensators to the system. The system response is the blue coloured plot as shown we had seen that this has overshoot, now we try to make it better by adding compensators. For P compensator it is almost the same plot, there is nothing much difference, for PI also there is nothing much difference, whereas for PD if we see the overshoot and settling time vary and they both are less than that of system response which is good for us to use, similarly all followed but the standouts are PD compensator and PID compensator, PID also is good but it has more overshoot occurring in more time than PD compensator. So, by adding a compensator to the Quarter Car Suspension Model, we can make better systems, which are having lower overshoot and settling time and that are fitting well to the practical conditions.